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Multifactor Capital Asset Pricing Model in the Jordanian Stock Market

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This is to certify that the doctoral dissertation by

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Abstract

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MA, Hashemite University, 2007

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

A valid and accurate capital asset pricing model (CAPM) may help investors and mutual funds managers in determining expected returns and thus, may increase profits which can be reflected on the community resources. The problem is that the traditional CAPM does not accurately predict the expected rate of return. A more accurate model is needed to help investors in determining the intrinsic price of the financial asset they want to sell or buy. The purpose of this study was to examine the validity of the single-factor CAPM and then develop and test the validity of a multifactor CAPM in the Jordanian stock market. The study was informed by the modern portfolio theory and specifically by the single-factor CAPM developed by Sharpe, Lintner, and Mossin. The research questions for the study examined the factors that may explain the variation in the expected rate of return on stocks in the Jordanian stock market and the relationship between the expected rate of return and factors of market return, company size, financial leverage, and operating leverage. A causal-comparative quantitative research design was employed to achieve the purpose of the study by testing the listed companies on the Amman stock exchange (ASE) for the period from 2000 to 2015. Data were collected from the ASE database and analyzed using the multiple regression model and *t* test. The results revealed that market return, company size, and financial leverage are not predictors of the expected rate of return while operating leverage is a predictor. The results of this study may contribute to positive social change by changing the way the individual investors and mutual funds managers select their investing portfolios which can lead to better resource distribution in the economy.

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Dedication

This dissertation is dedicated to my mother and father who spent most of their life and money in helping me and my brothers to complete our education. Special dedication is to my father who spared no effort to provide me with medical treatment after I suffered from a serious injury when I was a child. I am thankful for all my brothers who supported me during my study. My thanks also go to those people who treated me bad during my career because they pushed me to work harder and prove myself.

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Chapter 1: Introduction to the Study

In this study, I tested the validity of the single-factor capital asset pricing model (CAPM) developed by Sharpe (1964), Lintner (1965), and Mossin (1966). In addition, I tested a proposed multifactor CAPM that contains four variables following the model developed by Sharifzadeh (2005). Those variables include, in addition to the market return in the single-factor CAPM, size of the company, financial leverage, and the operating leverage.

The problem is that this traditional CAPM does not accurately predict the expected rate of return according to Zabarankin, Pavlikov, and Uryasev (2014) and thus, a more accurate model is needed to help investors in determining the intrinsic price of the financial asset they want to sell or buy. The main focus of this study was to test the validity of the traditional CAPM and to develop a multifactor CAPM that can predict the expected rate of return on the asset more accurately than the traditional model. Although many researchers tried to identify the factors that determine the expected rate of return on a stock by developing new extensions of the CAPM, these extensions cannot explain the complete variation in the expected rate of return in the emerging markets and thus, more variables are still needed to increase the explanation power of the CAPM. This study will fill this gap in the knowledge by testing new variables derived from the corporate finance theory in one of the emerging financial markets.

The study may help investors in correctly estimating the expected rate of return and thus, the price of the stock. This may increase their profits and lead to positively change their overall financial position which represents one source of financial support available for the society to cover the development expenses. In addition, the results of the study may be used to determine the fair return on the public utility which may increase the governmental resources available for the development of the local community.

In this chapter, I described the problem of the study and the variables involved in this problem. The theory that informed the study is explained in the theoretical base. The purpose and the nature of the study are explained before the definitions and assumptions of the study are discussed. The chapter concludes with the limitations, delimitations of the study and a summary.

Background of the Study

The CAPM was first introduced by Sharpe (1964), Lintner (1965), and Mossin (1966). In this model, the expected rate of return depends on two elements (Amihud & Mendelson, 2015): (a) the risk-free rate of return and (b) the market risk premium; because the model contains one risk factor (market risk), this model is called single-factor CAPM or the traditional CAPM. The relationship between the elements of the model is assumed to be linear (Zabarankin, Pavlikov, & Uryasev, 2014); this linear relationship can be expressed by the following equation:

$$E\ (R_i) = R_f + \beta_{iM}\ [E\ (R_M) - R_f] \qquad (1)$$

Where, $E\ (R_i)$: the asset expected return, (R_f) is the risk-free rate of return, $[E\ (R_M)]$: the expected return of the market, and (β_{iM}) is the sensitivity of the expected excess asset return to the expected excess market return (Beta).

Researchers have tested the validity of this single-factor model in different countries and at different times. Some studies supported the validity of the model while others have claimed its failure in predicting an accurate expected rate of return. Among studies that prove the invalidity of this traditional model was a study conducted by Bornholt (2013), who tested the model in the U.S. market and provided evidence about the anomalies that the model suffers from including: (a) the beta anomaly where portfolios that have higher beta than others have less return than predicted by the CAPM while portfolios with lower beta may have higher return than estimated by the model; (b) value anomaly where firms with high book-to-market equity ratio have more return than firms with low book-to-market ratio; and (c) momentum anomaly where stocks that have relatively high 6-month to 12- month returns have higher returns in the next 12 months than stocks with relatively low 6-month to 12-month returns.

In addition to the U.S. market, the model was tested in central and southeastern European emerging markets by Dzaja and Aljinovic (2013) who examined the model in the markets of nine countries in central and southeastern Europe for the period from 2006 to 2010. They concluded that the model was not appropriate to be used in these markets. In addition, the traditional model was tested in the Jordanian stock market and claimed to be invalid (Alrgaibat, 2015). These researchers have shown that the model is invalid in other markets despite the differences between these markets and the U.S. market

The traditional model was tested in the Indian stock market by Saji (2014), who tested the stock prices for the period from 2007 to 2012 and found that the model is not valid for asset pricing in the emerging markets. Based on these studies, it can be said that researchers from different regions supported the invalidity of the traditional CAPM in predicting the expected rate of return.

Contradictory evidence shows that some researchers found that the traditional capital asset pricing model is valid and can be used for asset pricing in some markets including Turkish market (Köseoğlu & Mercangöz, 2013) and Malysian market (Lee, Cheng, & Chong, 2016). Based on these studies, it can be concluded that the previous studies are not completely against the validity of the model.

Researchers have tried to add other variables to the traditional model to increase its accuracy because of the invalidity of the traditional CAPM. One of the early attempts to add other factors to the model was the study of Black, Jensen, and Scholes (1972), who developed a two-factor model that contained two variables: the market risk premium combined with β_i and other return combined with $(1-\beta_i)$. Another multifactor model contains three variables: market risk premium, size, and the book-to market ratio (Fama and French, 1992); this model is usually referred to as Fama-French three-factor model. A four-factor model was developed by Carhart (1997) who added a one year momentum to Fama-French three-factor model. The four-factor model includes variables of market risk premium, size, book-to market ratio, and the one year momentum. Chapter 2 will provide a detailed discussion on the empirical test of the traditional and developed CAPM models. All these attempts were to develop the traditional model for more accuracy by adding more variables without providing a theoretical base that supports it as additional sources of risks.

Although many researchers tried to identify the factors that determine the expected rate of return on a stock by developing new extensions of the CAPM, these extensions cannot explain the complete variation in the expected rate of return in the emerging markets and thus, more variables are still needed to increase the explanation power of the CAPM. This study will fill this gap in the knowledge by testing new variables derived from the corporate finance theory in one of the emerging financial markets.

Developing a CAPM model that contains variables derived from the corporate finance theory may provide more accuracy to the traditional model. In this study, I tested a model developed by Sharifzadeh (2005), who added three variables derived from the corporate fiancé theory to the traditional model: size, financial leverage, and operating leverage. This model has not been examined in the Jordanian stock market before.

Problem Statement

The stock returns are reduced when the investor buys a stock at more than its intrinsic price and when he or she sells the stock at less than the intrinsic price. The general problem is how stocks are or should be priced (Mossin, 1966). In addition, determining the expected rate of return of the stock can help financial managers in calculating the cost of equity for capital budgeting decisions. Most companies (85%) use the single-factor capital asset pricing model (CAPM) to estimate the cost of equity (Chawla, 2014).

The specific problem is the inability of this single-factor CAPM to determine the financial asset's expected rate of return (Alrgaibat, 2015; Gharaibeh, 2015; Ramadan, 2014). No previous studies tested the multifactor CAPM that includes the factors of size, financial leverage and operating leverage; in this quantitative study, I tested the multifactor CAPM as an alternative to the invalid traditional version in the Jordanian stock market using the causal–comparative design. In this study, I tested if the expected rate of return can be predicted from the market rate of return, size, financial leverage, and operating leverage.

Purpose of the Study

As the single-factor CAPM is claimed to be invalid, the purpose of this quantitative study was to examine the validity of a proposed multifactor CAPM in the Jordanian stock market by testing the relationship between the expected rate of return as a dependent variable and the independent variables of: market rate of return, company's size, financial leverage, and operating leverage. This objective was achieved by examining the validity of the single-factor CAPM in the market first and then developing and testing the validity of the multifactor CAPM. To accomplish this objective, the approach was quantitative, causal-comparative to test the two models for stocks listed in Amman stock exchange (ASE).

Research Questions and Hypotheses

Research Questions

The research questions in this study are related to the factors that may explain the variation in the expected rate of return as proposed in the multifactor CAPM. The study aimed to address the following questions:

Research Question 1: What factors explain the greatest-variation in the expected rate of return of a stock?

Research Question 2: What is the relationship between the company size and its stock rate of return?

Research Question 3: What is the relationship between the company financial leverage and its stock rate of return?

Research Question 4: What is the relationship between the company operating leverage and its stock rate of return?

Research Question 5: What is the relationship between the company's stock rate of return and: market return, company's size, financial leverage, and operating leverage?

Research Hypotheses

To answer the research questions, I developed the research hypotheses in an order that corresponds to the order of the questions. The research hypotheses include:

Hypothesis 1: this hypothesis was developed to test the single-factor CAPM which assumes that the only risk factor that should considered by the investors is the market risk as discussed by Amihud and Mendelson (2015):

H_0: Market rate of return does not explain the greatest-variation in the expected rate of return on a stock.

H_1: Market rate of return does explain the greatest-variation in the expected rate of return on a stock.

Hypothesis one includes testing two regression models:

$$R_{jt} - R_{ft} = a_i + \beta_j (R_{Mt} - R_{ft}) + e_{jt} \quad (2)$$

$$\overline{R_j - R_f} = \lambda_0 + \lambda_1 b_j + \lambda_2 \sigma^2 (e_j) + e'_j \quad (3)$$

The null and alternate hypotheses for the first regression model can be expressed as:

H_0: a_i , $\beta_j = 0$

H_1: a_i , $\beta_j \neq 0$

And for the second regression:

H_0: $\lambda_0 = 0$, $\lambda_1 = \overline{R_M - R_f}$, $\lambda_2 = 0$

H_1: $\lambda_0 \neq 0$, $\lambda_1 \neq \overline{R_M - R_f}$, $\lambda_2 \neq 0$

Where R_{jt} is the realized rate of return on stock j during the month t, R_{ft} is the risk free rate of return during the month t, R_{Mt} is the rate of return on the market portfolio during the month t, a_i is the intercept of the line of the excess asset return (R_{jt} - R_{ft}), $\overline{R_j - R_f}$ is the average monthly risk premium on stock j during the period of the study, $\overline{R_M - R_f}$ is the average monthly risk premium on the market portfolio during the period of the study, e_{jt} is the error term of the rate of return of stock j during the month t, and σ^2 (e_j) is the variance of stock j error term during the period of the study.

Hypothesis 2: the expected average rate of return for small stock is higher than the expected average rate of return for large stock. This relationship between size and return is based on the corporate finance suggestion that investors consider large companies to be confronted with less business risk than small companies. Thus, investors consider the stocks of small companies to be more risky and this high risk should be compensated by high return (Sharifzadeh, 2005).

H_0: A company's size is not predictor of rate of return of the stock of that company.

H_1: A company's size is predictor of rate of return of the stock of that company

The null and alternate hypotheses can be expressed as:

H_0: $\mu(\overline{R}_j^S) \leq \mu(\overline{R}_k^L)$

H_1: $\mu(\overline{R}_j^S) > \mu(\overline{R}_k^L)$

Where $\overline{R}_j^S$ is the average rate of return for the stock of small company j, $\overline{R}_k^L$ is the average rate of return for the stock of large company k, $\mu(\overline{R}_j^S)$ is the mean of all small companies' stocks rate of return, and $\mu(\overline{R}_k^L)$ is the mean of all large companies' stocks rate of return.

Hypothesis 3: the expected average rate of return for stocks with high financial leverage is higher than average rate of return for stocks with low financial leverage. This relationship between financial leverage and return is based on the corporate finance suggestion that investors consider companies with high financial leverage to be confronted with higher financial risk than companies with low financial leverage. Thus, investors consider the stocks of companies with high financial leverage to be more risky and this high risk should be compensated by high return (Sharifzadeh, 2005). The null and alternate hypothesis for hypothesis three are:

H_0: A company's financial leverage is not predictor of rate of return of the stock of that company.

H_1: A company's financial leverage is predictor of rate of return of the stock of that company.

Hypothesis three can be expressed as:

H_0: $\mu(\overline{R}_j^{HFL}) \leq \mu(\overline{R}_k^{LFL})$

H_1: $\mu(\overline{R}_j^{HFL}) > \mu(\overline{R}_k^{LFL})$

Where $\overline{R}_j^{HFL}$ is the average rate of return for the stock of high financial leverage company j, $\overline{R}_k^{LFL}$ is the average rate of return for the stock of low financial leverage company k, $\mu(\overline{R}_j^{HFL})$ is the mean of all high financial leverage companies' stocks rate of return, and $\mu(\overline{R}_k^{LFL})$ is the mean of all low financial leverage companies' stocks rate of return.

Hypothesis 4: the expected average rate of return for stocks with high operating leverage is higher than average rate of return for stocks with low operating leverage. This relationship between operating leverage and return is based on the corporate finance suggestion that investors consider companies with high operating leverage to be confronted with higher business risk than companies with low operating leverage. Thus, investors consider the stocks of companies with high operating leverage to be more risky and this high risk should be compensated by high return (Sharifzadeh, 2005). The null and alternate hypothesis for Hypothesis 4 are:

H_0: A company's operating leverage is not predictor of rate of return of the stock of that company.

H_1: A company's operating leverage is predictor of rate of return of the stock of that company.

And this can be expressed as:

H_0: $\mu(\overline{R}_j^{HOL}) \leq \mu(\overline{R}_k^{LOL})$

H_1: $\mu(\overline{R}_j^{HOL}) > \mu(\overline{R}_k^{LOL})$

Where $\overline{R}_j^{HOL}$ is the average rate of return for the stock of high operating leverage company j, $\overline{R}_k^{LOL}$ is the average rate of return for the stock of low operating leverage company k, $\mu(\overline{R}_j^{HOL})$ is the mean of all high operating leverage companies' stocks rate of return, and $\mu(\overline{R}_k^{LOL})$ is the mean of all low operating leverage companies' stocks rate of return.

Hypothesis 5: this hypothesis contains two parts: (a) the expected rate of return for any stock can be linearly predicted using four variables of: the market return, size, financial leverage, and operating leverage (b) there is linear relationship between the expected rate of return across cross sections of stocks and the coefficients of risk factors estimated in part (a). The null and alternate hypothesis for part (a) of hypothesis five are:

H_0: The company's expected rate of return is not linearly dependent on the factors of: the market return, company's size, financial leverage, and operating leverage.

H_1: The company's expected rate of return is linearly dependent on the factors of: the market return, company's size, financial leverage, and operating leverage.

The regression model for this part is:

$$R_{jt} - R_{ft} = a_j + \beta_j^M(R_{mt} - R_{ft}) + \beta_j^S(SLL_t) + \beta_j^{FL}(HFLLF_t) + \beta_j^{OL}(HOLLO_t) + e_{jt} \quad (4)$$

The null and alternate hypotheses can be expressed as:

H_0: a_i , β_j^M, $\beta_j^{S,}$ β_j^{FL} , $\beta_j^{OL} = 0$

H_1: a_i , $\beta_{jM,}$ $\beta_j^{S,}$ β_j^{FL} , $\beta_j^{OL} \neq 0$

Where the β_j's are the sensitivity of the expected rate of return of stock j to each risk factor of: market return (R_{tm} - R_{ft}), size (SLL_t), financial leverage ($HFLLF_t$), and operating leverage ($HOLLO_t$).

For part (b) the regression model is:

$$\overline{Rj - Rf} = \lambda_0 + \lambda_1 b_j^M + \lambda_2 b_j^S + \lambda_3 b_j^{FL} + \lambda_4 b_j^{OL} + e_j \quad (5)$$

Where the b_j's are estimates of βj's calculated from the part (a) regression.

The null and alternate hypothesis for part (b) can be expressed as:

$$H_0: \lambda_0 = 0 , \lambda_1 = \overline{R_M - Rf}, \lambda_2 = \overline{SLL}, \lambda_3 = \overline{HFLLF} , \lambda_4 = \overline{HOLLO}$$

$$H_1: \lambda_0 \neq 0 , \lambda_1 \neq \overline{R_M - Rf}, \lambda_2 \neq \overline{SLL}, \lambda_3 \neq \overline{HFLLF} , \lambda_4 \neq \overline{HOLLO}$$

These hypotheses are further explained in Chapter 3 and tested in Chapter 4.

Theoretical Foundation

The modern portfolio theory was developed through the portfolio investment theory of Markowitz (1952). Markowitz explained that selecting the portfolio can be done by first considering what believes investors have about the stocks and then use these believes to select the portfolio. His theory is concerned with the use of investors' information and believes in selecting the portfolio.

Markowitz (1952) claimed that the investors' view is positive toward the expected return and negative toward its variance. The relationship between the expected return and the variance was assumed by Markowitz to be direct (i.e. more variance yield more return). This relationship was called the expected return-variance rule (E-V). The variance of the stock return can be removed in part by diversification (i.e. formulating a portfolio consisted of stocks from different industries). The E-V rule can generate a set of portfolios with maximum return at a given level of variance and minimum variance at a given level of return. The set of portfolios that provide the highest return at a given variance and the lowest variance at a given level of return is included within a curve called *the efficient frontier*.

As investors desire more return and avoid the variance, each investor will select a portfolio from the efficient frontier that has the lowest variance at the same level of return (Markowitz, 1952). Investors' attempts to build the portfolios that achieve their goals will lead them to buy or sell some of their securities in the market; these sell and buy transactions will result in setting the equilibrium asset prices in the market (Sharifzadeh, 2005).

In the Markowitz theory, investors need to calculate variance and covariance for all risky stocks in the market to determine the efficient portfolios which is considered to be inapplicable (Sharifzadeh, 2005). Sharpe (1964), Lintner (1965), and Mossin (1966) were the first to represent the capital asset pricing model as a more applicable model to select portfolios compared to Markowitz theory. The CAPM stands on the theoretical assumption that the stock prices covary between each other because they vary with a common factor which is the market return; in other words, the only variance (risk) that should be considered is the covariance with the market return (market risk) (Amihud & Mendelson, 2015).

The first version of the CAPM is called the traditional or the single-factor model in which the market return is the only factor to be considered for pricing the financial asset (Amihud & Mendelson, 2015). The invalidity of this traditional model was supported by some studies (Bornholt, 2013; Dzaja & Aljinovic, 2013) while in other studies, researchers concluded that the model is valid (Köseoğlu & Mercangöz, 2013; Lee, Cheng, & Chong, 2016). Based on the conclusions that indicate the invalidity of the traditional CAPM, some researchers tried to extend the model by adding more variables to the market return, these attempts include studies by Black, Jensen, and Scholes (1972), Fama and French (1992), and Carhart (1997).

All these studies will be further discussed in Chapter 2 of this study. The current study follows the approach of previous studies in testing the validity of the traditional CAPM and in building a multifactor model to estimate the expected rate of return.

Nature of the Study

The nature of my study was causal-comparative quantitative research because my objective was to test an existing theory and examine the relationship between the expected rate of return and variables of: market factors, company's size, financial leverage, and operating leverage. The qualitative method is not appropriate for my research questions and objectives because my research is not about exploring, understanding, or interpreting of a phenomenon or a case (Yilmaz, 2013).

The mixed methods approach is not appropriate because my study will not contain a qualitative part. Experimental designs are not appropriate for my research because the independent variables cannot be manipulated and varied among the groups as discussed by Frankfort-Nachmias, Nachmias, and DeWaard (2015). My research will contain categorical variables like companies' size and financial leverage; thus, the correlational design is not appropriate for my research because it includes quantitative variables only and does not include categorical variables (Green & Salkind, 2014).

Study variables included the expected rate of return as the dependent variable and independent variables of market rate of return, company's size, financial leverage, and operating leverage. Data about the stock prices were collected from Amman Stock Exchange (ASE) and data about the other variables including: size, operating leverage, and financial leverage were collected from the companies' annual financial statements available on the ASE database and on the companies' websites. These data are available for the public and there are no ethical concerns about collecting and analyzing it. The study hypotheses were tested using correlation coefficients, regression coefficients, and *t* test. Data about risk-free asset (treasury bills) were collected from the central bank of Jordan.

Definitions

Dependent variable, independent variables, and major terms frequently used in this study are defined as follows:

*Beta (β)***:** a measure used to indicate the sensitivity of the stock rate of return to the market rate of return (Dzaja, & Aljinovic, 2013). It is used to represent the systematic risk and can be calculated as (Matar, 2016):

$$\beta j = \frac{\text{COV (Rj,RM)}}{\sigma 2\text{RM}} \qquad (6)$$

Where R_j is the rate of return on stock j, R_M is the rate of return on the market, and $\sigma2_{RM}$ is variation of the market return.

Company's size: is the average of the market value of the total assets of the company for the study period; it can be estimated by finding the market value of the total assets of the company at the first year of the study period and at the last year of the period then divide the total by 2 (Sharifzadeh, 2005).

Expected rate of return: is the required rate of return on the initial investment for the holding period. This return is expressed as a percentage from the investment (Sharifzadeh, 2005).

Financial leverage: is a measure for the degree of using debts by the company. Financial leverage is defined as the percentage of long term debt to the total assets of the company (Sharifzadeh 2005).

Market rate of return: is the rate of return achieved in the market during the holding period; the ASE price index is used in this study to represent the market. This return can be calculated at time t using the following equation (Alqisie & Alqurran, 2016):

$$R_{mt} = (I_t - I_{t-1}) * 100 / I_{t-1} \quad (7)$$

Where I_t is the ASE index closing price at time t and I_{t-1} is the index closing price at time t-1.

Market risk premium: is the rate of return on market remaining after subtracting the risk-free rate of return for the holding period (Sharifzadeh, 2005).

Operating leverage: this term represents the level of the company's fixed costs compared to its total costs. It is measured as the percentage of fixed assets to the total assets (Sharifzadeh 2005).

Realized rate of return: is the rate of return actually gained on the stock during the holding period; this return can be calculated at time t using the following equation (Alqisie & Alqurran, 2016):

$$R_{jt} = [(P_{jt} – P_{jt-1})*100] / P_{jt-1} \qquad (8)$$

Where P_{jt} is the closing price of the stock j at time t, P_{jt-1} is the closing price of the stock j at time t-1.

Risk-free rate of return: is the return that can be earned without bearing any risk; this rate of return is represented by returns on treasury bills issued by the central bank of Jordan (Alqisie & Alqurran, 2016). The maturity selected for these bills is equal to the selected holding period for this study which is one month.

Stock excess return: is the rate of return on the stock remaining after subtracting the risk-free rate of return for the holding period (Alqisie & Alqurran, 2016).

Assumptions

The purpose of the study was to examine the validity of the single-factor CAPM and then develop and test the validity of a multifactor CAPM. To achieve this goal, I should assume that the assumptions of the model are true. These assumptions, however, were not proved to be true, but it should be considered because the purpose of the study is to test the CAPM and thus, if these assumptions are not considered true, the model itself cannot be considered for studying. The CAPM assumptions are:

- To take the investment decision, the investor is concerned only about the expected return and the variance of the asset's returns (Sharpe, 1964).
- The investor will select the combination of assets with the minimum variance at a given expected return or the combination that generate the highest expected return at a given variance of returns (Lintner, 1965). This assumption is the same assumption in Markowitz theory which stated that the investors do or should select a portfolio on the efficient frontier.
- All investors can borrow and lend money at the same rate free from variance; this rate represents the risk-free rate or the riskless asset and its constant regardless the amount borrowed or lent (Sharpe, 1964).
- All investors agree on the expected returns, standard deviation (i.e. risk), and the correlation coefficients (Sharpe, 1964). In addition, all investors evaluate the available portfolios in the same way (Sharpe, 1964). This assumption was referred to by Sharpe (1964) as the *homogeneity of investor expectations*.
- The behavior of any single investor does not affect the market prices. What do affect the market prices are the actions of all investors. Thus, each investor in the market is a price-taker and not a price-maker (Sharifzadeh, 2005)
- All investors decide to invest for a one single time period. This holding period is homogeneous for all investors (Sharifzadeh, 2005).

- Investors can buy and sell shares in a competitive market without additional transactions cost or taxes (Berk & DeMarzo, 2014).
- Information is free and reviewable for all investors (Dzaja & Aljinovic, 2013).

Scope and Delimitations

The focus of this study was on the inability of the traditional CAPM to predict the expected rate of return and on testing a proposed model that may represent an alternative for the model. The model can be used to estimate the price of many financial assets including stocks, bonds, real estate, and all risky assets traded in a market (Sharifzadeh, 2005). For the purposes of this study, however, only the equity stocks are considered to test the model. Furthermore, only stocks of listed companies in the ASE were included in the population of the study. This study could be conducted using other risky assets in addition to the stocks but because of limitations that include: the large number of assets that may be studied, time, and resources, only stocks were considered.

Researchers have tested different versions of the multifactor CAPM including Fama and French three-factor model (Fama & French, 1992), Carhart four-factor model (Carhart, 1997), and the model of Black, Jensen, and Scholes (1972). In this study, however, I considered the multifactor model introduced by Sharifzadeh (2005). I selected this multifactor model because it contains variables that are derived from the corporate finance theory which may help in avoiding the anomalies associated with other multifactor models.

Limitations

The results of the study may be affected by how the variables are operationally defined and measured. Some variables, like the size of the company, may have different definitions and measurements methods across researchers. These differences may affect the results of the study and its comparability with the results of other studies. The multiple linear regressions that used in the study is based on the assumptions of linearity of the relationship between the rate of return and the independent variables, normal distribution of the monthly rate of return, and the absence of the multicollinearity between variables, (Field, 2013).

These assumptions, however, were tested before the regression is conducted because if it has not been met, the results of the multiple linear regression may be misleading (Field, 2013). In addition, the ASE index was used as a proxy for the market portfolio. This index includes the most liquid and largest 100 companies from the first and second markets. Based on this, the index may not represent all the stocks in the market. Finally, the study data included the stock prices of listed companies in the ASE for the period from 2000 to 2015 and thus, the results are generalizable only for the stocks of the public companies listed on the ASE during the study period.

Significance of the Study

Significance to Theory

The problem of the invalidity of the traditional CAPM was the subject for many studies in many countries (Aldaarmy, Abbod, & Salameh, 2015; Bajpai & Sharma, 2015; Bornholt, 2013); this study may add a new insight into the traditional model validity in the Jordanian market. In addition, different multifactor models were proposed and tested as alternatives for the traditional model; the results of these tests were not supported by a theoretical model and that's the reason for its failure in proving that the variables added to the traditional model represent additional risk factors actually considered by the investors (Sharifzadeh, 2005).

In this study, I tested a four-factor model that contains the factor of the traditional model and three additional factors of: size, financial leverage, and operating leverage. These factors are derived from propositions in the corporate finance theory and thus, the opportunity for the model to be valid in predicting the expected rate of return may be high. If the proposed model is proved to be valid, it may represent an alternative for the traditional model. Based on this, the study may contribute to the literature by presenting a new and valid model that can be used in all theoretical problems in which the traditional model was used.

Significance to Practice

The capital asset pricing model can be used by investors to determine the price the financial assets in the market. The importance of the studies that explore the stock prices is rising because of the big amount of money invested in the stock markets all around the world (Alrgaibat, 2015). In Jordan, however, the amount invested in the stock market represents 40% of the gross savings of the country; based on this, the importance of finding a valid model for pricing the stocks is high for all investors.

The results of this study may help investors and mutual funds in the selection of the optimal portfolios to achieve the intrinsic rate of return. In addition, the study findings may help the decision makers in determining the fair price of the public utility. The model can help the public decision makers in determining the fair return that should added to the cost of the public utility to determine its price. The CAPM can be used in the capital budgeting to determine the cost of equity and cost of debt (Berk & DeMarzo, 2014); setting a valid model can help companies in taking a profitable investment decisions by selecting the projects with the lowest discount rate. Selecting the profitable projects is important in practice and this study can help companies in this process by providing an accurate, valid, and tested model to determine the discount rate that can be used to determine the net present value for different projects.

Some public companies and departments in Jordan have big investments in the stock market including the social security corporation which manage the retirement's benefits for employees and workers. The study results may have a high importance to this department as it can help it to select the appropriate investment portfolios and to find a practical base for selecting investment projects.

Significance to Social Change

The study results may help individual and institutional investors in selecting profitable portfolios and thus help in increasing their wealth. The increase in the investors' wealth may increase the public resources available in the entire economy leading to the positively change the life of the community in the fields of education, infrastructure, and health services. Introducing a valid model to be used in the pricing of the public utility may enhance the utility services rendered to the public. The estimation of cost of capital can significantly affect the cost of utility for consumers (Buckland, Williams, & Beecher, 2015). For instance, a change of 0.5% in the cost of capital results in a change of U.S. D 12.4 in the average annual water bill of the consumer (Buckland et al., 2015). Based on this, providing more accurate model for estimating the cost of capital can change the utility bill of consumers and thus, increase the saving ability of the households.

The results of this study may help public corporations in evaluating the performance of their portfolios managers and increase the return on their investment portfolios by considering stocks of specific characteristics of size, operating leverage, and financial leverage. Increasing the return on the portfolios of the public corporations may increase the public resources available for development projects in education, health, and defense which may lead to the desired positive social change.

Summary and Transition

The main purpose of this study was to test the traditional CAPM to examine its validity in the Jordanian stock market in addition to test a proposed four-factor model that can be used as an alternative for the traditional model. The study was based on the portfolio investment theory of Markowitz (1952) and on the theoretical work of Sharpe (1964), Lintner (1965), and Mossin (1966), who firstly introduced the CAPM as an applicable model for predicting the expected rate of return.

In the traditional model, it is assumed that the only factor considered by the investors in determining the expected rate of return is the market risk and that the relationship between this risk and the expected rate of return is linear. Some empirical studies supported the validity of this model while many others concluded that the model cannot be accepted as a valid model. After testing the validity of the traditional model, I tested a proposed four-factor model that includes in addition to the market risk: the company size, financial leverage, and operating leverage. The main enquiries of the study were about the factors that explain the variation in the expected rate of return and the relationship between the expected rate of return and the variables of: market risk, company size, financial leverage, and operating leverage; five hypotheses were tested to answer these enquiries.

To approach the study objectives, I utilized a causal-comparative quantitative design. This design is appropriate for the study because of the nature of variables and the proposed relationship between them. The variables of the study included the dependent variable of the expected rate of return and independent variables of: market risk, size, financial leverage, and operating leverage. The study results may help investors and public corporations in selecting the ideal portfolios that increase their profits. Increasing investors profits may lead to increase the resources available for public services and thus, cause the positive social change through the development of the local community.

The remaining part of this dissertation starts with Chapter 2 which contains a theoretical analysis of the CAPM and a review and discussion of the literature written about the traditional model and its alternative models. In Chapter 3, I will illustrate the research design, procedures, the study population and sample, and data analysis plan. The results of the data analysis are explained in Chapter 4 while the conclusions of these results and the recommendations are discussed in Chapter 5.

Chapter 2: Literature Review

The specific problem of the study is the inability of the traditional capital asset pricing model to predict the expected rate of return. The expected rate of return required by investors can be used to estimate the cost of equity (Berk & DeMarzo, 2014). Many companies (85% of companies) realized this fact and use the CAPM to determine the cost of equity capital; these companies, however, use the traditional or the single-factor model (Chawla, 2014).

Researchers have tested the validity of the traditional model by testing the relationship between risk and return (Alrgaibat, 2015; Ramadan, 2014), by comparing the model to other multifactor models like Fama and French model (Aldaarmy, Abbod, & Salameh, 2015), and by developing alternative models (Bajpai & Sharma, 2015). The purpose of this study is to test the traditional CAPM in the Jordanian stock market and test a multifactor model as an alternative for the model.

This chapter starts with the literature search strategy which contains a list of search terms, databases and search engines used to search for these terms, and the years included in the search. After that, the theoretical foundation of the study is discussed starting from explaining Markowitz portfolio selection theory, utility function, risk-free asset, the assumptions of the CAPM, and the arbitrage pricing theory. The theoretical foundation is followed by a review of the empirical tests of the CAPM; through this review, studies related to the variables, the design, and the methodology of this study are discussed. The chapter is concluded with a section for summary and conclusions.

Literature Search Strategy

Literature Review through Annotated Bibliographies

During my course work at Walden University, I had submitted many annotated bibliography assignments. Most studies included in these assignments were required to be related to my program of study or to my dissertation topic and be within the range of the last 5 years. From these annotated bibliographies, I have reviewed many studies related to my dissertation topic; in addition, I have used the references of these studies to review other articles that may benefit me in writing my dissertation.

Libraries, Databases, Search Engines, and Search Terms Used

The main library I used to search for research articles is Walden University library which gives students a place to search huge number of articles, books, and dissertations from different databases. The databases I used include, in addition to other databases, Academic Search Complete, Business Source Complete, ScienceDirect, Social Sciences Citation Index, and Directory of Open Access Journals. The second main source of studies and articles was Google Scholar which I used to access many articles available on the internet and not available at Walden library. Linking Walden library to Google Scholar gives results from all over the world and from all databases in all libraries including Walden library. To search for resources relevant to my dissertation, I used the search terms of *capital asset pricing model, testing capital asset pricing model, risk and return, capital asset pricing model in Jordan, traditional capital asset pricing model, multifactor capital asset pricing model, empirical test of capital asset pricing model,* and *invalidity of capital asset pricing model*.

Scope of the Reviewed Literature

Years searched. The journal articles reviewed for the purpose of this study fall into two categories: (a) seminal articles related to the modern portfolio theory and the CAPM theory, these articles are out of the range of 5-year requirement of the Walden University; and (b) recent articles related to the empirical testing of the CAPM, these articles are mostly within the 5-year requirement. The search for seminal articles was not limited to specific time range because it is necessary for theoretical base of the study regardless of its date. The search for the empirical testing of the CAPM was limited to the articles published after the year 2013 to satisfy the 5-year requirement. In few instances, however, non-seminal articles may have been used that fall outside the 5-year range to support some theoretical arguments.

Types of literature and sources searched. The literature searched and reviewed includes four types: (a) seminal articles; (b) current peer-reviewed articles; (c) books; and (d) dissertations. The seminal literature covers the work of Markowitz (1952) on the portfolio selection theory, the work of Sharpe (1964), Lintner (1965), and Mossin (1966) on the CAPM theory, the work of Fama and French (1992) on the three-factor CAPM, the work of Black, Jensen, and Scholes (1972) related to the first attempt to add factors to the traditional CAPM, the work of Stephen Ross (1976) concerning the arbitrage pricing theory (APT), and the work of Carhart (1997) on the four-factor CAPM.

The current peer-reviewed articles include, among others, the studies of: Aldaarmy, Abbod, and Salameh (2015), Alrgaibat (2015), Amihud and Mendelson, (2015), Bajpai and Sharma (2015), Bornholt, (2013), Dajčman, Festić, and Kavkler (2013), Dzaja and

Aljinovic (2013), Ramadan (2014), Saji (2014), Soumaré, Aménounvé, Diop, Méité, and N'sougan (2013), and Zabarankin, Pavlikov, and Uryasev (2014). The books searched include statistics books like the book of Green and Salkind (2014) and finance books like the book of Berk and DeMarzo (2014). One Walden dissertation by Sharifzadeh (2005) was reviewed which include the model utilized in this study.

Capital Asset Pricing Model

The capital asset pricing model (CAPM) was introduced by Mossin (1966), Lintner (1965), and Sharpe (1964). As defined in this model, the expected rate of return $E(R_i)$ is a function of: the risk-free rate of return (R_f), the expected return of the market $[E(R_M)]$, and the sensitivity of the expected excess asset return to the expected excess market return (β_{iM}). This relationship can be expressed using the following equation:

$$E(R_i) = R_f + \beta_{iM} [E(R_M) - R_f] \tag{9}$$

If an investor wants to increase the expected rate of return, he or she should invest in riskier assets. In other words, bearing more risk leads to gaining more return; the excess return gained from the excess risk is the price of the risk.

Theoretical Analysis of CAPM

In Equation 9, the expected rate of return is expressed as a function of risk-free rate of return and the risk premium ($\beta_{iM} [E(R_M) - R_f]$). This risk premium represents the excess return required by the investors to compensate for the excess systematic risk (β_{iM}) (Gagliardini, Ossola, & Scaillet, 2016). The systematic risk is the risk confronted by the all market members like economic changes and international issues (Berk & DeMarzo, 2014). Another type of risk is the risk confronted by a specific firm only. This firm-specific risk is resulted from bad or good news about that firm (Berk & DeMarzo, 2014).

As the systematic risk affects all the firms in the market, it cannot be avoided even if the investor invests in different firms. It will affect all firms and thus, affect the entire investment (Berk & DeMarzo, 2014). Because the firm-specific risk affects only a particular firm and may affect one firm negatively while affecting the others positively (Berk & DeMarzo, 2014), the investor can invest in more than one firm to reduce the effect of this risk. Thus, the overall effect of the firm-specific risk will be lower in the case of investing in many firms than investing in a single firm. In other words, the systematic risk cannot be avoided by diversification of investment while the firm-specific risk is diversifiable (Berk & DeMarzo, 2014). Because of this, the firm-specific risk is not included in the CAPM model.

This study is about the single-factor and a proposed multifactor CAPM and thus, the theories behind the development of the model are chosen to be analyzed and discussed. The model was developed based on previous theories of Markowitz portfolio theory, utility function, and risk-free rate of return. The research questions of this study built on this theory by asking about the factors that may explain the expected rate of return, and whether factors other than the market risk premium (i.e. size, financial leverage, and operating leverage) may affect the expected return.

Markowitz portfolio selection theory. Markowitz theory represents the early beginning of the modern portfolio theory. According to Markowitz (1952), the portfolio selection consists of two stages: the first stage is about what the investor knows and thinks about securities in the market. This experience establishes the investor believes about the expected prices of the securities (Markowitz, 1952). The second stage includes the use of these believes to make the portfolio selection (Markowitz, 1952). Markowitz's theory is concerned with second stage in which the investors' beliefs about the securities are already established and the main issue is the portfolio selection (Markowitz, 1952).

Markowitz (1952) rejected the rule that the investors *do* or *should* select the security that generates the highest discounted expected returns because this indicates that the investor should invest all his or her capital in the security with the highest discounted expected return only. This rule ignores the diversification technique which is used in practice and considered logical in theory. Instead of this rule, Markowitz represented the rule that the investors considered the expected return as a desirable thing and the variance of this return as an undesirable thing (p. 77). In addition, there is no single diversified portfolio preferred over all other nondiversified portfolios (Markowitz, 1952).

Markowitz (1952) explained the relationship between the excepted return and the variance by stating that investors can generate more excepted return by bearing more variance or scarifying the additional excepted return by bearing less variance. This rule is called the expected return-variance rule (E-V) and represents an alternative rule for the expected returns maximization rejected by Markowitz. Markowitz explained that because the securities' prices are very correlated, diversification cannot remove all variance and the portfolio that generates the highest expected return is not always the portfolio with the lowest variance (p. 79).

The E-V rule provides the set of portfolios that have the maximum return at a given variance and a minimum variance at a given return (Markowitz, 1952). This set of portfolios can include undiversified portfolios also; an undiversified portfolio may be included in this set if it generates the highest return at a specific variance or the lowest variance at a specific return (Markowitz, 1952). Thus, the E-V rule provides a set of portfolios that contains mostly, and not completely, diversified portfolios (Markowitz, 1952).

To be useful, investment diversification should be done by investing in different industries and not investing in many securities within the same industry. For instance, it is better for the investor to invest in a portfolio consists of securities from media, financial services, and agriculture industries than investing in a portfolio consists of many securities from the retail industry. The logic behind this is that if all securities of the portfolio are in the retail industry and the retail industry securities' performance goes down, all securities in the portfolio will go down and thus, the portfolio return is down (Markowitz, 1952, p. 89). In addition, it is not enough to select securities with the minimum variance, the investor should invest in securities with low correlation between them (Markowitz, 1952). In the case of low correlation, different industries are expected to have different performance, one industry may perform well while the other is performing bad, this will balance the portfolio's return and variance; because of that, the investor should select a portfolio that contains securities from low correlated industries (Markowitz, 1952).

In the Markowitz model, the expected return and the expected variance of a portfolio can be calculated using the average return for each security in the portfolio and the average variance of that security. In addition, the covariance between the securities can be calculated using the correlation coefficient between the returns of the securities in the portfolio (Markowitz, 1952, p. 81). These variables can be obtained from the historical data available in the market. To estimate the return and the variance for the portfolio, the following variables should be known:

μ_i: $E(R_i)$: The expected rate of return of security i = average of historical returns for security i.

σ_i^2: Expected variance of returns of security i = variance of historical returns of security i.

σ_{ij}: Expected covariance coefficient between the returns of security i and returns of security j = historical covariance coefficient between the returns of security i with the returns of security j.

The investor can determine the proportion of investment he or she wants to allocate for each security. The total weights of the portfolio are denoted by X and this should equal 1, that is X=1. If the weight allocated to security i is denoted by X_i, then the expected rate of return (μ_p) and the variance of the portfolio (σ_p^2) can be calculated as follows (Markowitz, 1952, p. 81):

The expected rate of return for the portfolio:

$$\mu_p = X_1 \mu_1 + X_2 \mu_2 \ldots\ldots\ldots\ldots\ldots + X_n \mu_n$$

Or:

$$\mu p = \sum_{i=1}^{n} \mathrm{Xi\mu i} \tag{10}$$

and the expected variance of the return of the portfolio:

$$\sigma 2_{\mathrm{p}} = \sum_{\mathrm{i=1}}^{\mathrm{n}} \sum_{\mathrm{j=1}}^{\mathrm{n}} \mathrm{XiXj\sigma ij} \tag{11}$$

And

$$\sum_{i=1}^{n} Xi = 1 \tag{12}$$

By expressing the weights of securities or the X's in term of the other securities weights such as for a portfolio of 3 securities: 1, 2, and 3 the weight of security1, $X_1 = 1 - X_2 - X_3$ and use this substitutions in equations 10 and 11, then the portfolio variance can be expressed in term of its expected rate of return as follows (Sharifzadeh, 2005):

$$\sigma_p^2 = a + b\mu_p + c\mu^2{}_p \tag{13}$$

Where, a, b, and c contain (n-2) of the X's.

Using this equation, the portfolios with the lowest risk level at a given expected return can be derived and connected to get an envelope of these portfolios. The upper part of this envelop represents the mean-variance efficient set of portfolios or what is called now the *efficient frontier*. The efficient frontier contains all portfolios that generate the highest return at a given level of risk and have the lowest risk at a given expected return (Markowitz, 1952,). The envelope that contains all portfolios with the lowest level of risk is called in the modern literature the *minimum variance frontier*.

According to Markowitz (1952), the investors do or should select a portfolio that lies on the efficient frontier after deciding the level of risk the investor is willing to bear. The efficient frontier is illustrated in Figure 1. The point X represents the efficient portfolio with lowest level of risk and it is the portfolio with the global minimum variance. If not all securities have a perfect correlation with each other, this portfolio has a lower level of risk than the security with lowest risk and has an expected rate of return more than the security with the lowest return (Sharifzadeh, 2005). In Figure 1, all points inside the hyperbola are feasible or attainable as called by Markowitz and each point out of it is not feasible because it does not satisfy equation 12.

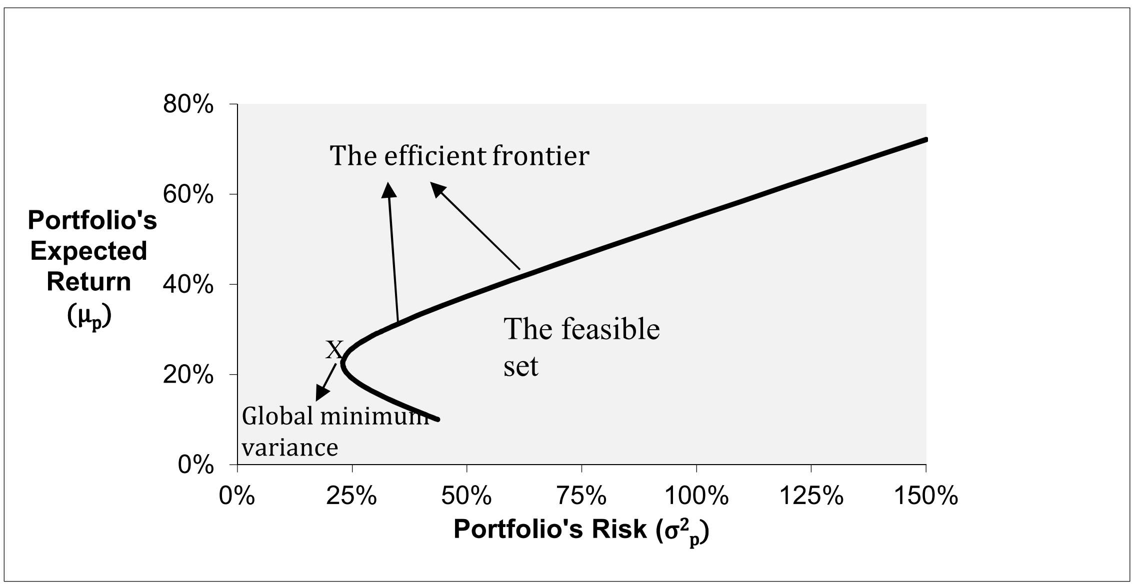

Figure 1. The efficient frontier. Adapted from "An empirical and theoretical analysis of capital asset pricing model" by M. Sharifzadeh, 2005, Doctoral dissertation. Copyright 2006 by Mohammad Sharifzadeh. Adapted with permission.

Utility function. In his work, Markowitz illustrated the efficient portfolios from which the investor can select based on the desired level of risk without discussing how the investor selects that desired level of risk. The answer is the utility aspect and its use in the decision-making process. The utility aspect implies that the risk-averse investors trade-off more risk for more expected return to get the same utility of welfare from the investment (Sharifzadeh, 2005). In other words, if the risk-averse investor generates a specific expected rate of return at a given level of risk to obtain a given level of utility, he or she will require more return for more levels of risk to obtain the same level of utility. The utility function can be expressed as follows (Sharifzadeh, 2005):

$$U_p = \mu_p - \alpha \sigma_p^2 \qquad (14)$$

Where U_p is the utility obtained from investing in a portfolio, μ_p is the expected return of that portfolio, σ_p^2 is the expected variance of the portfolio, and α is a positive number that represents the degree of risk aversion of the investor. The more the investor is risk-averse the more this number will be. Using equation 14, the value of μ_p can be calculated as a function of σ_p^2 and a constant utility value of U_p. This function can be expressed graphically as in Figure 2. This graph is called the utility indifference curve; for each constant value of U_p there is a separate indifference curve. Thus, for each investor there will be many indifference curves each of it reflects a specific combination of μ_p and σ_p^2 that generates a specific value of U_p.

Each curve generates more utility value than the lower curve; the investor prefers the curve with the highest utility value. Based on Markowitz work, the investor also wants to select a portfolio that lie on the efficient frontier. As a result, the optimal portfolio will be the one that generates the highest utility value and that lies on the efficient frontier. This optimal portfolio is not the same for all investors because different investors have different risk aversion degrees; the optimal portfolio for each investor differs depending on his or her risk aversion degree which leads to different desired utility value (Sharifzadeh, 2005). As shown in Figure 2, two different investors have the desired utility indifference curves U_1 and U_2 will select two different optimal portfolios. For the first investor (the one with more risk aversion), the optimal portfolio is P while for the other less risk aversion investor it is Q.

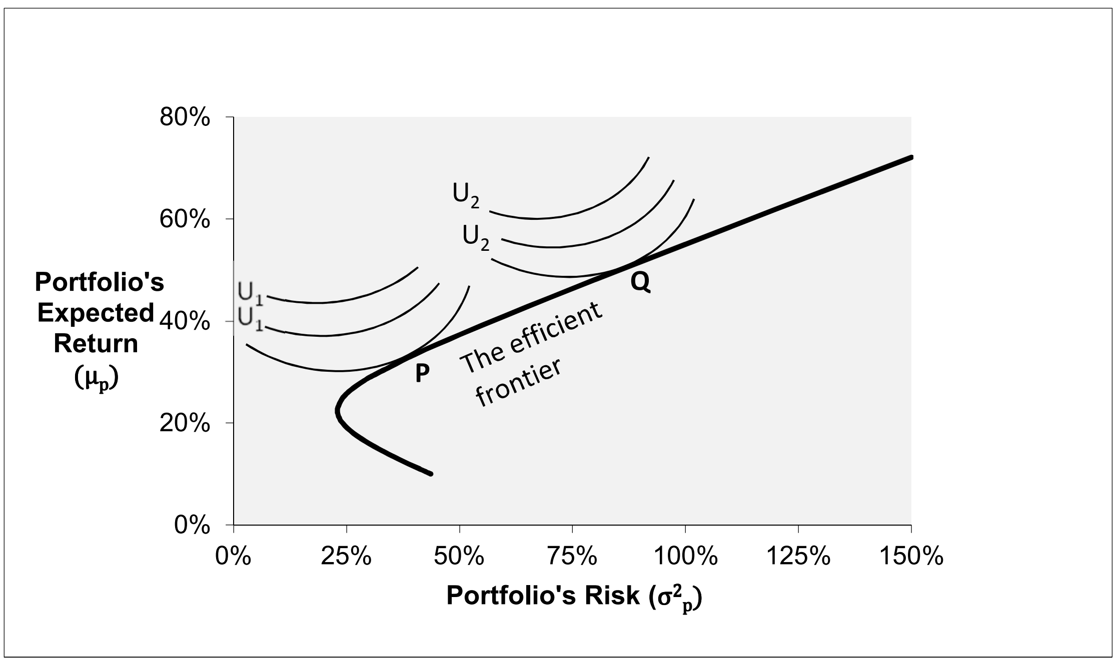

Figure 2. Efficient frontier, utility indifference curves, and the optimal portfolio selection. Adapted from "An empirical and theoretical analysis of capital asset pricing model" by M. Sharifzadeh, 2005, Doctoral dissertation. Copyright 2006 by Mohammad Sharifzadeh. Adapted with permission.

Risk-free asset and the optimal portfolio selection. According to Tobin (as cited in Sharifzadeh, 2005), the investor is able to distribute his or her investment in a risk-free asset and any portfolio on the efficient frontier. Sharpe (1964) introduced the assumption that all investors can lend and borrow money at the same rate. This assumption along with the idea of investing in a portfolio on the efficient frontier represents the first introduction of the CAPM. As illustrated in Figure 3, the free-risk asset is represented by the point R_f at which the risk is zero; the point Q is a portfolio on the efficient frontier. The point R_f has a zero variance and a zero correlation with Q. If the investor invests a proportion of X in portfolio Q and (1-X) in the risk-free asset, equations 10 and 11 will be:

$$\mu_p = (1-X) R_f + X R_q \quad (15)$$

$$\sigma_p^2 = X \sigma_q \quad (16)$$

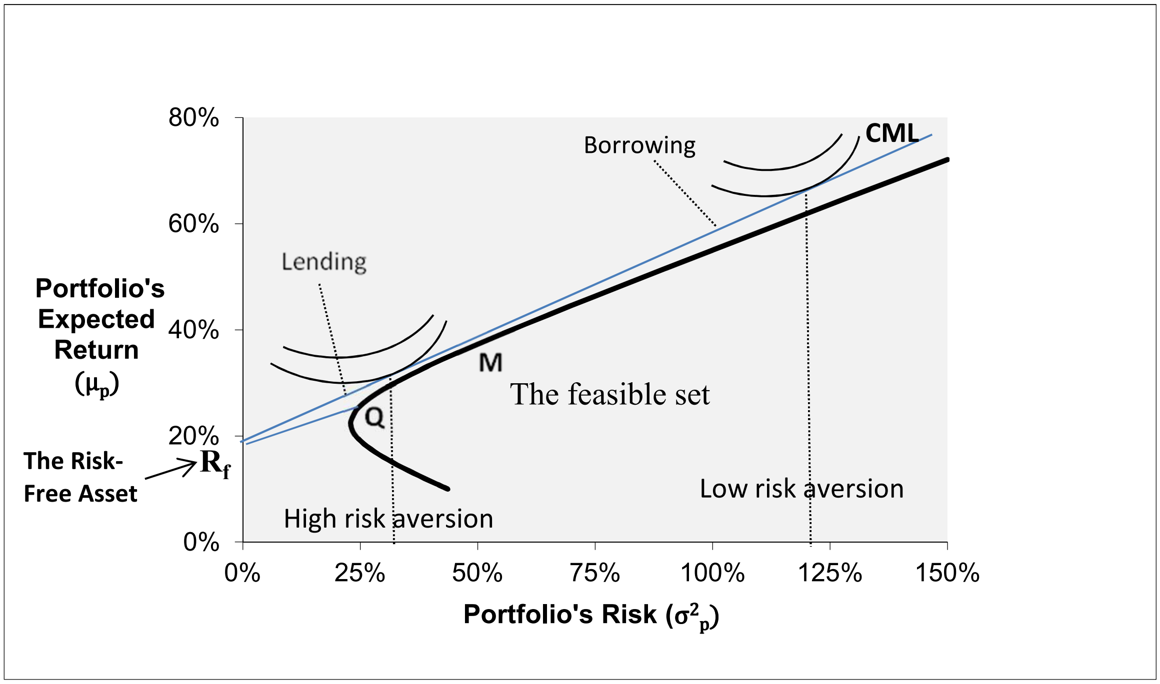

Figure 3. The capital market line (CML) and the global optimal portfolio. Adapted from "An empirical and theoretical analysis of capital asset pricing model" by M. Sharifzadeh, 2005, Doctoral dissertation. Copyright 2006 by Mohammad Sharifzadeh. Adapted with permission.

by eliminating the term X from both equations we get the equation that demonstrate the relationship between the expected return of a portfolio consists of a combination of risk-free asset and the portfolio Q (Sharifzadeh, 2005):

$$\mu p = \mathrm{Rf} + \left(\frac{\mu p - \mathrm{Rf}}{\sigma \mathrm{q}}\right)\sigma \mathrm{q} \tag{17}$$

All points lie on the line between R_f and Q represent a combination of risk-free asset and Q portfolio; the slope of this line is the change in portfolio's return divided by the change in its risk. In other words, the slope of the line is the excess return of Q portfolio over the risk-free return per unit of Q's risk. This slope is constant for the entire line which means that all portfolios with a combination of risk-free asset and a portfolio on the efficient frontier have the same portfolio's excess return per unit of portfolio's risk or simply, the same return per unit of risk.

Sharpe (1964) explained that rational investors always try to maximize the excess return per unit of risk or invest in a portfolio that located on the line between R_f and the frontier but with the highest slope. The Markowitz portfolio selection theory stated that the investors will select a portfolio on the efficient frontier line. Thus, the rational investors will want to invest in a portfolio that lies on the efficient frontier and at the same time on the line between R_f and the frontier and has the highest slope. This can be done by selecting the portfolio M in Figure 3 where the line R_f M become tangent to the efficient frontier. At this point, the portfolio is on the efficient frontier and on the line with the highest slope possible to be on the efficient frontier which is the line R_f M.

The portfolio M is the optimal portfolio for all investors; the investors with risk aversion will lend some of their money at a risk-free rate and invest the remaining in portfolio M. The investors with low risk aversion will borrow money at the risk-free rate to invest in the portfolio M. The line that starts from the risk-free return and is tangent to the efficient frontier is called the *capital market line* (CML). For each investor, the location of his or her portfolio on the line R_f M can be decided by finding the point where his or her utility indifference curve become tangent to the CML (Sharpe, 1964). As the optimal portfolio is the same for all investors with high and low risk aversion, the risk aversion degree then does not affect the investment decision. As explained before, the investors with high risk aversion will lend some of their money and invest the rest in portfolio M while the investors with low risk aversion will borrow money to invest more in portfolio M as explained by Sharpe (1964). Thus, the risk aversion degree affects the financial decision and not the investment decision. This theory of separating the investment decision from the financial decision is called the *separation theorem* (Lintner, 1965).

Theoretical assumptions of CAPM. The idea of CAPM is to explain how the price of the asset is determined in the market. In the Markowitz portfolio selection theory, investors select the portfolio that generates the maximum expected return at a given variance and the minimum variance at a given expected return. The CAPM built on this theory by trying to predict the relationship between the expected return and risk, and determine the efficient portfolio in the market equilibrium (Fama & French, 2004).

The theoretical assumptions of CAPM can be summarized as follows:

- To take the investment decision, the investor is concerned only about the expected return and the variance of the asset's returns (Sharpe, 1964).
- The investor will select the combination of assets with the minimum variance at a given expected return or the combination that generate the highest expected return at a given variance of returns (Lintner, 1965). This assumption is the same assumption in Markowitz theory which stated that the investors do or should select a portfolio on the efficient frontier.
- All investors can borrow and lend money at the same rate free from variance; this rate represents the risk-free rate or the riskless asset and its constant regardless the amount borrowed or lent (Sharpe, 1964).

- All investors agree on the expected returns, standard deviation (i.e. risk), and the correlation coefficients (Sharpe, 1964). In addition, all investors evaluate the available portfolios in the same way (Sharpe, 1964). This assumption was referred to by Sharpe (1964) as the *homogeneity of investor expectations*.
- The behavior of any single investor does not affect the market prices. What do affect the market prices is the actions of all investors. Thus, each investor in the market is a price-taker and not a price-maker (Sharifzadeh, 2005)
- All investors decide to invest for a one single time period. This holding period is homogeneous for all investors (Sharifzadeh, 2005).
- Investors can buy and sell shares in a competitive market without additional transactions cost or taxes (Berk & DeMarzo, 2014).
- Information is free and reviewable for all investors (Dzaja & Aljinovic, 2013).

The CAPM model implies that all investors should select a portfolio on the CML by constructing a portfolio consists of some percentage of risk-free asset and another percentage in the market portfolio. As mentioned before, the CAPM equation is:

$$E\,(R_{\mathrm{i}}) = R_{\mathrm{f}} + \beta_{\mathrm{iM}}\,[E\,(R_{\mathrm{M}}) - R_{\mathrm{f}}] \quad (18)$$

The model assumed that the expected rate of return equals the risk-free interest rate plus the market risk premium (the difference between market expected return and the risk-free interest rate multiplied by the beta of the stock). This equation represents what is called *single-factor CAPM* (Black, 1972) because it considers only one variable in determining the return in excess of the risk-free interest rate which is the market excess return combined with beta.

CAPM Extensions

Earliest studies that added more variables to the single-factor model include a study by Black, Jensen, and Scholes (1972). They concluded that the excess expected return on an asset is determined by another factor than its beta (Black et al., 1972). They presented a two-factor model as follows:

$$E\,(R_i) = \beta_i\,[E\,(R_M)] + (1 - \beta_i)\,[E\,(R_z)] \tag{19}$$

Where, $E\,(R_i)$: the asset expected return, β_i is the asset's beta, $E\,(R_M)$ is the market expected return, and $E\,(R_z)$ is the expected return of the other factor. The model implies that the expected return of the asset is derived from the market expected return combined with β_i and another factor expected return combined with $1 - \beta_i$.

Zero-Beta CAPM. After the introduction of the model of Black et al. (1972) which demonstrated that the stock expected return is a function of the market return combined with market beta and another factor return combined with (1-beta)**,** Black (1972) introduced a new version of the model called the Zero-Beta CAPM. The Zero-Beta model was built by relaxing the CAPM assumption concerning the existness of riskless asset (risk-free asset) as discussed by Beaulieu, Dufour, and Khalaf (2013)**.** The idea behind this version of the model is that if the inflation exists, it will affect even the risk-free asset which is usually estimated using the return in the treasury bills and thus, the risk-free asset will include the inflation risk and it is no longer considered free of risk (Sharifzadeh, 2005)**.** Black (1972), claimed that for each portfolio in the efficient frontier there is a counterpart portfolio located in the inefficient part of the frontier. The counterpart portfolio is uncorrelated with the efficient portfolio and based on this, the name Zero-Beta portfolio is given to the counterpart portfolio (Sharifzadeh, 2005)**.** The equation for this model is as follows (Sharifzadeh, 2005):

$$E\,(R_i) = E(R_{Z(M)}) + \beta_{iM}\,[E\,(R_M) - E(R_{Z(M)}] \qquad (20)$$

Where E (R_i) is the expected return on the stock i, E (R_M) is the expected return on the market, β_{iM} is the same beta of the traditional CAPM, and E($R_{Z(M)}$) is the expected return of the counterpart portfolio to the market portfolio M.

Fama-French three-factor model. As discussed by Fama and French (1992), there are many factors that can be added to the market risk to increase the explanation power of the traditional CAPM and these factors were supported by many empirical studies. Among these factors, two variables were selected by Fama and French to add to the single-factor CAPM: size (the outstanding shares multiplied by the share's market price) and equity book value to its market value. According to Fama and French (1992), the average rate of return is inversely related to the size and directly related to the book to market equity ratio. The equation for this new version of the CAPM is as follows (Aldaarmy, Abbod, & Salameh, 2015):

$$R_{it} - R_{ft} = a_j + \beta_i(R_{mt} - R_{ft}) + \beta_i^S\,(SLL_t) + \beta_i^{bm}\,(HBMLBM_t) + e_i \qquad (21)$$

Where the βi's are the sensitivity of the expected rate of return of stock i to each risk factor: market return (R_{mt} - R_{ft}), size (SLL_t), and book to market equity ($HBMLBM_t$).

Carhart four-factor model. Carhart (1997) added one factor to Fama and French three-factor CAPM. The added variable was the one-year momentum; the effect of the price momentum on the return is that stocks with high return in the last period of time tend to have higher return than average expected in the next period. Based on this, the new model of Carhart consists of four factors including the market risk, size, book to market equity, and the one-year momentum. The model can be depicted mathematically as follows (Garyn-Tal & Lauterbach, 2015):

$$R_{it} - R_{ft} = a_j + \beta_i(R_{mt} - R_{ft}) + \beta_i^{S}(SLL_t) + \beta_i^{bm}(HBMLBM_t) + \beta_i^{om}(OYPM_t) + e_i \quad (22)$$

Where the βi's are the sensitivity of the expected rate of return of stock i to each risk factor: market return ($R_{mt} - R_{ft}$), size (SLL_t), book to market equity ($HBMLBM_t$), and one-year price momentum ($OYPM_t$).

Liquidity-Augmented Fama-French CAPM. Following the methodology of Fama and French in adding more variables to the single-factor capital asset pricing model, Chan and Faff (2005), added the factor of illiquidity to Fama-French model to introduce the liquidity-augmented Fama-French model. The equation for this new CAPM is as follows (Chan & Faff, 2005):

$$R_{it} - R_{ft} = a_j + \beta_i(R_{mt} - R_{ft}) + \beta_i^{S}(SLL_t) + \beta_i^{bm}(HBMLBM_t) + \beta_i^{il}(Imv_t) + e_i \quad (23)$$

Where the βi's are the sensitivity of the expected rate of return of stock i to each risk factor: market return ($R_{mt} - R_{ft}$), size (SLL_t), book to market equity ($HBMLBM_t$), and the liquidity factor (Imv_t).

Arbitrage Pricing Theory

The APT was first introduced by Stephen Ross (1976) in the article "The Arbitrage Theory of Capital Asset Pricing". The APT represents an alternative theory for the single-factor CAPM; it replaces the one factor that affects the expected rate of return with many macroeconomics factors each with its own risk factor (beta) (Geambasu, Jianu, Hertelio, & Geambasu, 2014; Yao, Mei, & Clutter, 2014). These factors may include inflation, gross domestic product, and the major commodities prices (Geambasu et al., 2014). According to the APT, the relationship between the expected rate of return for a given stock, the risk-free return, and the return of other factors with its risk is a perfect linear relationship (Yao et al., 2014). In the APT, the expected rate of return is calculated as follows (Ross, 1976):

$$E_i = \rho + \gamma_1\beta_{i1} + \ldots + \gamma_k\beta_{ik}, \qquad (24)$$

Where E_i is the expected return on the i^{th} asset, ρ is the risk-free return, β_{ik} is sensitivity of i^{th} asset to the factor k, and γ_k is the risk premium of factor k.

Both CAPM and APT try to explain the variation in the asset's expected return by considering different number of factors; the CAPM considers only the market expected return and its beta while the APT considers more variables with more betas (Geambasu et al., 2014). Because the APT has many factors that affect the expected rate of return, it needs more calculation power and a larger volume of data than the CAPM (Geambasu et al., 2014). However, APT model is acceptable and followed by many academics and practitioners because it can be easily understood and provides more details with less cost (Geambasu et al., 2014).

Empirical Tests of CAPM

The first empirical test for the capital asset pricing model was conducted by Linter (1965), who tested the model using two-stage method. In the first stage, the excess return of each stock (Rj – Rf) is regressed against the market excess return (R_M – Rf) to obtain beta for each stock. The regression equation for the first stage is as follows (Sharifzadeh, 2005):

$$R_{jt} - R_{ft} = a_i + \beta_j (R_{Mt} - R_{ft}) + e_{jt} \qquad (25)$$

Where (R_{jt} - R_{ft}) is the stock excess return and (R_{Mt} - R_{ft}) is the market excess return.

Before conducting the second stage, Linter calculated the average excess return for each stock and for the market during the holding period. Resulted betas in the first regression are used as an independent variable in the second stage and regressed against the average excess return for the stocks. The regression model for the second stage is (Sharifzadeh, 2005):

$$\overline{R_j - R_f} = \lambda_0 + \lambda_1 b_j + \lambda_2 \sigma^2 (e_j) + e'_j \qquad (26)$$

Where (R_{jt} - R_{ft}) is the average stock excess return and $\lambda_2 \sigma^2 (e_j)$ is the nonsystematic risk.

If the CAPM holds, λ_1 should equal the average market excess return and λ_0, [λ2 σ2 (ej)] should equal zero. Because of measurement errors and correlation between the nonsystematic risk and beta, some researchers, pioneered by Black, Jensen, and Scholes (1972), tested the model using portfolios returns and betas instead of individual stock's returns and betas and assumed the nonsystematic risk to be zero to overcome problems associated with the two-stage method.

After that, researchers have conducted many studies to test the validity of the model in practice. Some of these studies provided support to the single-factor model including Bornholt (2013) and Li, Gan, Zhuo and Mizrach (2014) while others claimed its invalidity and supported other multifactor models like the study of Köseoğlu and Mercangöz (2013).

When reviewing the research that has been conducted concerning the validity of the single-factor CAPM during the last five years (Appendix A: Summary of the Results of Empirical Research about Traditional CAPM), It can be noted that most studies were against the traditional model and many researchers started with testing the traditional model to support the testing of alternative models.

Size, Operating Leverage, and Financial Leverage

One of the variables included in the Fama-French three-factor model was the size or the market equity for the company. Fama and French measured the size by multiplying the total outstanding shares of the firm by the market price of the share. Most studies that tested the Fama-French model measured the size variable by the same method. Fama and French (1992) concluded that the stock returns were negatively related to the size of the company. The same conclusion was reached by Sharifzadeh (2005) but the size was measured by the market value of total assets and not the market value of the equity only. In this study, I measured the size variable using the market value of the total assets following Sharifzadeh because the size of the company is the total investment in it whether it is from the owners or from debtors. Smaller stocks are regarded by investors to have more business risk and thus, this risk should be priced (Sharifzadeh, 2005).

Another variable considered by the investors as an indicator of the risk level of a stock is the financial leverage (Tan, Chua, & Salamanca, 2015). Stocks with high financial leverage (high debt) generate less returns than those with low financial leverage (Obreja, 2013; Ozturk & Yilmaz, 2015). Because of its high financial risk, investors consider stocks with high financial leverage to be more risky while they consider stocks with low financial leverage as less risky (Sharifzadeh, 2005). Based on this, it is hypothesized in this study that stocks with high financial leverage generate more return than stocks with low financial leverage. Financial leverage can be estimated using many methods, one of these methods is dividing the total long-term debt by the total assets (Tan et al., 2015), this latter method was used in this study because it measures the percentage of assets that financed by long-term debt only instead of total debt. Total debt includes short-term and long-term debt; short-term debt results mainly from purchasing from suppliers which is related more to the working capital than to the financial leverage.

The degree of operating leverage may affect the operating risk that companies bear. In fact, high operating leverage results in high business risk (Sharifzadeh, 2005); this risk is priced by the investors and eventually translated into a higher stock return (Lee & Park, 2013). In addition, the more the operating leverage of the company is, the more the risk premium is for its stock (Obreja, 2013). Researchers calculated the operating leverage by dividing fixed cost by the variable cost (Lee & Park, 2013), by dividing fixed cost on total costs (Sharifzadeh, 2005), by dividing net property, plant & equipment by total assets (Abdoh & Varela, 2017), dividing change in the earnings before tax and interest by the change in sales (Mar-Molinero, Menéndez-Plans, & Orgaz-

Guerrero, 2017), and by taking the marginal production costs as a proxy for the leverage (Obreja, 2013). The operating leverage can also be estimated by calculating the ratio of fixed assets to current assets (Kroll & Yechiam Aharon, 2014).

As many studies considered the fixed assets as a main component of the operating leverage, I calculated the operating leverage by dividing the net fixed assets for the company by its total assets and not by current assets because I wanted to estimate how much of the company's total investment is invested in those assets that generate the operating profit (fixed assets). I assumed that this ratio reflects how much the company is increasing its operating capacity to increase its profit; this increase includes more business risk because if the results did not match the expectations, the company will lose most of this investment.

Summary and Conclusions

The main issue of this study is the CAPM and how to improve its ability to predict the expected rate of return. The first theory about the relationship between risk and return was Markowitz portfolio selection theory in which he explained the relationship between the stock's prices variance and returns. Markowitz showed the efficient portfolios from which investor can select her or his portfolio at the desired level of risk. The desired level of risk depends on the degree of risk averse for each investor which can be calculated using the utility function. After introducing of the concept of risk-free asset, investors are considered to have the option to lend and borrow money at a specific rate. The investor can invest the borrowed money in the optimal portfolio or (S)he can lend money to others and benefit from the risk-free return.

The portfolio theory was not applicable or testable and the need for testable model was emerging. The first introduction of a practical model for estimating the expected rate of return was by Sharpe, Lintner, and Mossin who jointly developed the single-factor CAPM. According to this model, the expected rate of return depends on the market excess return, hence the name single-factor model. The expected rate of return can be estimated using the market excess return and the covariance between the stock return and the market return. The empirical test of this model was pioneered by Linter (1965) and then followed by many researchers all around the world. Because of the anomalies associated with the single-factor model revealed by its empirical tests, researchers have developed models with additional factors. These models include the zero-beta model introduced by Black et al. (1972) who replaced the risk-free asset in the single-factor model with a zero-beta portfolio. Another model was tested by Fama and French (1992); they added two variables to the traditional model: size and the equity book value to its market value. After that, Carhart (1997) added the variable of the price momentum to the model of Fama and French to develop his four-factor model. Following the same methodology of Carhart (1997), Chan and Faff (2005) added the variable of the stock's liquidity to the model of Fama and French to form a model called Liquidity-Augmented Fama-French CAPM.

Many researchers tested the single-factor CAPM all around the world and found it invalid to explain the variation in the expected rate of return and thus, the need for more accurate model emerged to help investors in selecting their optimal portfolios. Researchers have added many variables to the traditional model to develop models with more explanatory power. These models suffer from many problems because the addition of variables was not supported by theoretical base.

To fill the need for a more accurate CAPM and to avoid the problems of extended models that are not supported by theoretical base, I tested a new multifactor CAPM that contain variables derived from the corporate finance theory. To test the proposed multi factor CAPM, A causal-comparative quantitative research design was used as detailed in Chapter 3. The model was tested using stocks listed on the Jordanian stock market (Amman stock exchange) from 2000 to 2015. The study population, sample procedures, and data analysis plan are detailed in Chapter 3.

Chapter 3: Research Method

Introduction

The purpose of this study was to empirically test a proposed multifactor CAPM as an alternative to the traditional single-factor model. To achieve this goal, followed the design described in this chapter. The chapter begins with explaining the research variables and design rational. After that, I explain the methodology of the study in details and define the study population. In addition, the chapter includes an explanation of the pilot study that was conducted, the reason for conducting it, and how it was used to determine the appropriate sample size for each statistical test.

For the purposes of this study, I used secondary data collected from the Jordanian stock market. All procedures for gaining access to the data are described in this chapter along with data analysis plan that was followed to analyze these data and reach the results. Data analysis plan include a discussion of the analysis software I used to analyze the data, statistical tests to be conducted to test the study hypotheses, and how results were interpreted. Threats to the validity of the study and how it was addressed are discussed in detail before concluding the chapter with the ethical procedures and a summary.

Research Design and Rationale

This study is a quantitative, causal-comparative study to test the possible causes of the variation in the dependent variable. The dependent variable in the study is the expected rate of return on the stocks of the listed companies on the Jordanian stock market. The independent variables include the expected rate of return on the overall stock market, the size of the stock, the financial leverage, and the operating leverage. The specific problem of the study is the inability of the traditional single-factor CAPM to explain the variation in the expected rate of return on a stock and consequently, I tested the data to determine if the proposed independent variables explain the variation in the stock's expected rate of return. In addition, as explained in chapter 1, research questions of the study enquire about what factors explain the variation in the expected rate of return of a stock and what is the relationship between the independent variables and the expected rate of return. If the independent variables are found to be the possible causes for the variation, the proposed model will be able to explain that variation at a high percentage.

Causal-comparative design was used to achieve the study objectives because the independent variables cannot be manipulated and varied among the groups as discussed by Frankfort-Nachmias et al. (2015). The correlational design is not appropriate for my research because it includes quantitative variables only and does not include categorical variables (Green & Salkind, 2014) while my research contains categorical variables like company's size and financial leverage. By testing for the causes of the variation in the expected rate of return and the relationship of the expected rate of return with size, operating leverage, and financial leverage, the study can add new knowledge about the variables that explain the variation in the expected rate of return on a stock and consequently the variation of its price.

The model that was tested in this study was developed by Sharifzadeh (2005). The original model contains the expected rate of return on the stock as the dependent variable and the independent variables of expected rate of return on market, size, operating leverage, financial leverage, and implied volatility. For my study purposes, however, only the first four independent variables were included. The implied volatility is an indicator for the potential risk of a stock or stock market as perceived by the investor (Sharifzadeh, 2005). This indicator can be estimated using the prices of the stock options prices as discussed by Sharifzadeh The reason behind excluding this variable from the proposed model of this study is that in Jordan there is no market for stock's options and thus, all inputs required to calculate the implied volatility is not available.

Methodology

Population and Sampling Procedures

The population of this study includes all public companies listed on (ASE), the only stock market in Jordan. The total population of listed securities in the market is 191 securities as on 23/6/2017. Based on this, this study did not include private companies or companies that unlisted on the market because data about such companies is unavailable for the public The unit of analysis for this study is each company listed on the ASE and continue to be listed for the period from 2000-2015, the total number of these companies is 109. Banks were excluded from the study because they did not disclose fixed assets and long term debt as a separate line for the end of 1999. After excluding banks, total number of companies included in the study is 90 companies. Information that was studied about the unit of analysis include monthly closing stock prices and the variability of these prices, total assets, total fixed assets, and total long-term debt. Data about the assets and liabilities of the companies was derived from their financial statements submitted to the ASE. All these data were collected from the ASE website at (http://www.ase.com.jo).

For the purpose of this study, all companies listed on the Amman stock exchange for the period from 2000 to 2015 were included; the total number of these companies is 90 after excluding banks. To examine the effect of the size, financial leverage, and operating leverage on the expected rate of return, I first grouped listed companies based on the study variables as follows:

- Size: the average total assets for each listed company was calculated by adding the total assets of company as on Dec 2000 to the total assets as on Dec 2015 and divide the total by two. The companies then were ordered based on the average total assets and the companies with size above the median was labeled as (large size companies) and companies with size less or equal to the median were labeled (small size companies).
- Financial leverage: the financial leverage for each company was calculated by dividing the long term debt by the total assets. After that, the financial leverage at the year 2000 was added to the financial leverage at the year 2015 and the total was divided by two. The same procedure followed for the size variable was followed to order companies based on financial leverage and assign companies to the groups of (high financial leverage and low financial leverage).
- Operating leverage: the first step in grouping companies based on this variable was to calculate the operating leverage for each company by dividing the total

fixed assets on the total assets; this leverage was calculated for the year 2000 and 2015. After that, the leverage of 2000 was added to that of 2015 and the total was divided by two. The same procedures of ordering companies based on the financial leverage and size were employed here to group companies to two groups (high operating leverage and low operating leverage).

The appropriate sample size for each statistical test used in this study was determined based on the results of the pilot study discussed in this chapter. This sample size was estimated only to compare with the data collected and determine if the available data is sufficient for conducting the regression and *t*-test analysis

Pilot Study

The main purpose of the pilot study was to estimate the sample size for each statistical test in the study and then compare it with the collected data to ensure that the data is sufficient to conduct the tests. In the pilot test, I chose two stocks from the population belong to two different industries and then conduct the same regression test that used for the main study. The monthly rate of return for each stock and for ASE index were calculated for the period from 2010 to 2015 and then, the returns of each stock were regressed against the index returns for the same period. The value of the resulted R-square was used to calculate the correlation coefficient. The correlation coefficient along with the power of 90% were fed into G*Power software under the multiple regression test using one predictor and under *t* test to determine the required sample size.

Data Collection

Data required for the study was collected directly from available resources because it is already exist and does not require the use of any instruments like questionnaires or interviews. I collected data about the prices of the stocks for each company and for the market index from Amman stock exchange website at (www.ase.com.jo). Data required for calculating variables of size, financial leverage, and operating leverage were collected from the financial statements of the companies available in the same website of ASE. In addition, I contacted the central bank of Jordan by e-mail to get data about the treasury bills (risk-free asset). All the required data were collected for the period from 2000-2015.

Study Variables

Before discussing the study hypotheses and data analysis plan, I will illustrate the operational definitions of the variables included in the study as follows:

R_{jt}: is the realized rate of return for the company j during the time period t. this is measured using the following equation (Alqisie & Alqurran, 2016):

$R_{jt} = [(P_{jt} – P_{jt-1})*100] / P_{jt-1}$

Where P_{jt} is the closing price of the stock j at the end of month t, $P_{jt-1}$is the closing price of the stock j at the end of the previous month.

R_{ft}: is the realized rate of return free of risk during the month t. This rate was measured using the average rate of return of the treasury bills' issues for each year by the central bank of Jordan.

R_{Mt}: is he rate of return on the market. This variable was measured using the ASE price index as a proxy. This variable is calculated in the same way of calculating the stock return except that the stock price is replaced by the index price for the month t and t-1.

$\overline{R_k}^L$: is the average rate of return for the stock of large size company k during the study period from 2000 to 2015. This average is the simple monthly average rate of return for every company in the subgroup of large companies. The size of the company was measured by finding the average market value of its assets during the study period.

$\overline{R_j}^S$: is the average rate of return for the stock of small size company j during the study period. This average is the simple monthly average rate of return for every company in the subgroup of large companies.

$\overline{R_j}^{HFL}$: is the average rate of return for the stock of high financial leverage company j for the entire period of the study. This average is the simple monthly average rate of return for every company in the subgroup of high financial leverage companies. The financial leverage was calculated by dividing the company's long-term debt by its total assets.

$\overline{R_k}^{LFL}$: is the average rate of return for the stock of low financial leverage company k for the entire period of the study. This average is the simple monthly average rate of return for every company in the subgroup of low financial leverage companies.

$\overline{R_j}^{HOL}$: is the average rate of return for the stock of high operating leverage company j for the entire period of the study from 2000 to 2015. This average is the simple monthly average rate of return for every company in the subgroup of high operating leverage companies. The operating leverage for the company was measured by dividing the fixed asset of the company by its total assets.

$\overline{R}_k^{LOL}$: is the average rate of return for the stock of low operating leverage company k for the entire period of the study. This is measured by finding the simple monthly average rate of return for every company in the subgroup of low operating leverage companies.

SLL_t: the difference between the average rate of return for large size companies and the average rate of return for small size companies during the month t. this is measured by calculating the simple average rate of return for all companies in the subgroup of high sized companies during the month t and the simple average rate of return for all companies in the subgroup of low sized companies during the same period then subtract the two averages.

$HFLLF_t$: the difference between the average rate of return for companies with high financial leverage and the average rate of return for companies with low financial leverage during the month t. this is measured by subtracting the simple average rate of return for all companies in the subgroup of high financial leverage companies during the month t from the simple average rate of return for all companies in the subgroup of low financial leverage companies during the same period.

$HOLLO_t$: the difference between the average rate of return for companies with high operating leverage and the average rate of return for companies with low operating leverage during the month t. this is calculated by finding the simple average rate of return for all companies in the subgroup of high operating leverage companies during the month t and the simple average rate of return for all companies in the subgroup of low operating leverage companies during the same period then subtract the two averages.

Study Hypotheses

The main purpose of this study was to test the validity of the single-factor capital asset pricing model in the Jordanian stock market and examine the validity of a new proposed model. The new proposed model was created by adding new variables to the single- factor model following the methodology of some researchers in the field including Carhart (1997), Chan and Faff (2005), Fama and French, (1992), and Sharifzadeh (2005). The new variables include company's size (as measured by the market value of the company assets), financial leverage, and operating leverage. Because the new variables are derived from the corporate finance theory, including it in the model may link the corporate finance theory to the investment theory as discussed by Sharifzadeh. To achieve the purpose of the study, the following hypotheses were tested:

Hypothesis 1

This hypothesis was developed to test the single-factor CAPM which assumes that the only risk factor that should considered by the investors is the market risk as discussed by Amihud and Mendelson (2015):

- H_0: Market rate of return does not explain the greatest-variation in the expected rate of return on a stock.
- H_1: Market rate of return does explain the greatest-variation in the expected rate of return on a stock.

Hypothesis one includes testing two regression models:

$$R_{jt} - R_{ft} = a_i + \beta_j (R_{Mt} - R_{ft}) + e_{jt}$$

$$\overline{R_j - R_f} = \lambda_0 + \lambda_1 b_j + \lambda_2 \sigma^2 (e_j) + e'_j$$

The null and alternate hypotheses for the first regression model can be expressed as:

H_0: a_i , β_j= 0

H_1: a_i , $\beta_j \neq 0$

And for the second regression:

H_0: $\lambda_0 = 0, \lambda_1 = \overline{R_M - R_f}, \lambda_2 = 0$

H_1: $\lambda_0 \neq 0, \lambda_1 \neq \overline{R_M - R_f}, \lambda_2 \neq 0$

Where a_i is the intercept of the line of the excess asset return (R_{jt} - R_{ft}), $\overline{R_j - R_f}$ is the average monthly risk premium on stock j during the period of the study, $\overline{R_M - R_f}$ is the average monthly risk premium on the market portfolio during the period of the study, e_{jt} is the error term of the rate of return of stock j during the month t, and σ^2 (e_j) is the variance of stock j error term during the period of the study.

If the traditional CAPM is true, then the intercept of the regression should not be significantly different from zero. In addition, if the traditional CAPM holds true, the slope of the regression line (β_j) should be significantly different from zero because if it is not significantly different from zero, this means that there is no linear relationship between the market risk premium and the stock excess return and this make the traditional CAPM invalid. Finally, if the traditional CAPM is true, the nonsystematic risk (σ^2 [e_j]) should not be significantly different from zero because if its zero, the nonsystematic risk is not important in determining the stock rate of return.

Hypothesis 2

The expected average rate of return for small stock is higher than the expected average rate of return for large stock. This relationship between size and return is based on the corporate finance suggestion that investors consider large companies to be confronted with less business risk than small companies. Thus, investors consider the stocks of small companies to be more risky and this high risk should be compensated by high return (Sharifzadeh, 2005).

- H_0: A company's size is not predictor of rate of return of the stock of that company.

- H_1: A company's size is predictor of rate of return of the stock of that company

The null and alternate hypotheses can be expressed as:

H_0: $\mu(\overline{R}_j^{S}) \leq \mu(\overline{R}_k^{L})$

H_1: $\mu(\overline{R}_j^{S}) > \mu(\overline{R}_k^{L})$

Where $\mu(\overline{R}_j^{S})$ is the mean of all small companies' stocks average rate of return and $\mu(\overline{R}_k^{L})$ is the mean of all large companies' stocks average rate of return.

If the mean of the monthly average rate of return of small sized companies is higher than that of the large sized companies then, the size variable may represent a cause for the differences in the rate of return of the stocks as concluded by the previous research of Fama and French (1992) and Sharifzadeh (2005). This supports the proposition that investors consider companies with small size riskier than those with large size because small sized companies are exposed to more business risk than the large sized companies.

Hypothesis 3

The expected average rate of return for stocks with high financial leverage is higher than the average rate of return for stocks with low financial leverage. This relationship between financial leverage and return is based on the corporate finance suggestion that investors consider companies with high financial leverage to be confronted with higher financial risk than companies with low financial leverage. Thus, investors consider the stocks of companies with high financial leverage to be more risky and this high risk should be compensated by high return (Sharifzadeh, 2005). The null and alternate hypothesis for hypothesis three are:

H_0: A company's financial leverage is not predictor of rate of return of the stock of that company.

H_1: A company's financial leverage is predictor of rate of return of the stock of that company.

This hypothesis can be expressed as:

H_0: $\mu(\overline{R}_j^{HFL}) \leq \mu(\overline{R}_k^{LFL})$

H_1: $\mu(\overline{R}_j^{HFL}) > \mu(\overline{R}_k^{LFL})$

Where $\mu(\overline{R_j}^{HFL})$ is the mean of all high financial leverage companies' stocks average rate of return, and $\mu(\overline{R_k^{LFL}})$ is the mean of all low financial leverage companies' stocks average rate of return.

If the mean of the monthly average rate of return of high financial leverage companies is greater than that of the low financial leverage companies then, the financial leverage variable may represent a reason for the differences in the rate of return of the stocks and this is in line with the previous research (Obreja, 2013; Ozturk & Yilmaz, 2015; Sharifzadeh, 2005). In addition, this supports the proposition that investors consider companies with high financial leverage riskier than those with low financial leverage as they are exposed to more financial risk.

Hypothesis 4

The expected average rate of return for stocks with high operating leverage is greater than the average rate of return for stocks with low operating leverage. This relationship between operating leverage and return is based on the corporate finance proposition that investors consider companies with high operating leverage to be confronted with higher business risk than companies with low operating leverage. Thus, investors consider the stocks of companies with high operating leverage to be more risky and this high risk should be compensated by high return (Sharifzadeh, 2005). The null and alternate hypothesis for hypothesis four are:

H_0: A company's operating leverage is not predictor of rate of return of the stock of that company.

H_1: A company's operating leverage is predictor of rate of return of the stock of that company.

And this can be expressed as:

H_0: $\mu(\overline{R}_j^{HOL}) \leq \mu(\overline{R}_k^{LOL})$

H_1: $\mu(\overline{R}_j^{HOL}) > \mu(\overline{R}_k^{LOL})$

Where $\mu(\overline{R}_j^{HOL})$ is the mean of all high operating leverage companies' stocks average rate of return and $\mu(R_k^{\overline{LOL}})$ is the mean of all low operating leverage companies' stocks average rate of return.

If the mean of the monthly average rate of return of high operating leverage companies is greater than that of the low operating leverage companies then, the operating leverage variable may represent a cause for the differences in the rate of return of the stocks. This supports the proposition that investors consider companies with high operating leverage riskier than those with low operating leverage as they are exposed to more business risk and thus, investors require more return on its stocks.

Hypothesis 5

This hypothesis contains two parts: (a) the expected rate of return for any stock can be linearly predicted using four variables of: the market return, size, financial leverage, and operating leverage (b) there is linear relationship between the expected rate of return across cross sections of stocks and the coefficients of risk factors estimated in part (a). The null and alternate hypothesis for part (a) of hypothesis five are:

H_0: The company's expected rate of return is not linearly dependent on the factors of: the market return, company's size, financial leverage, and operating leverage.

H_1: The company's expected rate of return is linearly dependent on the factors of: the market return, company's size, financial leverage, and operating leverage.

The regression model for this part is:

$$R_{jt} - R_{ft} = a_j + \beta_j^{M}(R_{mt} - R_{ft}) + \beta_j^{S}(SLL_t) + \beta_j^{FL}(HFLLF_t) + \beta_j^{OL}(HOLLO_t) + e_{jt}$$

The null and alternate hypotheses can be expressed as:

$$H_0: a_i , \beta_j^{M}, \beta_j^{S,} \beta_j^{FL} , \beta_j^{OL} = 0$$

$$H_1: a_i , \beta_{jM,} \beta_j^{S,} \beta_j^{FL} , \beta_j^{OL} \neq 0$$

Where the β_j's are the sensitivity of the expected rate of return of stock j to each risk factor of: market return ($R_{tm} - R_{ft}$), size (SLL_t), financial leverage ($HFLLF_t$), and operating leverage ($HOLLO_t$).

For part (b) the regression model is:

$$\overline{Rj - Rf} = \lambda_0 + \lambda_1 b_j^{M} + \lambda_2 b_j^{S} + \lambda_3 b_j^{FL} + \lambda_4 b_j^{OL} + e_j$$

Where the b_j's are estimates of βj's calculated from the part (a) regression.

The null and alternate hypothesis for part (b) can be expressed as:

$$H_0: \lambda_0 = 0 , \lambda_1 = \overline{R_M - Rf}, \lambda_2 = \overline{SLL}, \lambda_3 = \overline{HFLLF} , \lambda_4 = \overline{HOLLO}$$

$$H_1: \lambda_0 \neq 0\ ,\ \lambda_1 \neq \overline{R_M - Rf},\ \lambda_2 \neq \overline{SLL},\ \lambda_3 \neq \overline{HFLLF}\ ,\ \lambda_4 \neq \overline{HOLLO}$$

Data Analysis Plan

Collected data included: stocks monthly closing prices for the companies, rate of return on the treasury bills for the study period, ASE index monthly closing prices, and for each company: total fixed assets, total assets, total liabilities, total long-term debt, and total number of outstanding shares. These data were used to calculate the study variables as explained in the variables section of this chapter. Microsoft excel was used to save the data, arrange it, and calculate the required variables. After that the calculated variables were uploaded to PASW (the new name of SPSS software) to analyze the data and test the hypotheses.

To test the study hypotheses, statistical tests of correlation coefficient, linear regression, and *t* test were used through the PASW software. Independent-samples *t* test is used when the objective is to compare the means of two independent groups on the dependent variable (Green & Salkind, 2014) which is the objective of the second, third, and forth hypotheses. As the objective of the first and fifth hypotheses was to determine if the expected rate of return can be predicted using the variables of: market risk, size, financial leverage, and operating leverage and thus, the simple and multiple linear regression were used to test these hypotheses because this test is used to predict the dependent variable (the outcome) from one or several independent variables (the predictors) as discussed by Field (2013). Before starting the analysis of the data, it should be first tested to determine if the assumptions of the statistical tests have been met. The assumptions of *t* test include (Green & Salkind, 2014):

- The test variable is normally distributed in each of two populations established based on the grouping variable.
- The sample units represent a random sample from the population and the values of the test variable are independent from each other.

And the assumptions of the linear multiple regression are (Field, 2013):

- Additivity and linearity: this means that the dependent variable is linearly related to the independent variables and the overall effect of independent variables on the dependent variable can be expressed by adding up their individual effect.
- Independence: this assumption means that the errors in the model are uncorrelated to each other.
- Homoscedasticity/ homogeneity of variance: this means that the variance of the residuals at each level of independent variable should be the same.
- Normality distributed errors: this means that residuals in the model should be normally distributed with a mean of 0.
- Variable types: all independent variables should be quantitative ore categorical and the dependent variable should be measured at interval level and should be unbounded.

- No perfect multicollinearity: this means that there is no perfect linear relationship between any two or more variables.
- Non-zero variance: this assumption means that the independent variables should not have a variance of zero.

After testing the data for these assumptions, data were analyzed and the *t* test results were interpreted based on the probability value (*p* value) of the test and the means of the subgroups as generated by the PASW software. The regression analysis results were interpreted using the *p* value, R-square value, and correlation coefficient values.

Threats to Validity

External Validity

One characteristic that differentiate the quantitative research from the qualitative is that its focus on the generalizability of the results, cause effect relationship, and prediction (Yilmaz, 2013). External validity can be defined as the generalizability of the research results to new populations (Pearl & Bareinboim, 2014). Based on this, it can be claimed that external validity of the quantitative research can be assessed by evaluating the degree to which study results can be generalized to other environments and settings. This study was quantitative using causal-comparative design and thus, threats to external validity represent the threats that may affect the generalizability of its results.

The companies included in this study represent all the companies that was listed on the ASE for the period from 2000 to 2015 and because of this, the results of the study may be generlizable to all companies because all of it was included. Jordanian stock market, however, shares some attributes with other markets and this may increase the ability to generalize the study results to these markets under some cautions. These cautions may include the events occurred during the study period and affected the specific region of the country like the Arabic spring movements. Such events may have not affected countries in Africa or America for example which limits the generalizability of the results to these countries.

Internal Validity

The main concern of the internal validity is the causal relationship between the research process and its results (Yilmaz, 2013). In other words, internal validity is whether the study procedures were strong enough to provide a solid support for its results. Some threats to internal validity of this study may include the selection threat which may occur because of selecting companies with special characteristics that may lead to special pre-known results. I addressed this threat by selecting all companies listed in the ASE for the study period. Another threat to the internal validity is the threat of regression which occurs when some companies have extreme results that may affect the overall results. I addressed this threat by excluding the outliers from the data before analyzing it. Other threats to internal validity including history, maturation, and instrumentation are not relevant to my study as I do not have experiments, human participants, and instruments.

Construct Validity

The main concern of the construct validity is whether the operationalisations of the study reflect the theoretical constructs on which they are based (Yilmaz, 2013). In my study, however, the CAPM was derived from the finance theory and the proposed additional variables were constructed from the corporate finance theory. All variables definitions and measurements were derived from the literature and from theories. Based on this, there are no threats to the construct validity in my study.

Ethical Procedures

I collected data required for this study using secondary resources including the websites of the ASE and the central bank of Jordan who represent the official issuers of this data. Based on this, there are no ethical procedures that should be taken concerning the participants' recruitment and data collection processes. As the data is available for the public, confidentiality and protection of data do not represent any concern. Conflict of interest, however, is absent in this study because I do not work for any of the agencies responsible for the stock market in Jordan and the study is not sponsored by any of these agencies. Because the approval of the institutional review board (IRB) is required prior to collecting data, I applied for the approval and the approval number is 10-16-17-0487431.

Summary

I started this chapter by explaining the rationale behind selecting the quantitative causal-comparative design for the study and why other designs were not chosen. The rational is that I wanted to study the cause of the variation in the stock expected rate of return without any manipulation of the independent variables. The methodology of the study was then discussed including the population of the study which consists of all public companies listed on the ASE index. All companies listed on ASE for the period from 2000-2015 excluding banks were included in the study. The study variables included the dependent variable of the expected rate of return and independent variables of size, financial leverage, and operating leverage. The proposed CAPM model, however, did not include the variable of implied volatility included in the model of Sharifzadeh (2005) because it relates to the stock options market that does not exist in Jordan.

I discussed the data analysis plan after discussing study variables and hypothesis to show the readers how the study variables are connected to formulate the study hypotheses and then explain how I analyzed the data to test these hypotheses. I analyzed the data using Independent-samples *t* test and linear regression which will be conducted using the PASW software. Concerning the internal validity, regression and selection threats were managed by including all listed companies during the study period and by excluding the outliers from the analysis. After analyzing data following the analysis plan, results are discussed in Chapter 4 and the final conclusions and recommendation are stated in Chapter 5.

Chapter 4: Results

Introduction

In this study, I examined the validity of the CAPM in the Jordanian stock market. The main purposes of the study were to (a) test the validity of the traditional CAPM and (b) test the validity of a proposed multifactor CAPM. To achieve the objectives of the study, I tried to explore the factors that explain the greatest-variation in the expected rate of return of a stock and the relationship between the stock rate of return and variables of size, financial leverage, and operating leverage.

I addressed these enquires by formulating and testing five hypotheses. Hypothesis 1 was developed to test the validity of the traditional CAPM while Hypothesis 5 was developed to test the proposed model. Hypotheses 2 through 4 were developed to test the relationship between the stock's expected return and the variables of size, financial leverage, and operating leverage. At the beginning of this chapter, I explained the results of the pilot study which was conducted using two selected stocks from the study population to estimate the sample size for each statistical test in the study and then compare it with the collected data to ensure that the data is sufficient to conduct these tests. After that, I moved to discuss the process of data collection including the sources of data, stocks selection criteria, and descriptive statistics for the companies included in the study. Finally, the results of testing Hypothesis 1 through 5 are stated and the chapter is concluded by summarizing the answers for the research questions.

Pilot Study

The main purpose of the pilot study was to determine the appropriate sample size to conduct the regression analysis for hypotheses 1 and hypothesis 5 in addition to *t* test for the rest of hypotheses and then compare it to the collected data. The IRB approval number for my study is 10-16-17-0487431. The two stocks selected for the purposes of the pilot study were: the stock of Arab bank (ARBK) and Jordan electric power company (JOEP). I selected these two companies because they have many differences: (a) they belong to different industries (banking and utility) which may ensure that the parameters included in the estimation of sample size are not biased because of the attributes of a given industry; and (b) they have different financial ratios of price to earnings (P/E) and dividends pay-out ratios. Another reason for selecting the two stocks was that both of them are included in the calculation of the Amman stock index and thus, they both considered large companies which may make them more representative of the market.

The monthly stock excess returns for the two stocks were regressed separately against the monthly index excess returns for the period from 2010 to 2015 using the following equation:

$$R_{jt} - R_{ft} = a_i + \beta_j (R_{Mt} - R_{ft}) + e_{jt} \quad (27)$$

The results of the linear regression for the two stocks are illustrated in Table 1. The relationship between the ARBK monthly excess returns and the index monthly excess returns was significant ($F(1,70) = 42.997$, $p < .001$) and the same can be said for the JOEP stock ($F(1,70) = 15.646$, $p < .001$). Beta for both stocks were positive and significant ($p < .001$) which indicates that the relationship between the market return and the stock return is consistent with the CAPM model. The adjusted R^2 for the ARBK regression was .372 which means that 37.2% of the change in the monthly excess returns of the ARBK is explained by the change in monthly excess returns of the index. The adjusted R^2 for the JOEP regression was .171 which means that only 17.1% of the change in the JOEP monthly excess returns is explained by the change in the monthly excess returns of the index. These values of the adjusted R^2 for both stocks may support the claim that there are variables other than the market return that explain the variation in the stock return.

Table 1

Regression Coefficients for ARBK and *JOEP Stock Against Amman Stock Index*

	Intercept	β	F	Adjusted R^2
ARBK	-0.327*	1.324**	42.997**	.372
JOEP	-.0153*	1.093**	15.646**	.171

* $p < .9$ ** $p < .001$

As for the main purpose of this pilot test which is determining the sample size, the data required for estimating the sample size using G*Power 3.1 software are the effect size, the power, and the number of predictors. The effect size under the regression test is estimated by the software by entering the R^2 value which is the lowest R^2 resulted from the regressions of the two stocks in the pilot study. I entered the power of 90% in the software and I used the adjusted R^2 of .171 to estimate the effect size which was 0.20 and I got the sample size of 80. In this study, there are 12 returns for each stock for the period of 16 years (11 returns in the first year) giving a total of 191 rates of return which is more than required by the software. Under the *t* test, I entered the power of 90% and the effect size of 0.2 (the same in calculated under the regression test) and I got the total sample size of 858. In this study, I selected all the listed companies in Amman stock exchange that were listed for the entire period from 2000 to 2015 excluding banks. The total number of included companies were 90 companies and this means that I have about 17190 monthly returns (191 returns for each company* 90 companies). This number of returns is more than the sample size calculated using the G*Power software.

Data Collection

Data Sources

Data of the study were collected following the same procedures described in Chapter 3. Data about stocks' prices and data required to calculate the variables of size, financial leverage, and operating leverage were downloaded from the ASE website. Data about the risk-free asset (treasury bills) was obtained from the central bank of Jordan after communicating with them through their official e-mail. The downloaded secondary data were raw and needed time to determine which companies were listed for the entire period of the study from 2000 to 2015 and to calculate the stocks monthly returns, size, financial leverage, and operating leverage.

Selection Criteria

The companies included in this study were the companies listed on the ASE for the period of the study from 2000 to 2015 excluding banks. Banks were excluded because data about their fixed assets and long term debt were not disclosed for the end of the year 1999; this data were required to calculate the variables of financial leverage and operating leverage at the beginning of the study period. Table 2 summaries the number of companies that were included and excluded from the study.

Table 2

Number of Companies Included and Excluded from the Study

Details	Count
Companies listed on the ASE as on 01/01/2000	152
Companies listed on the ASE as on 31/12/2015	226
Companies listed for the entire period 2000-2015	100
Excluded companies (banks) listed from 2000-2015	10
Companies included in the study	90

Descriptive Statistics

The included companies belong to three different sectors in the ASE: industrial companies, financial companies, and services companies. About 49% of the included companies were from the industrial sector, 21% from the financial sector, and 30% were from the services sector. Descriptive information about size, financial leverage, and operating leverage for these companies is illustrated in Table 3.

Table 3

Descriptive Statistics for Variables of: Size, Financial Leverage, and Operating Leverage

Variable	Mean	Median	Min	Max
Size	63,255,159	15,651,911	1,802,694	1,202,152,790
Financial leverage	.049	.018	0	.767
Operating leverage	.343	.310	.003	.891

Study Results

In this section, I restated each hypothesis discussed in chapter3 and summarized the results of testing each one. Data needed to test each hypothesis and the procedures followed to calculate the required variables are explained under each hypothesis. Furthermore, the statistical tests conducted for each hypothesis are stated and its results are reported.

Hypothesis 1

This hypothesis was developed to test the single-factor CAPM which assumes that the only risk factor that should considered by the investors is the market risk**.** The null and alternate hypotheses for the first hypothesis are:

- H_0: Market rate of return does not explain the greatest-variation in the expected rate of return on a stock.
- H_1: Market rate of return does explain the greatest-variation in the expected rate of return on a stock.

Hypothesis one includes testing two regression models:

$$R_{jt} - R_{ft} = a_i + \beta_j (R_{Mt} - R_{ft}) + e_{jt} \quad (28)$$

$$\overline{R_j - R_f} = \lambda_0 + \lambda_1 b_j + \lambda_2 \sigma^2 (e_j) + e'_j \quad (29)$$

The null and alternate hypotheses for the first regression model can be expressed as:

H_0: a_i , $\beta_j = 0$

H_1: a_i , $\beta_j \neq 0$

And for the second regression:

H_0: $\lambda_0 = 0$, $\lambda_1 = \overline{R_M - R_f}$, $\lambda_2 = 0$

H_1: $\lambda_0 \neq 0$, $\lambda_1 \neq \overline{R_M - R_f}$, $\lambda_2 \neq 0$

Where a_i is the intercept of the line of the excess asset return (R_{jt} - R_{ft}), $\overline{R_j - R_f}$ is the average monthly risk premium on stock j during the period of the study, $\overline{R_M - R_f}$ is the average monthly risk premium on the market portfolio during the period of the study, e_{jt} is the error term of the rate of return of stock j during the month t, and σ^2 (e_j) is the variance of stock j error term during the period of the study.

If the traditional CAPM is true, then the intercept of the regression should not be significantly different from zero. In addition, if the traditional CAPM holds true, the slope of the regression line (β_j) should be significantly different from zero because if it is not significantly different from zero, this means that there is no linear relationship between the market risk premium and the stock excess return and this make the traditional CAPM invalid. Finally, if the traditional CAPM is true, the nonsystematic risk (σ^2 [e_j]) should not be significantly different from zero because if its zero, the nonsystematic risk is not important in determining the stock rate of return.

Testing hypothesis one-first regression. Data required for this hypothesis were the treasury bills returns (risk-free asset), the ASE index monthly closing prices (market returns) and the monthly closing prices of each company of the 90 companies included in the study for the period from January 2000 to December 2015. Monthly closing prices for the index and for the companies were downloaded from the ASE website while data about the treasury bills' returns were obtained by e-mail after communicating the central bank of Jordan. To test this part of hypothesis one, monthly returns on the treasury bills (risk free asset) were calculated for the period from January, 2000 to December 2015 by dividing the total interest rate on all issues for each year by 12. I did this because I found that one month may be included in the tenor of more than one issue. After that, returns on the ASE index and returns on each stock of the 90 stocks included in the study were calculated for the same period. Returns on the stocks were calculated as follows:

$R_{jt} = [(P_{jt} – P_{jt-1})*100] / P_{jt-1}$

Where P_{jt} is the closing price of the stock j at the end of month t, $P_{jt-1}$is the closing price of the stock j at the end of the previous month.

And returns on the index were calculated using the following equation:

$$R_{mt} = (I_t - I_{t-1}) * 100 / I_{t-1}$$

Where I_t is the ASE index closing price at the end of month t and I_{t-1} is the index closing price at the end of the previous month.

The monthly excess stock returns for each company (R_{jt} - R_{ft}) were calculated by subtracting the stock return of that company for a given month from the treasury bills return for that month and market risk premiums ($R_{Mt} – R_{ft}$) for each month were calculated by subtracting the ASE index return for that month from the treasury bills return of the month. To obtain regression coefficients of the first regression for each stock, I regressed the monthly excess return for each stock on the monthly market risk premiums for the entire period of the study. Data required for this regression were arranged using Microsoft excel and then copied to IBM SPSS software to conduct a linear regression. Table 4 contains an example of how the data were calculated in excel for the Jordan insurance company. Data for all companies were calculated using the same table by adding two columns for each company: one for the returns and one for the stock excess returns:

Table 4

Example of how Monthly Excess Returns and Market Risk Premium were Calculated for Jordan Insurance Company

Month	Average monthly return on treasury bills	Index monthly returns RMt	Index monthly risk premium RMt-Rft	Jordan insurance returns	Jordan insurance excess returns
Feb-00	1.00%	-3.20%	-4.20%	-0.28%	-1.28%
March-00	1.00%	-1.83%	-2.83%	-2.89%	-3.89%
Jan-04	0.43%	10.03%	9.60%	14.11%	13.68%
Feb-04	0.43%	-2.27%	-2.70%	3.09%	2.66%
April-07	0.81%	-3.60%	-4.41%	-5%	-5.81
Dec-10	0.39%	0.80%	0.41%	9.50%	9.11%
Jan-11	0.47%	0.01%	-0.46%	1.65%	1.18%
Feb-11	0.47%	-5.14%	-5.61%	-5.28%	-5.75%

An example of regression results using SPSS for one company (Jordan Insurance) is illustrated in Table 5.

Table 5

Regression Analysis Results for Jordan Insurance Excess Returns on the ASE Index Excess Returns

Details	Value	*P* value
Intercept	-0.396	.515
Beta	0.666	.000
R squared	.129	
Adjusted R squared	.124	

As can be seen in Table 5, the intercept of the regression equation for Jordan insurance company was -0.396 with *p* value of .515. The intercept is not significant and thus, the null hypothesis cannot be rejected which means that a_i for Jordan insurance company is not statistically different from zero. Beta value was 0.666 with p value $< .001$ which means that the null hypothesis of the first regression can be rejected and thus, β_j value is statistically different from zero. Adjusted R squared for this regression was 12.4% which means that only 12.4% of the variation in the excess returns of the stock of Jordan insurance company is explained by the variation in market index excess returns. The regression coefficients and its significance for all companies were summarized and are illustrated in Table 6 while adjusted R squared results for these companies are summarized in Table 7.

Table 6

Summary of Regression Coefficients and its Significance for the 90 Companies Included In the Study

Details	At 1% level	At 5% level
Percentage of a_i's significantly not different from zero	100%	97%
Percentage of β_j's significantly different from zero	67%	80%

Table 7

Summary of Adjusted R Squared Results for All Companies in the Study

Adjusted R squared range	Percentage of stocks in the range
0-10%	70%
11%-20%	22%
21%-30%	4%
31%-40%	4%
Over 40%	0%
Average adjusted R squared	7.97%
Median adjusted R squared	5.30%

Testing hypothesis one-second regression. As can be seen in Equation 29, the variables included in this regression are: the average of monthly excess returns for each stock for the entire period from 2000-2015 as the dependent variable, the estimates of b_j's and the estimates of nonsystematic risk $[\sigma^2 (e_j)]$'s for each stock as the independent variables. The average of monthly excess returns for each stock $(R_j – R_f)$ was calculated using excel and the b_j's of the stocks were obtained from the first regression. Nonsystematic risk for each stock was measured using the mean square of residuals resulted from the first regression. After that, these data were arranged in excel as illustrated in Table 8.

Table 8

Data Required for the Second Regression

Company	$\overline{Rj - Rf}$ (%)	b_j	$\sigma^2 (e_j)$ (%)
Jordanian expatriate investment holding	0.170	1.474	1.537
Al-Zarqa for education & investment	0.255	0.275	0.708
Union land development corp.	1.162	1.463	2.194
Zara for investment	-0.783	0.629	0.458
The Jordan cement factories	-0.706	0.57	0.791
Jordan phosphate mines	0.787	1.617	1.344
Arab potash	0.868	1.237	0.932
Jordan petroleum refinery	-0.302	0.894	0.993

Results of second regression. Data similar for that in Table 8 for all companies included in the study were used to conduct a multiple linear regression to solve Equation 29. The results of the regression are summarized in Table 9.

Table 9

Regression Analysis Results for Hypothesis One- Second Regression

Details	Value	*t* statistic	*P* value
Intercept (λ_0)	-0.576	-4.704	.000
Coefficient for b_j's (λ_1)	0.279	1.852	.067
Coefficient for $[\sigma^2 (e_j)]$'s	0.304	7.119	.000
R squared	.402		
Adjusted R squared	.389		

Null and alternate for the second regressions were as follows:

$$H_0: \lambda_0 = 0, \lambda_1 = \overline{R_M - R_f}, \lambda_2 = 0$$

$$H_1: \lambda_0 \neq 0, \lambda_1 \neq \overline{R_M - R_f}, \lambda_2 \neq 0$$

The average monthly excess return for the market ($\overline{R_M - R_f}$) was -0.00055 and thus the hypothesized value of λ_1 is -0.055%, the hypothesized value of λ_0 and λ_2 is zero. This information was accompanied with information about standard error to calculate *t* statistic and its *p* values as illustrated in Table 10. Based on information provided in Table 10 and using the significance level of 5%, the null hypothesis that $\lambda_0 = 0$ can be rejected which means that the value of λ_0 was significantly different from zero, $t(89) = -4.721$, $p < .001$. The null hypothesis that $\lambda_1 = \overline{R_M - R_f} = -0.055\%$ can be rejected, $t(89) = 2.211$, $p = .015$ and thus, $\lambda_1 \neq -0.055\%$. Finally, null hypothesis that $\lambda_2 = 0$ can be rejected, $t(89) = 7.069$, $p < .001$ which means that λ_2 value was significantly different from zero.

Table 10

t Statistic and p Values for Hypothesis One- Second Regression

Details	λ_0	λ_1	λ_2
Coefficient	-0.576	0.279	0.304
Hypothesized value	0.000	-0.055	0.000
Standard error	.122	.151	.043
T statistic	-4.721	2.211	7.069
p value	<.001	.015	<.001
Adjusted R squared .389			

The result that $\lambda_1 \neq \overline{R_M - R_f} \neq$ -0.055% and it was not significantly different from zero means that the b_j's (systematic risk) does not represent a significant variable in estimating the expected rate of return of the stock and the market return is not the variable that determine the expected rate of return which does not support the capital asset pricing model**.** However, nonsystematic risk ($[\sigma^2 (e_j)]$'s) plays a significant role in estimating the expected rate of return because it was significantly different from zero. Considering these results and the value of the adjusted R squared (38.9%), it can be concluded that the CAPM does not hold true in the Jordanian stock market and there are other risk factors than the systematic risk that affect the estimation of the expected rate of return of the stock. Figure 4 supports this conclusion because it illustrates the gap between the expected average excess rate of return estimated using the model of second regression and the actual average excess return for the stocks. In the following sections I will add and test a set of variables to increase the accuracy of CAPM in estimating the expected rate of return of the stock.

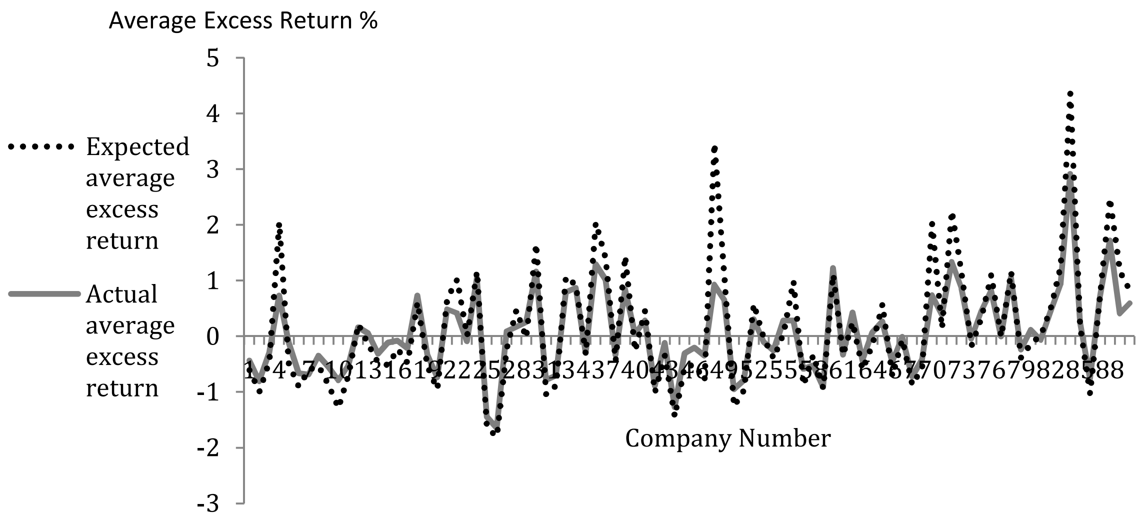

Figure 4. Expected average excess return estimated using the second regression model compared to actual average excess return for stocks included in the study

Hypothesis 2

It is hypothesized that the expected average rate of return for small stock is higher than the expected average rate of return for large stock. This relationship between size and return is based on the corporate finance suggestion that investors consider large companies to be confronted with less business risk than small companies. Thus, investors consider the stocks of small companies to be more risky and this high risk should be compensated by high return (Sharifzadeh, 2005). The null and alternate hypotheses for hypothesis two are:

- H_0: A company's size is not predictor of rate of return of the stock of that company.

- H_1: A company's size is predictor of rate of return of the stock of that company

The null and alternate hypotheses can be expressed as:

H_0: $\mu(\overline{R}_j^{S}) \leq \mu(\overline{R}_k^{L})$

H_1: $\mu(\overline{R}_j^{S}) > \mu(\overline{R}_k^{L})$

Where $\mu(\overline{R}_j^{S})$ is the mean of all small companies' stocks average rate of return and $\mu(\overline{R}_k^{L})$ is the mean of all large companies' stocks average rate of return.

If the mean of the monthly average rate of return of small sized companies is higher than that of the large sized companies then, the size variable may represent a cause for the differences in the rate of return of the stocks as concluded by the previous research of Fama and French (1992) and Sharifzadeh (2005). This supports the proposition that investors consider companies with small size riskier than those with large size because small sized companies are exposed to more business risk than the large sized companies.

Testing Hypothesis 2. Data required to test this hypothesis were the average rate of return and size for each stock of the companies included in the study. The size for each stock was calculated by averaging total market value of the company's assets at the beginning and the end of the study period. Market value of the company's assets at the beginning of the study period was calculated by first multiplying the number of outstanding shares as on 31/12/1999 by the closing price of the stock on the same day and then add total liabilities as on the same date to the result. The same calculations were done to calculate the size for the stock at the end of the study period (31/12/2015). An example of these calculations is illustrated in Table 11.

Table 11

Calculations of Size Variable for Stocks Included in the Study

Details/ company	Jordan insurance	Middle east insurance	National portfolio securities	Arab international hotels
Number of outstanding shares 31/12/1999	5,000,000	2,640,000	5,000,000	12,000,000
Closing price 31/12/1999	3.460	4.700	0.900	3.510
Market capitalization 31/12/1999	17,300,000	12,408,000	4,500,000	42,120,000
Total liabilities 31/12/1999	11,691,766	9,422,102	448,420	9,307,022
Total market value of assets 1/1/2000	28,991,766	21,830,102	4,948,420	51,427,022
Number of outstanding shares 31/12/2015	30,000,000	21,000,000	10,000,000	32,000,000
Closing price 31/12/2015	2.040	1.430	0.480	1.310
Market capitalization 31/12/2015	61,200,000	30,030,000	4,800,000	41,920,000
Total liabilities 31/12/2015	40,817,402	45,607,956	3,174,626	13,784,167
Total market value of assets 31/12/2015	102,017,402	75,637,956	7,974,626	55,704,167
Average market value(size)	65,504,584	48,734,029	6,461,523	53,565,595

Data of number of outstanding shares for each company and total liabilities were obtained from the information provided by listed companies to the ASE at the end of each year. This information includes data about all components of financial statements for each year. I obtained the closing prices for each stock from the data available on the ASE website.

To prepare data for *t test,* size for company included in the study was calculated as illustrated in Table 11. After that, the median of the sizes was calculated and the companies lower than the median were labeled *small size* while other companies were labeled *large size*. The average rate of return for each company for the entire period of 191 months was then calculated and *t* test was conducted using data similar to that in Table 12.

Table 12

Data Prepared to Conduct t Test for Hypothesis 2

Company	Average rate of return %	Group (L/S)
Jordan insurance	0.157	L
Middle east insurance	-0.216	L
National portfolio securities	1.008	S
Arab international hotels	-0.147	L
Arabian seas	1.320	S
National poultry	0.837	L

One-tailed *t* test cannot be conducted using SPSS software, the software includes only two-tailed test. Because of that, I conducted the two-tailed first and then I divided the resulted significance value by 2 to get the significance for one-tailed test. The results for one-tailed *t test* are summarized in Table 13. From information provided in Table 13, the significance value is greater than 5% and thus, the null hypothesis that the average rate of return for stocks with small size is less than or equal to that for stocks with large size cannot be rejected, $t(88) = 0.887$, $p = .189$. This means that the rate of return for small size stocks is not higher than the big size stocks as hypothesized.

Table 13

Results of One-Tailed t test for Hypothesis Two

Details		Mean rate of return %	Standard deviation
Small size		0.721	.831
Large size		0.583	.632
t-statistic	0.887		
P value (one-tailed)	.189		

Hypothesis 3

The purpose of this hypothesis was to test whether the expected average rate of return for stocks with high financial leverage is higher than the average rate of return for stocks with low financial leverage. This relationship between financial leverage and return is hypothesized based on the corporate finance suggestion that investors consider companies with high financial leverage to be confronted with higher financial risk than companies with low financial leverage. Thus, investors consider the stocks of companies with high financial leverage to be more risky and this high risk should be compensated by high return (Sharifzadeh, 2005). The null and alternate hypothesis for hypothesis three are:

H_0: A company's financial leverage is not predictor of rate of return of the stock of that company.

H_1: A company's financial leverage is predictor of rate of return of the stock of that company.

This hypothesis can be expressed as:

H_0: $\mu(\overline{R}_j^{HFL}) \leq \mu(\overline{R}_k^{LFL})$

H_1: $\mu(\overline{R}_j^{HFL}) > \mu(\overline{R}_k^{LFL})$

Where $\mu(\overline{R}_j^{HFL})$ is the mean of all high financial leverage companies' stocks average rate of return, and $\mu(\overline{R}_k^{LFL})$ is the mean of all low financial leverage companies' stocks average rate of return.

If the mean of the monthly average rate of return of high financial leverage companies is greater than that of the low financial leverage companies then, the financial leverage variable may represent a reason for the differences in the rate of return of the stocks and this is in line with the previous research (Obreja, 2013; Ozturk & Yilmaz, 2015; Sharifzadeh, 2005). In addition, this supports the proposition that investors consider companies with high financial leverage riskier than those with low financial leverage as they are exposed to more financial risk.

Testing Hypothesis 3. Data required to test this hypothesis were the average rate of return and the financial leverage for each stock (company) included in the study. The financial leverage for each company was calculated by averaging its financial leverage at the beginning and at the end of the study period. Financial leverage at the beginning of the study period was measured by dividing total long-term debt by total assets of each company as on 31/12/1999. Financial leverage at the end of the study period (31/12/2015) was measured following the same procedure. Table 14 represents an example of how the financial leverage for each company was measured.

Table 14

Calculations of Financial Leverage for Stocks Included in the Study

Details/ company	Jordan phosphate mines	General investment	National cable & wire Manufacturing	Nutri dar
Total long-term debt 31/12/1999	113,311,543	0	2,012,884	1,293,750
Total assets 31/12/1999	447,123,878	12,863,962	18,825,997	5,869,038
Financial leverage 31/12/1999 %	25.342	0	10.692	22.044
Total long-term debt 31/12/2015	59,414,000	0	1,084,230	1,304,758
Total assets 31/12/2015	1,174,183,000	26,858,239	34,153,497	13,271,410
Financial leverage 31/12/2015 %	5.060	0	3.175	9.831
Average financial leverage %	15.201	0	6.933	15.937

Data about total assets and total long-term debt for each company were obtained from the information provided by listed companies to the ASE at the end of each year. To prepare data for conducting the statistical test, each company was assigned to group of high financial leverage (HFL) or low financial leverage (LFL). Companies were assigned to these groups by calculating the median of financial leverage of all companies first and then assign companies with financial leverage higher than the median to the high financial leverage group and companies with financial leverage lower than the median to the group of low financial leverage. The average rate of return for each company for the entire period of 191 months was calculated to be used as the dependent variable in the statistical test. Data required for *t test* were arranged in tables similar to Table 15.

Table 15

Data Prepared to Conduct t test for Hypothesis Three

Company	Average rate of return %	Group (HFL/LFL)
Jordan paper & cardboard factories	-0.296	HFL
The public mining	0.472	LFL
Arab chemical detergents industries	-0.683	LFL
Dar al dawa development & investment	0.281	HFL
Arab aluminum industry	0.385	LFL
General investment	0.239	LFL

Because the normality assumption of the test has not been met, I used a nonparametric statistical test called Mann-Whitney *U* test as recommended by Green and Salkind (2014). To conduct this test, I converted the groups' variable from being HFL or LFL to 1 or 2. The result of this test is summarized in Table 16. The table includes the test results after converted to one-tailed by dividing the two-tailed *p* value on two. Based on the results of Mann-Whitney *U* test, the null hypothesis that the average rate of return for stocks with high financial leverage is less than or equal to that for stocks with low financial leverage cannot be rejected, z = -0.835, p = .202. This means that the hypothesized relationship between financial leverage and the rate of return does not exist.

Table 16

Results of Mann-Whitney U Test for Hypothesis Three

Group		High financial leverage	Low financial leverage
Average rank		47.8	43.2
N		45	45
P value (one-tailed)	.202		

Hypothesis Four

The purpose of this hypothesis was to test whether the expected average rate of return for stocks with high operating leverage is greater than the average rate of return for stocks with low operating leverage. This relationship between operating leverage and return is based on the corporate finance proposition that investors consider companies with high operating leverage to be confronted with higher business risk than companies with low operating leverage. Thus, investors consider the stocks of companies with high operating leverage to be more risky and this high risk should be compensated by high return (Sharifzadeh, 2005). The null and alternate hypothesis for hypothesis four are:

H_0: A company's operating leverage is not predictor of rate of return of the stock of that company.

H_1: A company's operating leverage is predictor of rate of return of the stock of that company.

And this can be expressed as:

H_0: $\mu(\overline{R}_j^{HOL}) \leq \mu(\overline{R}_k^{LOL})$

H_1: $\mu(\overline{R}_j^{HOL}) > \mu(\overline{R}_k^{LOL})$

Where $\mu(\overline{R}_j^{HOL})$ is the mean of all high operating leverage companies' stocks average rate of return and $\mu(\overline{R}_k^{LOL})$ is the mean of all low operating leverage companies' stocks average rate of return.

If the mean of the monthly average rate of return of high operating leverage companies is greater than that of the low operating leverage companies then, the operating leverage variable may represent a cause for the differences in the rate of return of the stocks. This supports the proposition that investors consider companies with high operating leverage riskier than those with low operating leverage as they are exposed to more business risk and thus, investors require more return on its stocks.

Testing hypothesis four. Data required to test this hypothesis were the average rate of return and the operating leverage for each stock (company) included in the study. The operating leverage for each company was calculated by averaging its operating leverage at the beginning and at the end of the study period. Operating leverage at the beginning of the study period was measured by dividing fixed assets on total assets of each company as on 31/12/1999. The same calculations were made to measure the operating average at the end of the study period (31/12/2015). In Table 17, an example is illustrated to explain how the operating leverage for each company was measured.

Table 17

Calculations of Operating Leverage for Stocks Included in the Study

Details/ company	Zara for investment	The Jordan cement factories	Jordan phosphate mines	Arab potash
Fixed assets 31/12/1999	187,401,520	113,930,487	175,353,614	198,943,000
Total assets 31/12/1999	202,779,166	164,599,941	447,123,878	414,724,000
Operating leverage 31/12/1999 %	92.417	69.217	39.218	47.970
Fixed assets 31/12/2015	172,045,058	100,958,926	292,626,000	313,014,000
Total assets 31/12/2015	220,599,199	195,011,262	1,174,183,000	1,018,631,000
Operating leverage 31/12/2015 %	77.990	51.771	24.922	30.729
Average operating leverage %	85.203	60.494	32.070	39.349

Data about fixed assets and total assets for each company were obtained from the information provided by listed companies to the ASE at the end of each year. To prepare data for conducting *t test* , each company was assigned to group of high operating leverage (HOL) or low operating leverage (LOL). Companies were assigned to these groups by calculating the median of operating leverage of all companies first and then assign companies with operating leverage higher than the median to the high operating leverage group and companies with operating leverage lower than the median to the group of low operating leverage. The average rate of return for each company for the entire period of 191 months was calculated to be used as the dependent variable in the statistical test. Data required for *t test* were arranged in tables similar to Table 18.

Table 18

Data Prepared to Conduct t test for Hypothesis Four

Company	Average rate of return %	Group (HOL/LOL)
Jordan international insurance	0.128	LOL
Islamic insurance company	0.580	LOL
Arab assurers	-0.132	LOL
Arab Jordanian insurance group	0.165	LOL
Jordan marketing	1.329	HOL
Jordan trading facilities	0.975	LOL

Because the one-tailed *t test* cannot be conducted using SPSS software, I conducted the two-tailed test first and then I divided the resulted significance value by 2 to get the significance for one-tailed test. The results for one-tailed *t test* are summarized in Table 19. As can be seen in Table 19, the significance value is less than 5% and thus, the null hypothesis that the average rate of return for stocks with high operating leverage is less than or equal to that for stocks with low operating leverage can be rejected, $t(88) = 2.042$, $p = .022$. This means that the expected average rate of return for stocks with high operating leverage is greater than the average rate of return for stocks with low operating leverage as hypothesized.

Table 19

Results of One-Tailed t test for Hypothesis Four

Details		Mean	Standard deviation
High operating leverage		0.808	.800
Low operating leverage		0.496	.641
t-statistic	2.042		
P value (one-tailed)	.022		

Hypothesis Five

This hypothesis contains two parts: (a) the expected rate of return for any stock can be linearly predicted using four variables of: market return, size, financial leverage, and operating leverage (b) there is linear relationship between the expected rate of return across cross sections of stocks and the coefficients of risk factors estimated in part (a). Because the tests of variables of size and financial leverage yielded insignificant results, this hypothesis was modified to include only two variables: market return and operating leverage. Based on this, the new null and alternate hypothesis for part (a) of hypothesis five are:

H_0: The company's expected rate of return is not linearly dependent on the factors of: market return and company's operating leverage.

H_1: The company's expected rate of return is linearly dependent on the factors of: market return and company's operating leverage.

The regression model for this part is:

$$R_{jt} - R_{ft} = a_j + \beta_j^{M}(R_{mt} - R_{ft}) + \beta_j^{OL}(HOLLO_t) + e_{jt} \quad (30)$$

Where,

$R_{jt} - R_{ft}$: excess return of stock j during the month t

$R_{mt} - R_{ft}$: excess return of the market during the month t (the variable of market return)

$HOLLO_t$: the difference between average rate of return of high operating leverage companies and the average rate of return of companies with low operating leverage during the month t. This variable was measured by subtracting the average return of all companies in high operating leverage group during month t from the average return of all companies in the low operating leverage group during the same month.

β_j^{M}: sensitivity of the stock j return to the market risk variable

β_j^{OL}: sensitivity of the stock j return to the operating leverage risk variable

The null and alternate hypotheses can be expressed as:

H_0: a_i , β_j^{M}, $\beta_j^{OL} = 0$

H_1: a_i , $\beta_{jM,}$ $\beta_j^{OL} \neq 0$

Where the β_j's are the sensitivity of the expected rate of return of stock j to each risk factor of: market return ($R_{tm} - R_{ft}$) and operating leverage ($HOLLO_t$).

If the rate of return for each stock actually depends on the variables of market return and operating leverage, then for each company, the value of the intercept a_i should not be significantly different from zero and the value of $\beta_{jM,}$ β_j^{OL} should be different from zero

For part (b) the regression model is:

$$\overline{Rj - Rf} = \lambda_0 + \lambda_1 \, b_j^M + \lambda_2 \, b_j^{OL} + e_j \tag{31}$$

Where,

$\overline{Rj - Rf}$: average monthly risk premium on stock j during the period of the study

b_j's: are estimates of βj's calculated from the part (a) regression.

λs: represent the intercept of the regression, the expected value of the average market excess return, and the expected value of the excess average return of companies with high operating leverage over average return of companies with low operating leverage

The null and alternate hypothesis for part (b) can be expressed as:

$$H_0: \lambda_0 = 0 \,,\ \lambda_1 = \overline{R_M - Rf} \,,\ \lambda_2 = \overline{HOLLO}$$

$$H_1: \lambda_0 \neq 0 \,,\ \lambda_1 \neq \overline{R_M - Rf},\ \lambda_2 \neq \overline{HOLLO}$$

Testing hypothesis five-part (a). Data required for this hypothesis were the monthly excess returns for each company included in the study and for the market index, these data were calculated when hypothesis one was tested. The new variable in Equation 30 was the operating leverage risk premium which was calculated by first finding the difference between the average return of companies with high operating leverage and average return of companies with low operating leverage for each month of the 191 months. The monthly average return for each group (high and low operating leverage) was measured by calculating the average of returns of all companies in that group during the given month. Table 20 includes an example of how the operating leverage variable was calculated.

Table 20

Example of how Operating Leverage Variable was Calculated

Month	Average return of companies with high operating leverage	Average return of companies with low operating leverage	Difference $HOLLO_t$
Feb-00	-3.87%	-2.05%	-1.82%
Mar-00	-5.05%	-3.61%	-1.44%
Apr-00	-5.37%	-3.67%	-1.70%
May-12	-3.79%	-3.30%	-0.49%
Jun-12	-3.15%	0.34%	-3.49%
Jul-12	-1.44%	-3.85%	2.41%
Nov-15	-1.16%	-1.83%	0.67%
Dec-15	3.04%	1.23%	1.81%

To conduct the regression test, variables in Equation 30 were arranged in Microsoft excel. These variables include: excess return for the stocks (R_{jt} - R_{ft}), market excess return (R_{mt} - R_{ft}), and the difference between average rate of return of high operating leverage companies and the average rate of return of companies with low operating leverage ($HOLLO_t$). Data for regression were prepared in the same form illustrated in Table 21.

Table 21

Example of Data Prepared for Regression Test of Hypothesis Five-Part (a)

Month	ASE index monthly excess returns% R_{Mt}-R_{ft}	Operating leverage difference% $HOLLO_t$	Jordan insurance excess return%	Middle east insurance excess return%	United insurance excess return%
Feb-00	-4.21	-1.82	-1.29	-1.00	-1.00
Mar-00	-2.84	-1.43	-3.90	-1.00	-1.00
Apr-00	-4.46	-1.70	-1.00	-1.00	-1.00
May-00	-3.59	-2.02	-9.96	-1.00	-1.00
Jun-00	-1.13	2.96	-1.00	-17.38	-6.00
Jul-00	-5.64	-0.11	8.84	-1.00	-1.00
Aug-00	-3.48	3.38	-0.11	-1.00	1.87
Sep-00	0.53	1.57	-1.00	-1.00	-1.00

To obtain regression coefficients of the first part for each stock, I regressed the monthly excess return for each stock (R_{jt} - R_{ft}) on the monthly market risk premiums (R_{Mt}-R_{ft}) and the operating leverage variable ($HOLLO_t$) for the entire period of the study. The regression results for one company (Jordan insurance) are illustrated in Table 22.

Table 22

Regression Analysis Results for Jordan Insurance Excess Return on the Market Risk Premium and Operating Leverage Premium

Details	Value	*P* value
Intercept	-0.234	.698
Beta for market excess return	0.695	.000
Beta for operating leverage premium	-0.513	.015
R squared	.156	
Adjusted R squared	.147	

The intercept of the regression equation for Jordan insurance company was -0.234 with *p* value of .698. The intercept is not significant and thus, the null hypothesis concerning a_j cannot be rejected which means that a_j for Jordan insurance company is not statistically different from zero. Beta value for market excess return was 0.695 with *p* value >.001 and Beta value for operating leverage premium was -0.513 with $p = .015$ which means that the null hypothesis of the first regression concerning β_j^M and β_j^{OL} can be rejected and thus, β_j^M and β_j^{OL} value is statistically different from zero. Adjusted R squared for this regression was 14.7% while for the traditional capital asset pricing model it was 12.4%. This means that the explanation power of the CAPM was increased by including the variable of operating leverage. In addition, the adjusted R squared value of 14.7% indicates that variables other than the operating leverage should be added to the new model to increase the explained portion of the variation in the stock's rate of return. The regression coefficients and its significance for all companies are summarized in

Table 23 while adjusted R squared results for these companies are summarized in Table 24.

Table 23

Summary of Regression Coefficients and its Significance for Hypothesis Five-part (a)

Details	At 1% level of	At 5% level
Percentage of a_i's significantly not different from zero	100%	97%
Percentage of β_j^{M}'s significantly different from zero	69%	78%
Percentage of β_j^{OL}'s significantly different from zero	28%	44%

Table 24

Summary of Adjusted R Squared Results for all Companies in the Study-Hypothesis Five

Adjusted R squared range	Percentage of stocks in the range
0-10%	61%
11%-20%	28%
21%-30%	7%
31%-40%	4%
Over 40%	0%
Average adjusted R squared	10%
Median adjusted R squared	7%

Testing hypothesis five-part (b). Variables included in testing this part are: the average of monthly excess returns for each stock for the entire period from 2000-2015 as the dependent variable, the estimates of β_j^M and β_j^{OL} for each stock as the independent variables. The average of monthly excess returns for each stock ($R_j - R_f$) was calculated using excel and the b_j's of the stocks were obtained from the regression in part (a). Data required for the regression of this part were arranged in tables similar to Table 25.

Table 25

Data Required for Regression Analysis of Hypothesis Five- Part (b)

Company	$\overline{Rj - Rf}$ (%)	β_j^M	β_j^{OL}
Jordanian expatriate investment holding	0.170	1.532	-0.991
Al-Zarqa for education & investment	0.255	0.275	-0.006
Union land development corp.	1.162	1.410	0.920
Zara for investment	-0.783	0.640	-0.195
The Jordan cement factories	-0.706	0.567	0.060
Jordan phosphate mines	0.787	1.576	0.717
Arab potash	0.868	1.210	0.459
Jordan petroleum refinery	-0.302	0.904	-0.174

Part (b) regression results. Data similar for that in table 25 for all companies included in the study were used to conduct a multiple linear regression to solve Equation 31. The results of the regression are summarized in Table 26.

Table 26

Regression Analysis Results for Hypothesis Five- part (b)

Details	Value	*t* statistics	*P* value
Intercept (λ_0)	-0.156	-1.169	.246
Coefficient for β_j^M (λ_1)	0.359	1.984	.050
Coefficient β_j^{OL} (λ_2)	0.311	3.075	.003
R squared	.135		
Adjusted R square	.115		

Null and alternate for the second regressions were as follows:

H_0: $\lambda_0 = 0$, $\lambda_1 = \overline{R_M - Rf}$, $\lambda_2 = \overline{HOLLO}$

H_1: $\lambda_0 \neq 0$, $\lambda_1 \neq \overline{R_M - Rf}$, $\lambda_2 \neq \overline{HOLLO}$

The average monthly excess return for the market $(\overline{R_M - R_f})$ was -0.00055 and the average monthly excess return for operating leverage variable $\overline{HOLLO}$ was 0.312. Thus, the hypothesized value of λ1 and λ_2 were -0.055% and 31.2% respectively. This information was accompanied with information about standard error to calculate *t* statistic and its *p* values as illustrated in Table 27. Based on information provided in Table 27 and using the significance level of 5%, the null hypothesis that $\lambda_0 = 0$ cannot be rejected which means that the value of λ_0 was not significantly different from zero, $t(89) = -1.172$, $p = .122$. The null hypothesis that $\lambda_1 = \overline{R_M - R_f} = -0.055\%$ can be rejected, $t(89) = 2.287$, $p = .012$ and thus, $\lambda_1 \neq$ -0.055%. Finally, null hypothesis that $\lambda_2 = \overline{HOLLO} = 0.312$ cannot be rejected, $t(89) = -0.009$, $p = .496$ which means that λ_2 value was equal to the average excess return caused by operating leverage variable. In Figure 5, I illustrated the difference between the actual average excess return for all companies and the expected average excess return calculated using the CAPM tested in part (b) of hypothesis five.

Table 27

t Statistic and p Values for Hypothesis Five Part (b)

Details	λ_0	λ_1	λ_2
Coefficient	-0.156	0.359	0.311
Hypothesized value	0.000	-0.055	0.312
Standard error	.133	.181	.101
T statistic	-1.172	2.287	-0.009
p value	.122	.012	.496
Adjusted R squared .115			

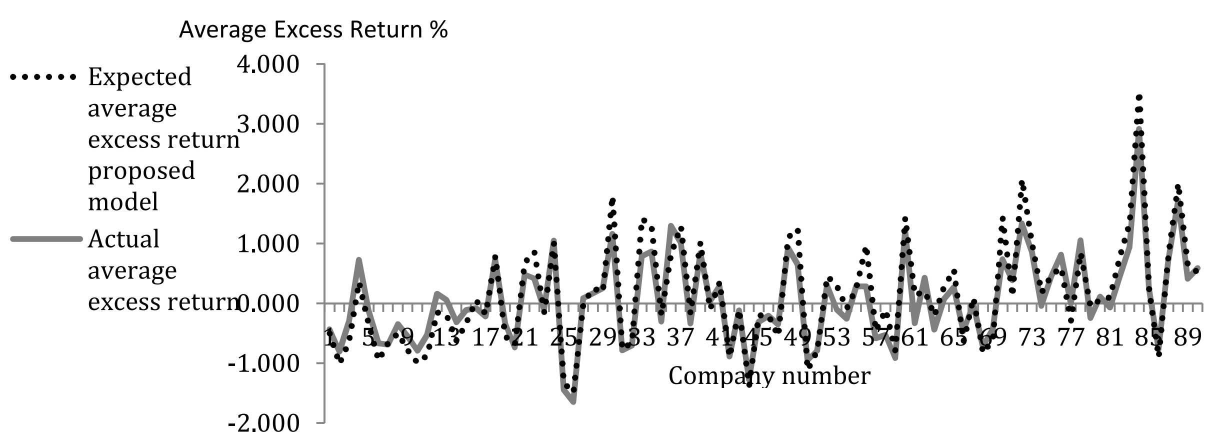

Figure 5. Expected average excess return estimated using the model of hypothesis five part (b) compared to the actual average excess return for stocks included in the study

Examining the Assumptions of Statistical Tests

Hypothesis 1

The assumptions of multiple linear regression for this hypothesis were examined as follows:

- Additivity and linearity: this means that the dependent variable is linearly related to the independent variables and the overall effect of independent variables on the dependent variable can be expressed by adding up their individual effect. To test this assumption, I used plot of standardized residuals against standardized predicted values generated by SPSS. It can be noticed from Figure 6 that the points are distributed and no specific curves or patterns exist which means that the assumption has been met.
- Independence: this assumption means that the errors in the model are uncorrelated to each other. I used Durbin-Watson test to verify if this assumption is met. Durbin-Watson value was 1.947 which is very close to the value of 2, the critical value at which there is no correlation between the residuals.
- Homoscedasticity/ homogeneity of variance: this means that the variance of the residuals at each level of independent variable should be the same. I used figures 6 to test this assumption. It can noticed from this figure that the plots do not have the shape of funnel which means that the assumption of homoscedasticity can be considered met.

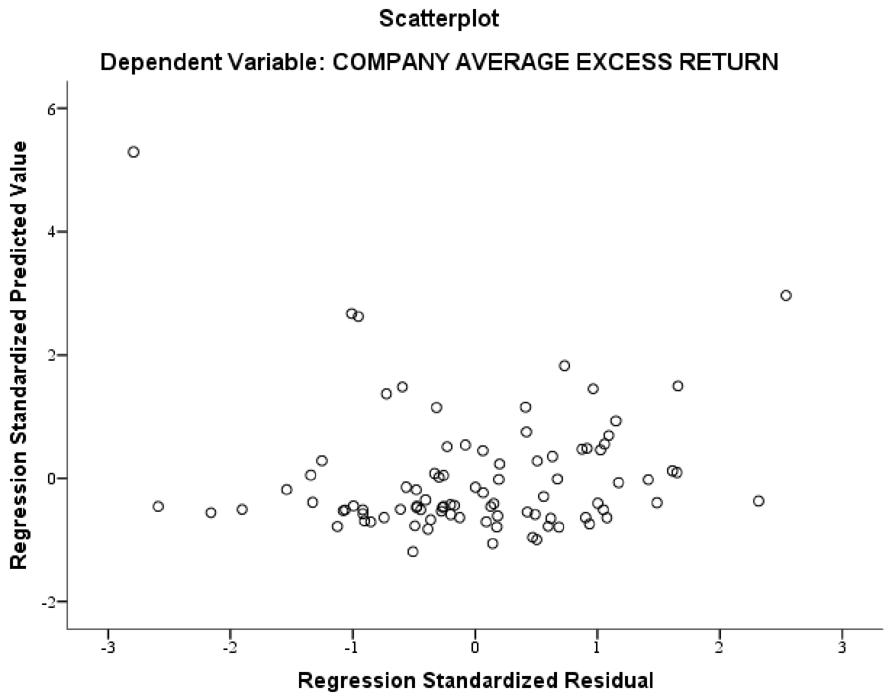

Figure 6. Scatterplot to check for the assumption of Homoscedasticity and linearity for the first regression

- Normally distributed errors: this means that residuals in the model should be normally distributed with a mean of zero. To test if this assumption has been met, I used the histogram and P-P plot. Because the histogram shape in Figure 7 is not skewed and look very close to normal shape, it can be concluded that this assumption has been met. The P-P plot in Figure 8 echoes this view because the data seem to fall very close to the ideal diagonal line.

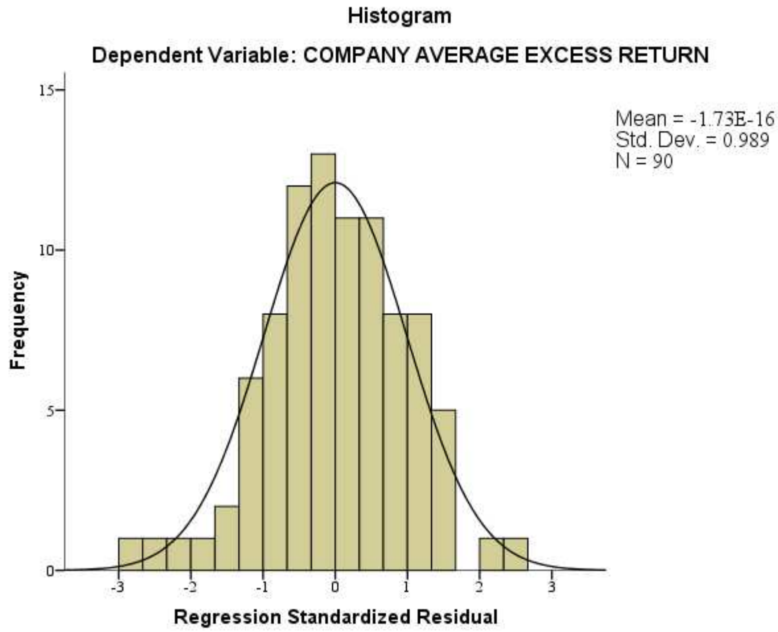

Figure 7. Histogram to test the assumption of normality

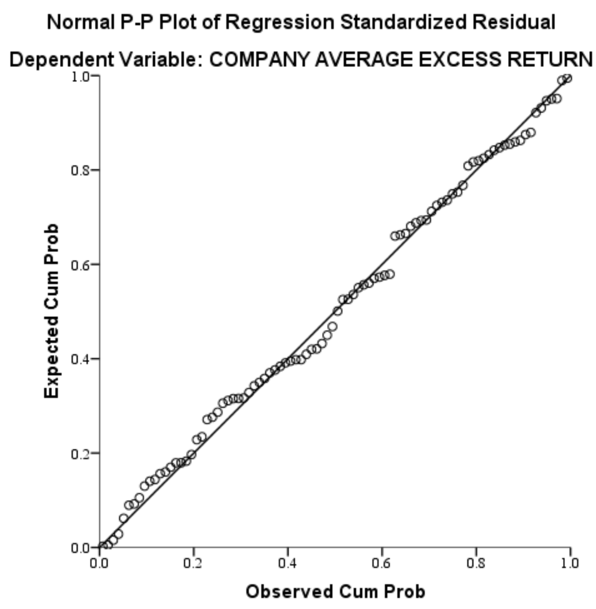

Figure 8. P-P plot to test the assumption of normality

- Variable types: all independent variables should be quantitative or categorical and the dependent variable should be measured at interval level and should be unbounded. This assumption has been met because all variables included in this regression were measured at the interval level or more.

- No perfect multicollinearity: this means that there is no perfect linear relationship between any two or more independent variables. To test this assumption, I used the collinearity diagnostics table in the regression output generated using SPSS. From Table 28, it is clear that there is no high variance proportion for two variables at the same eigenvalue. Betas variable has 72% of its variance on dimension 3 while the variable of nonsystematic risk has 84% of its variance on dimension 2. From this, I concluded that this assumption has been met.

Table 28

Collinearity Diagnostics Table for the First Regression

		Variance proportions	
Dimension	Eigenvalue	Beta's	Nonsystematic risk
1	2.484	.040	.060
2	0.360	.240	.840
3	0.156	.720	.100

- Non-zero variance: this assumption means that the independent variables should not have a variance of zero. The variance of the first independent variable (the betas) was 0.168 while the variance of the second independent variable (nonsystematic risk) was 2.092. This means that the variance of the two independent variables is different from zero.

Hypothesis 2

The assumptions of t test for this hypothesis were examined as follows:

- The test variable is normally distributed in each of two populations established based on the grouping variable. To test this assumption, I used Shapiro-Wilk test for normality. The null hypothesis for this test is that the variable is normally distributed and the alternate hypothesis is that it is not normally distributed. In Table 29, I summarized the results of this test. The significance of each group (small size and big size) was more than 5% and thus, the null hypothesis that the test variable (average return) is normally distributed cannot be rejected. Based on this, the normality assumptions can be considered met.

Table 29

Results of Shapiro-Wilk Test for Normality for Hypothesis Two

Group	Statistic	*P* value
Large size	.972	.339
Small size	0.968	.247

- The sample units represent a random sample from the population and the values of the test variable are independent from each other. Because the companies included in the study were all companies listed for the period from 2000-2015 and because no company could be included in more than one group (it is either in small size group or big size group), I can consider that the values of the average rate of return (the test variable) are independent from each other.

Hypothesis 3

The assumptions of t test for this hypothesis were examined as follows:

- The sample units represent a random sample from the population and the values of the test variable are independent from each other. Because the companies included in the study represent all companies listed for the period from 2000-2015 and because no company could be included in more than one group (it is either in high financial leverage group or low financial leverage group), I can consider that the values of the average rate of return (the test variable) are independent from each other.
- The test variable is normally distributed in each of two populations established based on the grouping variable. To test this assumption, I used Shapiro-Wilk test for normality. The null hypothesis for this test is that the variable is normally distributed and the alternate hypothesis is that it is not normally distributed. In Table 30, I summarized the results of this test. The significance value for the high financial leverage group was more than 5% and thus, it can be said that the test variable (average rate of return) is normally distributed for this group. The significance value for the low financial leverage group, however, was less than 5% and thus, the dependent variable was not normally distributed for this population. To sum up, this assumption is violated.

Table 30

Results of Shapiro-Wilk Test for Normality for Hypothesis Three

Group	Statistic	*P* value
High financial leverage	.980	.611
Low financial leverage	.910	.002

Hypothesis 4

Before conducting *t test* , the test assumptions for this hypothesis were tested as follows:

- The sample units represent a random sample from the population and the values of the test variable are independent from each other. Because the companies included in the study represent were all companies listed for the period from 2000-2015 and because no company could be included in more than one group (it is either in HOL group or LOL group), I can consider that the values of the average rate of return (the test variable) are independent from each other.
- The test variable is normally distributed in each of two populations established based on the grouping variable. To test this assumption, I used Shapiro-Wilk test for normality. The null hypothesis for this test is that the variable is normally distributed and the alternate hypothesis is that it is not normally distributed. In Table 31, the results of this test are summarized. The significance value for the two groups was greater than 5% and thus, the null hypothesis that the test variable (average rate of return) is normally distributed

cannot be rejected. Based on this, the normality assumptions can be considered met.

Table 31

Results of Shapiro-Wilk Test for Normality for Hypothesis Four

Group	Statistic	*P* value
High operating leverage	.964	.178
Low operating leverage	.957	.090

Hypothesis 5

The assumptions of multiple linear regression for this hypothesis were examined as follows:

- Additivity and linearity: this means that the dependent variable is linearly related to the independent variables and the overall effect of independent variables on the dependent variable can be expressed by adding up their individual effect. To test this assumption, I used plot of standardized residuals against standardized predicted values generated by SPSS. It can be noticed from Figure 9 that the points are distributed and no specific curves or patterns exist which means that the assumption has been met.

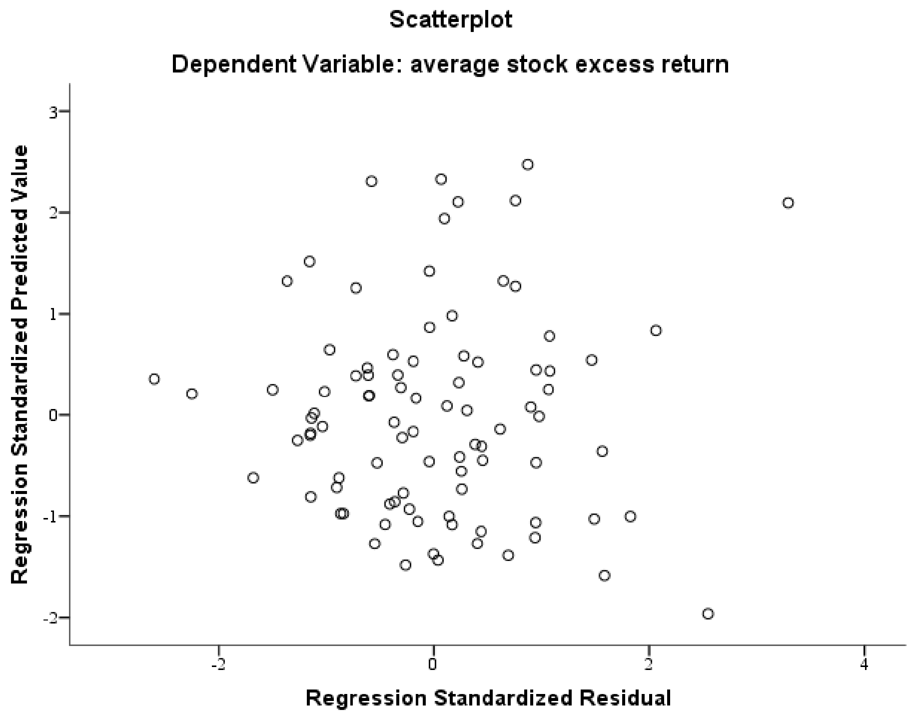

Figure 9. Scatterplot to check for the assumption of Homoscedasticity and linearity for the regression of hypothesis five- part (b)

- Independence: this assumption means that the errors in the model are uncorrelated to each other. I used Durbin-Watson test to verify if this assumption is met. Durbin-Watson value was 1.713 which is greater than 1 and less than 3. This value can be considered normal because values of Durbin-Watson statistic that cause concern are values less than 1 or greater than 3 as discussed by Field (2013). Based on this, this assumption can be considered met.
- Homoscedasticity/ homogeneity of variance: this means that the variance of the residuals at each level of independent variable should be the same. I used figures 9 to test this assumption. It can noticed from this figure that the plots do

not have the shape of funnel which means that the assumption of homoscedasticity can be considered met

- Normally distributed errors: this means that residuals in the model should be normally distributed with a mean of zero. To test if this assumption has been met, I used the histogram and P-P plot. Because the histogram shape in Figure 10 is not skewed and look very close to normal shape, it can be concluded that this assumption has been met. The P-P plot in Figure 11 supports this view because the data were very close to the ideal diagonal line.
- Variable types: all independent variables should be quantitative or categorical and the dependent variable should be measured at interval level and should be unbounded. This assumption has been met because all variables included in this regression were measured at the interval level or more.
- Non-zero variance: this assumption means that the independent variables should not have a variance of zero. The variance of the first independent variable (β_j^M) was 0.165 while the variance of the second independent variable (β_j^{OL}) was 0.529. This means that the variance of the two independent variables is different from zero.

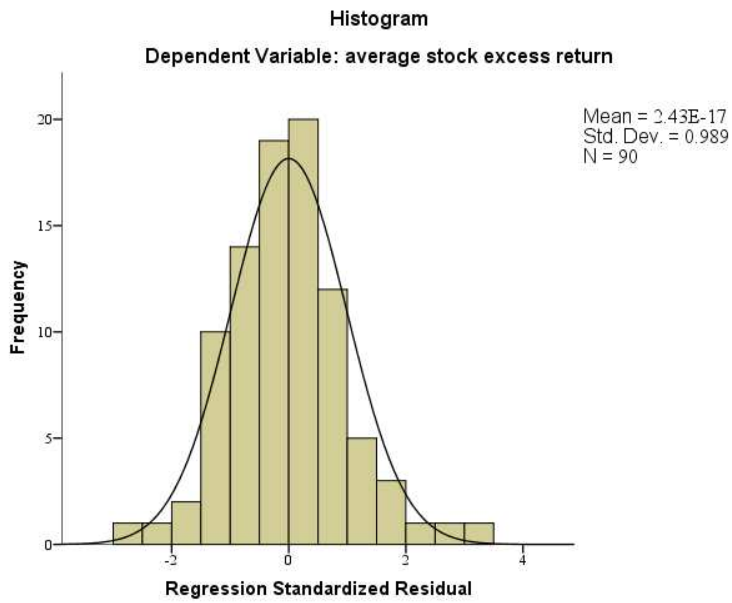

Figure 10. Histogram to test the assumption of normality for hypothesis five part (b)

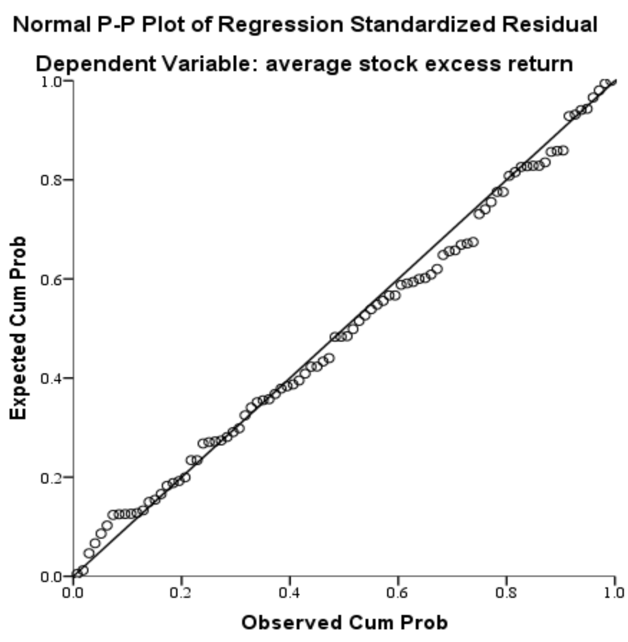

Figure 11. P-P plot to test the assumption of normality for hypothesis five part (b)

- No perfect multicollinearity: this means that there is no perfect linear relationship between any two or more independent variables. To test this assumption, I used the collinearity diagnostics table in the regression output generated using SPSS. From Table 32, it is clear that there is no high variance proportion for two variables at the same eigenvalue. β_j^M has 92% of its variance on dimension 3 while β_j^{OL} has 100% of its variance on dimension 2. From this, I concluded that this assumption has been met.

Table 32

Collinearity Diagnostics Table for Regression of Hypothesis Five- Part (b)

		Variance proportions	
Dimension	Eigenvalue	β_j^M	β_j^{OL}
1	1.836	.080	.000
2	1.000	.000	1.000
3	0.164	.920	.000

Summary

In the beginning of this chapter, I explained that there are five main questions for this study; the first question was about the variables that explain the greatest-variation in the expected rate of return of a stock. The results of data analysis indicated that market return does not explain the greatest-variation in the expected rate of return while nonsystematic risk does. This conclusion does not support the validity of the capital asset pricing model in the Jordanian stock market.

The purpose of the second question was to find the relationship between size and the expected rate of return of the stock. Analysis results indicated that the size of the company is not a predictor for the rate of return of its stock as hypothesized. This conclusion does not match the corporate finance proposition that investors consider small companies to be more risky and thus, its stock should yield more return.

In the third question, the enquiry was about the relationship between financial leverage and the expected rate of return on a stock. The purpose was to determine if the financial leverage is a predictor of the rate of return. The results of the statistical test suggested that financial leverage is not a predictor for the expected rate of return and thus, the hypothesized relationship between financial leverage and the rate of return does not exist.

In the fourth question, the enquiry was about the relationship between the operating leverage and the rate of return of a stock. The results of data analysis indicated that the hypothesized direct relationship between operating leverage and rate of return does exist which means that the operating leverage is a predictor of the rate of return. This conclusion is in line with the corporate finance proposition that investors consider companies with high operating leverage to be riskier than those with low operating leverage and thus, its stock rate of return should be higher.

The enquiry in the last question was related to the relationship between the stock rate of return and variables of: market return, company's size, financial leverage, and operating leverage. The hypothesis related to this question was modified by excluding the variables of size and financial leverage because it had insignificant relationship with the rate of return. Based on this, the modified last question was about the relationship between the rate of return and the variables of: market return and operating leverage. Analysis results indicated that there was a significant relationship between the operating leverage and the stock's rate of return while this return was not significantly related to the market return. These findings are discussed and interpreted in Chapter 5 where I also explained the implications of it. Recommendation for further research and potential impact for positive social change are also detailed in the next chapter.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this causal-comparative quantitative study was to test the validity of a proposed capital asset pricing model in the Jordanian stock market. The proposed model included: the expected rate of return of the stock as the dependent variable and the independent variables of: market rate of return, size, financial leverage, and operating leverage. The need for testing such model was that many previous studies claimed the invalidity of the traditional CAPM in many countries including Jordan (Bornholt, 2013; Dzaja & Aljinovic, 2013, Alrgaibat, 2015).

The first research question posed in this study was about the validity of the traditional CAPM in Jordanian stock market. Study findings suggested that because the intercept of the model was significantly different from zero and because the betas coefficient was significantly different from its hypothesized value of -0.055% (average market risk premium), the traditional CAPM can be considered invalid in the Jordanian stock market. The enquiry in the second question was about the relationship between the expected rate of return and the size of the stock. The findings of the study revealed that the hypothesized inverse relationship between size and rate of return does not exist.

The direct relationship between financial leverage and the expected rate of return was the main issue of the third question. The results of data analysis clarified that this hypothesized relationship does not exist and the expected rate of return for stocks with high financial leverage was less than or equal the return on stocks with low financial leverage. In the fourth question, the enquiry was about whether the expected rate of return of stocks with high operating leverage is higher than that for stocks with low operating leverage. This direct relationship was supported by the results of data analysis which means that operating leverage represents a significant variable in increasing the expected rate of return.

The proposed CAPM was the issue of the last research question in which the relationship between the expected rate of return on a stock and both the market return and the operating leverage was the main enquiry. Study findings showed that market return was not a significant variable in determining the expected rate of return while operating leverage was significant.

Interpretation of Findings

Validity of the Traditional CAPM

According to Amihud and Mendelson, (2015), the theory behind the standard CAPM is that the only risk that should be accounted for is the systematic risk. The systematic risk is represented by b_j or beta in the standard model tested in this study. In testing the first part of Hypothesis 1, about 80% of betas for companies included in the study were significantly different from zero at 5% level which means that the systematic risk is important in determining the expected rate of return for most of companies. Based on the CAPM, the relationship between systematic risk and expected rate of return starts from an intercept equals to the risk-free rate of return at which the risk equals zero. Consequently, if the standard model hold true, then the relationship between the stock excess return (R_{jt} - R_{ft}) and market excess return (R_{Mt} – R_{ft}) should start from zero or in other words, the intercept of the regression should not be significantly different from zero. In this study, about 97% of alphas (intercepts) for companies included in the study were significantly not different from zero which means that the model was valid for most companies.

Another theoretical base on which the CAPM stands is that the systematic risk coefficient should equal the marker excess return ($R_{Mt} – R_{ft}$) and the nonsystematic risk should not be significantly different from zero. In testing the second part of Hypothesis 1, beta coefficient was significantly different from the market excess return while the nonsystematic risk ($\sigma^2 [e_j]$) and the regression intercept were significantly different from zero. Based on these conclusions, it can be stated that the results of this study do not support the validity of the traditional CAPM.

This conclusion concerning the invalidity of the traditional CAPM in the Jordanian stock market is in line with the studies of many researchers who reached the same conclusion about this market (Alqisie & Alqurran, 2016; Alrgaibat, 2015, Blitz, Pang, & Van Vliet, 2013) and about many other countries (Dajčman, Festić, & Kavkler, 2013; Dzaja, & Aljinovic, 2013; Li, Gan, Zhuo, & Mizrach, 2014; Nyangara, Nyangara, Ndlovu, & Tyavambiza, 2016; Obrimah, Alabi, & Ugo-Harry, 2015; Saji, 2014; Wu, Imran, Feng, Zhang, & Abbas, 2017).

Other researchers, however, claimed that the model is valid in Jordan (Bjuggren & Eklund, 2015) and countries like Malaysia (Lee et al., 2016), Turkey (Köseoğlu & Mercangöz, 2013), Saudi Arabia (El-Mousallamy & El-Masry, 2016), India (Bajpai, & Sharma, 2015), Sweden (Novak, 2015), China (Long, Jaaman, & Samsudin, 2014), and Bosnia & Herzegovina (Zaimović, 2013). The conclusion of this study supports the invalidity of the traditional CAPM and adds new evidence against it confirming what was claimed by most researchers in the discipline.

Variables of Size, Financial Leverage, and Operating Leverage

The variable of the company's size was included in all studies that tested the three factor model of Fama and French but it was measured using the market capitalization of the company. The inverse relationship between size and expected rate of return that was found by Fama and French (1992) was also hypothesized in this study but with different measure. Because the size measurement was different, the conclusion of this study concerning the size variable cannot be compared to studies other than the study of Sharifzadeh (2005) who concluded that there was an inverse relationship between size and return of the stock. In the Jordanian stock market, however, this inverse relationship between size and return was not found. This conclusion is not in line with the proposition of corporate finance theory that investors consider small sized companies to be confronted with high business risk and thus, its stock should generate higher return than the stocks of large sized companies. Investors in the Jordanian stock market are either not considering the size of the stock when they invest in it or they do not use the available financial information when taking investment decisions.

Because the proposed model is tested for the first time in the Jordanian stock market, there are no previous studies that could be discussed and compared to this study concerning the variable of operating leverage and financial leverage. The study results indicated that stocks with high financial leverage generated a return that is less than or equal to that generated by the stocks with low financial leverage. This conclusion is in line with that reached by Obreja (2013) who has concluded that the relationship between financial leverage and the stock risk premium is negative when the operating leverage is economically significant. Stocks with high financial leverage were concluded to have a lower rate of return than those with low financial leverage by Ozturk and Yilmaz (2015) which may partially support the concluded relationship in this study. Based on this, the corporate finance proposition that investors consider stocks with high financial leverage to have a higher financial risk and thus, the expected rate of return on these stocks should be higher than stocks with low financial leverage may not be true in the Jordanian stock market. Investors may not be interested in analyzing the financial leverage ratios of the stocks in which they are investing or they are considering other variables in taking investment decisions.

The relationship between the firm operating leverage and its stock's rate of return have been studied by Lee and Park (2013) who reached the conclusion that firms with high operating leverage have a high rate of return on its stock. This positive relationship was found in this study despite the different measurement of the operating leverage which I calculated by dividing fixed assets on the total assets while it was measured by dividing fixed cost by the variable cost in the study of Lee and Park (2013). The conclusion of this study concerning the relationship between operating leverage and the stock rate of return is apposite to those reached in the study of Sharifzadeh (2005) in which he has concluded that the rate of return for stocks with high operating leverage was not higher than stocks with low operating leverage. Based on this, the corporate finance suggestion that stocks with high operating leverage should yield higher return than those with low operating leverage may be true in the Jordanian market. Investors are positively considering the operating leverage of the company when they invest in its stock.

Finally, the results concerning the proposed capital asset pricing model which was adjusted by excluding the variables of size and financial leverage was not totally disappointing. The model included the systematic risk and the operating leverage as independent variables and the expected rate of return as the dependent variable. The systematic risk coefficient for this model was significantly different from the market excess return which does not support the model. What supports the model were results of the intercept which was not significantly different from zero and the operating leverage coefficient that was not significantly different from the average excess return caused by operating leverage. This conclusion may not support the CAPM but it supports the linear relationship between risk and return and the relationship between the operating leverage of a company and its stock's expected rate of return.

Limitations of the Study

Because this study included firms listed on ASE, its results can be generalized for the stocks in Jordan and other emerging markets that have similar attributes. The ASE index was used as a proxy for the market portfolio; this index does not include all companies listed on the ASE and thus, it does not represent the entire market. Using ASE index to represent the market portfolio may have affected the calculation of betas of stocks which were calculated based on its prices' covariance with this index. This effect of index has extended to the results of testing hypothesis one and five because betas of the stocks were used in the regressions of these hypotheses.

Another limitation was the unavailability of the required data related to the banks listed on ASE. Because data were unavailable for this sector, I excluded banks from the study; the number of excluded banks was 10 banks which reduced the number of firms included in the study to 90. The results of the study could have been changed if these banks were included because its financial structure is different than other companies. Exclusion of these firms may have affected the results of testing hypothesis three and four because banks' financial and operating leverage is different than other companies. In addition to banks, insurance companies also have a different financial and operating leverage attributes than other companies; the inclusion of these companies may also have affected the results of testing hypotheses three and four.

The independent variables included in this study were measured in different ways than in the previous research. Measurement differences may limit the comparability of the study with other studies in the field. The size variable, for example, was measured in this study by averaging total market value of the company's assets at the beginning and the end of the study period while in many studies it was measured using the market capitalization of the firm. Based on this, the variable of size in this study can be considered a new variable compared to that in other studies.

Recommendations

The approach followed in this study to test the CAPM was by adding more variables to the traditional model following the approach of many studies (Carhart, 1997; Chan & Faff, 2005; Fama & French, 1992; Sharifzadeh, 2005). Following the same line, further research may be conducted to include more variables other than tested in this study to enhance the explanatory power of the model. In addition, the traditional model may be tested in the Jordanian stock market using different methods. For example, the model may be tested using portfolios' returns instead of the returns of individual stocks to overcome the measurement errors and correlation between nonsystematic risk and beta similar to the approach of Black, Jensen, and Scholes (1972).

Companies in different sectors may have different financial structures resulted from the nature of business of each sector. For example, financial and investment institutions may have a low operating leverage because its revenues are generated from investing cash and not from operating the fixed assets. Based on this, the logic behind including the operating leverage in the model may not be correct for these firms. Because of these differences, future studies may be conducted to study the operating structures of listed companies in different sectors first and then develop and test a different model for each sector.

To increase the generalizability of results, further research may be conducted to test the capital asset pricing model in many similar stock markets collectively and then compare the results of these markets. After that, the results may be interpreted to uncover the different attributes that resulted in different conclusions about the validity of the model in these markets. For example, markets in Arab countries could be studied collectively to test the traditional and the proposed model. The proposed model may be tested in regions like Middle East, Far East, African countries, and so on.

Because the coefficient of beta was not equal to the market risk premium, the traditional CAPM which assumes that the market risk premium is the only risk that affects the expected rate of return is not valid in the Jordanian stock market. The proposed model was found invalid except for the variable of operating leverage. Based on this, future studies may include operating leverage as a variable in any CAPM model developed and tested in the Jordanian stock market or any similar markets.

Based on the results of this study, the proposed model that includes variables of market risk premium, size, financial leverage, and operating leverage was found to be invalid except for the operating leverage which indicates the importance of testing models that contain different variables or the same variables with different method of measurement. Adding different variables to the model and testing it for different range of time may give results closer to the corporate finance theory than the results of this study. In addition, measuring the same variables using different methods adopted by previous studies may enhance accuracy and change the conclusions about the relationship between the expected rate of return and the variables. For example, the size may be measured using the firm's market capitalization, the financial leverage may be measured by dividing long-term debt on the total equity, and the operating leverage may be measured by dividing fixed costs on the variable costs. Finally, the proposed model may be tested many times for the same range of years by changing the measurement of variables in each time to see how the measurement of variables affects the results of the model.

Future research may be conducted using the APT in which the market risk premium is not included in the model. The model of APT as discussed in Chapter 2 includes many macroeconomic variables like inflation rate, gross domestic product, and the major commodities prices. These macroeconomic variables are undiversifiable because as implied by its name, it is related to the economy and not to the firm specific attributes which makes it similar to the market risk or systematic risk. These macroeconomic variables may be used to develop a new model for estimating the expected rate of return in the Jordanian stock market. The model then can be tested using the same linear regression used to test the proposed CAPM.

Implications

The proposed model of the study was tested to enhance the explanatory power of the traditional CAPM which may help investors in estimating the intrinsic price for the stocks in which they have invested. The study results indicated that the proposed variables had no significant effect on the expected rate of return except for the operating leverage. Based on this, researchers can exclude the variables of size and financial leverage and include the variable of operating leverage in their future studies. Thus, the results of this study can help individual and institutional investors by educating them that the variables included in the study are not significant in determining the price of stocks and the return of their portfolios which may encourage them to do further analysis to find what factors actually affect their expected rate of return and increase their profit. This increase in the investors' profit may enhance the public resources available to the entire community. Public resources may be used to provide services of health, education, and infrastructure for the public.

In addition, helping other researchers in finding the appropriate variables to include in their versions of the CAPM may increase the accuracy of estimating the cost of capital which is used by many investors to select their projects. Increasing the accuracy of estimating the cost of capital may increase the profits generated from the projects and thus, increase the wealth of investors and the wealth of the entire society. Helping researchers in finding the appropriate variables to include in the CAPM and enhance the estimation of the cost of capital may also help in determining the fair price of the public utility which may lead to decrease the utility bill for the public and thus, increase the saving ability of the households.

Concluding that the proposed model was not valid for the Jordanian stock market implies that the variables of market risk premium, size, and financial leverage should not be used in the models when evaluating the performance of the portfolio managers in financial institutions. This may help the management of these financial institutions in finding variables that are more accurate in determining the justified rate of return and compare it with the actual rate of return for their portfolios.

Because an important portion of the Jordanian savings is invested in the stock market (40% of the country savings), it is very important to find an accurate model to price the stocks traded in this market. The variables of market risk premium, size, and financial leverage may not be used by investors to estimate the price of the financial asset while the variable of operating leverage can be considered in valuation of the stocks.

The study conclusions imply that the method used to test the capital asset pricing model may be inappropriate and researchers need to find another method to test the model. Other methods may include using advanced statistical tests. In addition, researchers may use returns on portfolios constructed based on the study variables instead of relying on returns on individual stocks used in this study. The study conclusions indicate that Jordanian stock market may need to be analyzed to find what special attributes that may be making it different from other markets in which the CAPM and the proposed CAPM were valid like the U.S. market.

Finally, it may be a valid idea to test models like the CAPM in sector wise instead of testing it for the entire market because business sectors may have different attributes that affect the validity of the relationship between risk and return. For example, the traditional and proposed CAPM may be tested in the financial institutions sector in one time and then in the industrial sector and so on.

Concluding Statement

The purpose of this study was to test the traditional and a proposed capital asset pricing model in the Jordanian stock market, the findings indicated that both models are not valid. The traditional CAPM was invalid because beta coefficient in the first regression was not significantly different from zero and it was significantly different from the average market risk premium, the nonsystematic risk and the intercept of the regression were significantly different from zero. All of these conclusions are against the validity of the traditional CAPM.

The proposed CAPM contained variables of market risk premium, size, financial leverage, and operating leverage. All variables were found insignificant except the operating leverage which means that this variable can be used to estimate the expected rate of return. In addition, the intercept of the regression was significantly not different from zero and both the market risk premium and operating leverage premium were significantly different from zero. These conclusions about the intercept and the premiums may provide support for the linear relationship between the expected rate of return on one side and the systematic risk and operating leverage on the other side. Beta coefficient for this regression, however, was significantly different from the market risk premium which is against the validity of the proposed model.

Finally, failing to provide evidence that supports the validity of the proposed capital asset pricing model may suggest testing other models in the Jordanian stock market like the APT model or other CAPM extensions. In addition, variables different than that used in this study may be added to the traditional CAPM to formulate a new model. The new model can be tested separately in each sector of the Jordanian stock market.

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Appendix A: Summary of the Results of Empirical Research about Traditional CAPM

Table A1

Summary of the Results of Empirical Research about Traditional CAPM

Authors	Year of publication	Main subject	country	Results
Sattar	2017	Testing Fama-Franch and traditional CAPM	Bangladesh	Fama-French model performed better than traditional CAPM
Chaudhary	2017	Testing the traditional CAPM	India	Traditional CAPM is weak and alternative model is needed
Akhtar	2017	Testing Fama-Franch and traditional CAPM	India	Fama-French model performed better than traditional CAPM
Alqisie and Alqurran	2016	Testing the traditional CAPM	Jordan	Traditional model was invalid
Lee, Cheng, and Chong	2016	Testing the traditional CAPM	Malaysia	The traditional CAPM was valid

Authors	Year of publication	Main subject	country	Results
Berk and Van Binsbergen	2016	Testing the traditional CAPM and its extensions	U.S.A	Traditional CAPM outperformed all its extensions
Stotz	2016	Studying investment strategies	U.S.A	Traditional CAPM was valid with announcement and not valid with no-announcement
Nyangara, Nyangara, Ndlovu, and Tyavambiza,	2016	Testing the traditional CAPM	Zimbabwe	Traditional CAPM was inadequate
El-Mousallamya nd El-Masry	2016	Evaluating mutual funds' performance using traditional CAPM and downside CAPM	Saudi Arabia	Both CAPM and downside CAPM were valid
Aldaarmy,	2015	Traditional	Saudi Arabia	Fama-French model

Authors	Year of publication	Main subject	country	Results
Abbod, and Salameh		CAPM and Fama-French model		outperformed traditional model
Bajpai and Sharma	2015	Testing the traditional CAPM	India	Traditional CAPM was valid
Alrgaibat	2015	Testing the traditional CAPM	Jordan	Traditional model was invalid
Obrimah, Alabi, and Ugo-Harry	2015	Relevant model for testing market efficiency	Nigeria	Traditional CAPM was invalid
Novak	2015	new methodology for testing the traditional CAPM	Sweden	The traditional CAPM was valid
Dakhlaoui and Gana	2015	Testing the traditional	Tunisia	The Carhart four-factor model was the

Authors	Year of publication	Main subject	country	Results
		CAPM and two extentions		best model
Ejaz and Polak	2015	Testing if the traditional CAPM explain the short-term momentum	Six middle east countries including Jordan	Traditional CAPM could not explain the momentum effect
Mazzola and Gerace	2015	comparing the traditional CAPM to a dynamic-beta CAPM	Australia	Dynamic-beta model performed better than traditional static-beta CAPM
Bjuggren and Eklund	2015	Testing the traditional CAPM and a CAPM with property right risk factor	49 countries including U.S.A, UK, and Jordan	The traditional CAPM was valid but its explanatory power was increased when adding the property right risk factor
Saji	2014	Testing the traditional CAPM	India	Traditional model was invalid

Authors	Year of publication	Main subject	country	Results
Ramadan	2014	Relationship between risk and return	Jordan	CAPM was invalid
Avadhanam, Mamidi, and Mishra	2014	Testing the traditional CAPM in public sector	India	Traditional CAPM was valid
Li, Gan, Zhuo, and Mizrach	2014	Testing the traditional CAPM using EGARCH	U.S.A	Traditional CAPM was not valid
Long, Jaaman, and Samsudin	2014	Testing the efficiency of the market based on the traditional CAPM	China	Market was efficient and CAPM was valid
Fung, Lau, and Chan	2014	Testing conditional consumption and market	U.S.A	Traditional CAPM was not valid

Authors	Year of publication	Main subject	country	Results
		volatility models		
Ju	2014	Comparing traditional and behavioral CAPM	China	Both behavioral and traditional CAPM were valid but the behavioral performed better
Dajčman, Festić and Kavkler,	2013	Testing the traditional CAPM	Slovenia, Hungary, and Czech	Traditional model was invalid
Soumaré, Aménounvé, Diop, Méité, and N'sougan,	2013	Traditional CAPM and Fama-French model	Ivory Coast	Fama-French model outperformed traditional model
Dzaja and Aljinovic	2013	Testing the traditional CAPM	Countries of central and southeastern Europe	Traditional CAPM was invalid
Köseoğlu and Mercangöz	2013	Testing the traditional and	Turkey	Traditional and Zero-Beta CAPM were

Authors	Year of publication	Main subject	country	Results
		the Zero-Beta CAPM		both valid. Zero-beta model was better
Zaimović	2013	Testing the traditional CAPM using logarithmic returns	Bosnia & Herzegovina	Traditional model was valid
Blitz, Pang, and Van Vliet	2013	Testing the relationship between risk and return	30 emerging countries including Jordan	Traditional CAPM was invalid
Albadvi and Norouzi	2013	Using the CAPM to evaluate the risk of customer value lifetime	Iran	The downside CAPM performed better than traditional model

Appendix B: Letter of Permission Obtained for Using the Adapted Figures

Mail - mohammad.elshqirat@waldenu.edu   Page 1 of 1

Re: figures permission

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Mon 7/31/2017 7:08 PM

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