Empirical Evidence on the Reliability of CAPM: A Case Study of BIST 30 Index , Turkey

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ABSTRACT

This thesis empirically investigates the relationship between beta and the average returns over the period between 2009 to 2013 for 30 active firms in Borsa Istanbul stock Exchange by using the second pass regression analysis in the light of the CAPM model. The approach conducted in this thesis is to test whether the security Market Line (SML) holds for Borsa Istanbul stock Exchange's sample data.

Based on the empirical results estimated, explanatory power supports the view that the estimated value of coefficient is less than zero. The regression estimates suggest that standard CAPM is not able to provide the results which could validate the accuracy of CAPM for Borsa Istanbul stock Exchange in Turkey.

The results of this study suggests that, Turkish stock market could provide new investment opportunities for international investors but since the economy is active in emerging markets the risk could be associated to the returns.

Keywords: CAPM, the second pass Analysis, BIST, and Turkish Economy.

ÖZ

Yapılan bu tez çalışması ampirik olarak Borsa Istanbul kıymetler hisse seneti getirisi ile betalar arasındaki ilişkiyi aylık (2009 ve 2013) veriler kullanarak ölçmüştür. Bu ilişkiye Sermaye Aktif Fiyat Teorisi çercevesinde ne kadar anlamlı olup olmadığına bakılmıştır. 30 aktif firma için En Küçük Kareler tekniği ikinci geçiş regrasyon analizi uygulanarak yukarıda belirtilen ilişkinin rolü ölçülmeye çalışılmıştır. Çalışma, ayni zamanda kullanılan ilgili modelin doğruluğunuda ortaya koymaya çalışmıştır. Burda uygulanan yaklaşım tekniği güvenlik pazarı hattı'nın kulanılan verileri desteklemediği yönündedir.

Elde edilen ampirik sonuçlar ışığında, hesaplanan katsayılar sıfırdan küçük olup kullanılan modelin hassasiyetini belirtmemektedir. Regrasyon sonuçları Sermaye Aktif Fiyat Teorisi modelinin Borsa İstanbul da kayıtlı 30 aktif firma için geçerli hassasiyetin olmadığı vurgulamıştır.

Ampirik sonuçlar ayni zamanda İstanbul menkul kıymetler uluslararası yeni yatırımcılara iyi fırsatlar verebilir yalnız gelişmekte olan pazarlarda getirilerin bir takım riskler taşıyacağını ampirik değerlerle belirtilmektedir.

Anahtar kelimeler: Sermaye Aktif Fiyat Teorisi, Ikinci geçiş regrasyonu, Istanbul menkul kıymetler borsası, Turkiye Ekonomisi.

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INTRODUCTION

1.1 Introduction

As the economy is growing every day, people around the world are wealthier than ever. There are different types of people in a society with different characteristics. They also have different economical and financial and life style characteristics. Some prefer to spend their money on leisure while others prefer to invest in financial markets. Since most of investors are risk averse, there is always the problem of maximizing the return and minimizing the risk associated to those returns. To overcome the issue, the academia tries so hard to come in handy. There have been a number of theories and solutions introduced over the past decades. Most of these models aim to calculate the returns on share prices and estimate the risks associated to those returns.

1.2 Aim of the thesis

This thesis empirically investigates the relationship between beta and the average returns over the period between 2009 to 2013 for 30 active firms in Borsa Istanbul stock Exchange by using the second pass regression analysis in the light of the CAPM model. The approach conducted in this thesis is to test whether the security Market Line (SML) holds for Borsa Istanbul stock Exchange's sample data.

1.3 Methodology and Data Collection

The first and the second pass regression techniques are conducted in the light of the CAPM to investigate the relationship between beta and the average returns over the period between 2009 to 2013 for 30 active firms in Borsa Istanbul stock Exchange. According to the proposal defined for the study a number of 30 firms are chosen for the from ISE (Borsa Istanbul) index. The data is collected monthly. The common variables for the CAPM are, Stock return, risk free rate of return, return on market.

1.4 Findings of the thesis

Based on the empirical results estimated, explanatory power supports the view that the estimated value of coefficient is less than zero. The regression estimates suggest that standard CAPM is not able to provide the results which could validate the accuracy of CAPM for Borsa Istanbul stock Exchange in Turkey.

1.5 Structure of the Thesis

Chapter 1 as it has been reviewed tries to describe the introductory sections of the thesis. Next chapter is literature review which describes the background of the study. Chapter 3 describes the case study. In chapter 4, Data and Methodology and model are described. In chapter 5, the empirical results are interpreted and the remarks will be concluded in chapter 6.

Chapter 2

LITERURE REVIEW

This section tries to investigate the previous studies of the Capital Asset Pricing Model. A numerous amount of studies have already focused on the subject in different markets to understand the fundamentals of CAPM and how it works under certain market conditions. This chapter focuses on those studies and tries to explain how CAPM works in different markets. Furthermore, this section will discuss the history of the case study chosen for the thesis. Istanbul stock exchange and Turkish economy will be the subject of the investigation in this chapter.

2.1 CAPM (Capital Asset Pricing Model)

CAPM is known to be one the preliminary approaches to evaluate the efficiency of portfolios. The theory focuses on the relation between Stock returns, risk free rate of return and return on market. The theory was firstly introduced by Sharpe (1964).Later on the approach was extended by Lintner (1965) and Mossin (1966). According to Graham and Harvey (2001), the most common approach used in US via firms to estimate the cost of equity is CAPM.

CAPM considers the following assumptions. All investors:

1. Aim to maximize economic utilities (Asset quantities are given and fixed).
2. Are rational and risk-averse.
3. Are broadly diversified across a range of investments.
4. Are price takers, i.e., they cannot influence prices.
5. Can lend and borrow unlimited amounts under the risk free rate of interest.
6. Trade without transaction or taxation costs.
7. Deal with securities that are all highly divisible into small parcels (All assets are perfectly divisible and liquid).
8. Have homogeneous expectations.
9. Assume all information is available at the same time to all investors.

The following graph illustrates this linear model with all its components.

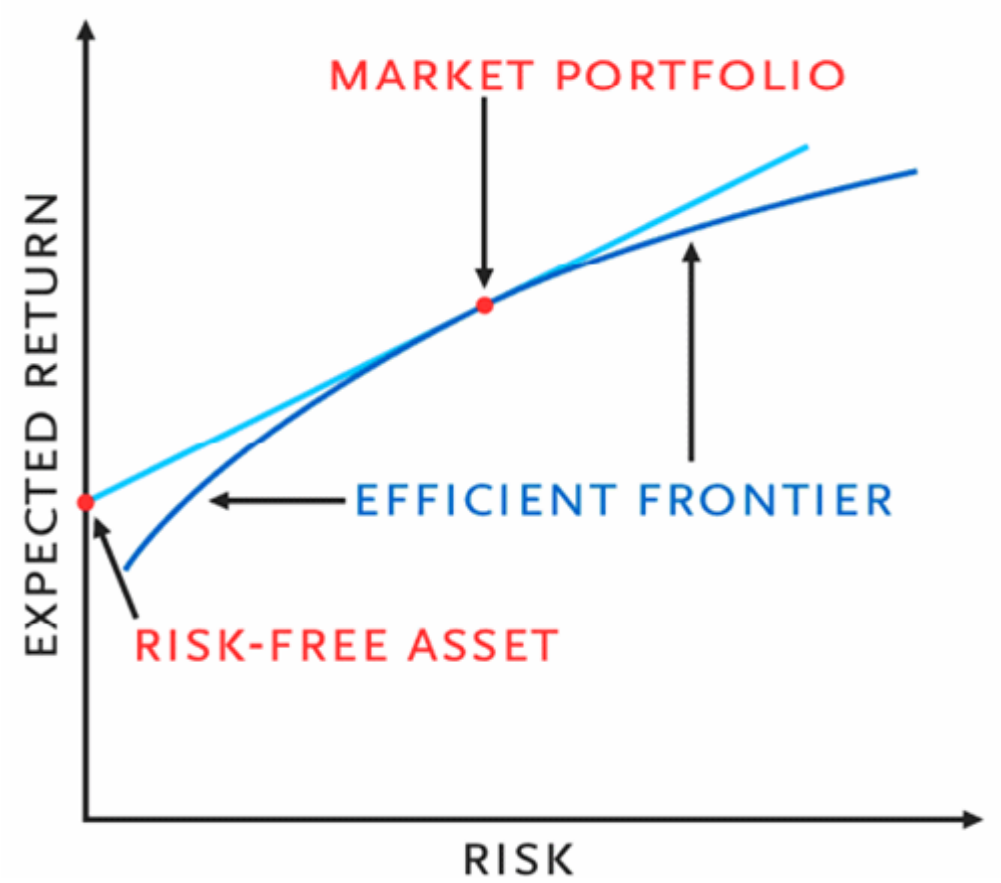

Figure 1: Market Portfolio & Efficient Frontier

When it comes to cross sectional approaches, there are many studies focused on CAPM to see if the approach is appropriate in those methods. According to Jagannathan and Wang, 1996, CAPM is not able to fully perform when it comes to cross sectional studies. To be more on the pint, it fails to calculate the accurate return related to beta of an asset. To overcome the issue, different studies such as Fama and Fench (1993) tried to dome by solutions. They added other factors such as size to resolve the issue.According to Dittmar (2002), the three moments CAPM and four moments CAPM are more accurate with respect to standard CAPM. He concluded that the best solution is when four moments CAPM is used under certain assumptions. He also

found that this model is even better than the model developed by Fama and French (1993).

All the investors in a financial market, will to hold a portfolio which the risk and the rate of return are some point tangent to the minimum variance frontier for risky assets. This minimum is shown by the total investment line in the figure 1. The X axis in the next figure (figure 2) represents the portfolio risk which is measured by calculating the standard deviation. The other axis (y) shows the expected return. Rf is the return on the risk free asset. If an investor does not will to bear the risk will end up by the return equal to Rf. In this case it is said that the portfolio is riskless. If investors invest on the risk-free rate and invests the borrowings in a portfolio with a relative high risk and low expected return, the investor will end up at point g on the lower straight line.

According to (Fama and French 2004), to have an efficient portfolio, investors should hold a mixture of risky and riskless assets. They continue that, sum of all those assets being held by the investors, is equal to the value of risky assets.

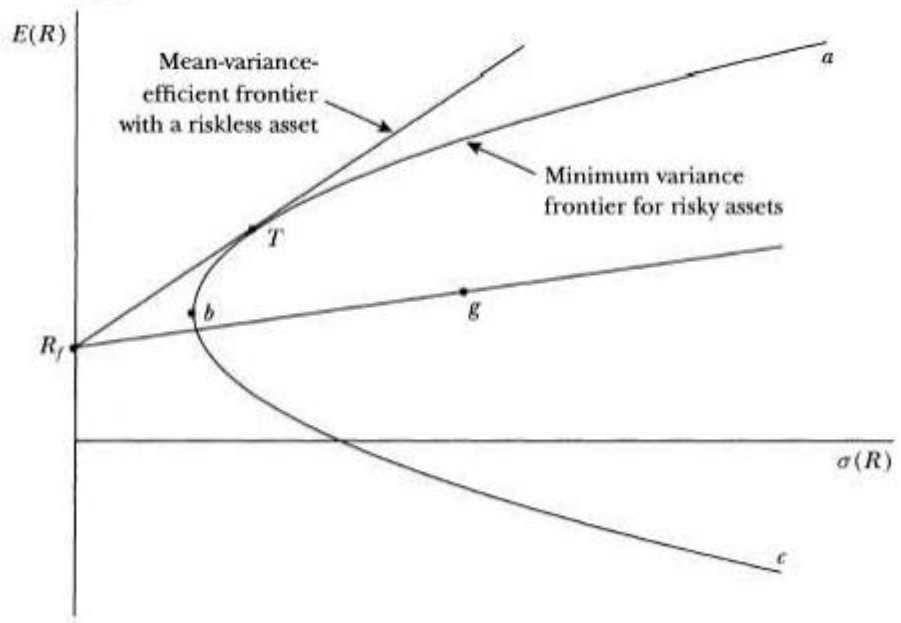

Figure 2: Linear Model

The linear formula of the CAPM is:

$E(Ri) = Rf + \beta i\ (R\ m\ - R\ f\ )$

In the above formula, the expected return is shown by ER. It shows the return on an asset. The risk free asset which is usually the return on government treasury bills or notes is shown by Rf. This represents the amount of return on the riskless asset. Result of the division of covariance of the returns on asset I over the variance of returns on market is shown by Bi. The expected return – β relationship has been tested extensively to validate if β is the right variable to explain and predict the return and risk of a portfolio.

2.2 Previous Studies on CAPM

There have been many empirical studies done on CAPM since it has been firstly introduced. However among them, the study done by Black, Jensen and Scholes (1972) is considered to be the first one. They focused on the SML and used a cross-section test. They selected their data set for the period of 1926 – 1965 in New York Stock Exchange. In the first step they calculated the beta of each stock individually. After that they made 10 different portfolios according to the calculated betas. In the end they estimated betas of portfolios and average return and hence calculating the SML. The results of their test were very promising and supportive for the CAPM.

In another study done by Fama and MacBeth (1974), they used a similar approach. They almost found out the same results and their results could support the accuracy of CAPM. They tried to predict future rates of return based on estimates from previous periods.

Although these researchers found supportive evidence for CAPM, number of studies which reject the ability of CAPM is not low.According to Richard Roll (1977) there are serious issues with the CAPM assumptions and the model itself. He said, that the model could only be tested by testing if the market portfolio is efficient and since it should contain all the financial instruments on the international market it is impossible to test it.In another study which was an extension to the previous study done by Fama and MacBeth (1974), Fama and French (1992) concluded that there are a couple of issued which are not resolved by CAPM.They used the company size because they believed that total assets of firms could have a significant effect on its risk. According to their results, if firms are smaller, they would have larger returns

which is totally not acceptable by CAPM since CAPM only takes the beta of firms in to consideration.Reinganum (1983) said that in January risk premiums tend to be higher while French (1980) stated that on Mondays same premiums are on average lower. Other studies showed that earnings/price ratio as well as book-to-market value has positive influence on risk premiums. Despite all the critique the CAPM is widely used in the industry. It is used to help making capital budgeting decisions or measuring the performance of investment managers and is also a very useful benchmark.

The academics discussed in the previous paragraph, tested the CAPM as it was first designed by Sharpe and Lintner. What was really tested was the performance of β as a proxy for risk. The performance of β as a proxy for risk proved to be very low and because of this other factors that could also be used as proxies for risk and return were introduced. With these new proxies the CAPM was extended to a much more complex model which is not as intuitively appealing as it was before. In this paragraph the more recent academic literature regarding the CAPM and the new proxies for risk and return will be discussed. The more recent academic literature will be used as the basis for the empirical research for this master thesis. Banz was one of the first academics who introduced a new proxy that could help to explain average cross-sectional returns (1981). Banz conducted research on the total market value of equity of a firm (stock price times shares outstanding) and its return. The total market value of equity is also called the firm size (Banz 1981, p. 1). Banz conducted a cross-sectional regression on all the stocks listed at the New York Stock Exchange (NYSE) for at least five years in the 1936-1975 period. Banz found that for the total period, firms with a larger value market value of equity had lower returns on average compared to firms with a smaller value of market equity. This points to a misspecified CAPM (Banz 1981, p. 8).

Similar results were found by Fama and French in 1992 on the NYSE in the 1963-1990 period (Fama and French 1992, p. 428). Lam also found the size of the market equity of firms to be significantly related to the average expected returns on the Hong Kong stock market for the 1980-1997 period (Lam 2002, p. 178). Satawiriya on the other hand, did not find the "size" effect, introduced by Banz to be significantly related to the average expected stock returns on the Thai stock market for the 1990-2005 period (Satawiriya 2006, p. 16). The results found by Satawiriya are similar to the ones Morelli found on the stock market of the United Kingdom for the 1988-2000 period (Morelli 2007, p. 263).

One explanation of the "size" effect could be that investors do not have as much information about smaller firms compared to larger firms. Because of this information problem, investors see these smaller firms as more risky and could therefore be less reluctant to invest in the stock of smaller firms (Banz 1981, p. 17). According to the CAPM assumptions all investors agree about the expected results of assets because of the joint probability distribution. It is clear that the explanation that less information about a certain firm would lead to higher returns is not in line with this assumption. Bhandari came up with another variable to explain expected stock returns. In 1988 Bhandari stated that the leverage ratio of a firm ((book value of total assets – book value of common equity) / market value of common equity) could be useful as a proxy for risk. This leverage ratio is called the debt-to-equity ratio (Bhandari 1988, p. 507). The reasoning behind this is quite simple. A firm with a high debt-to-equity ratio has a higher probability to be unable to repay its debt payments or to attract new capital to finance new profitable investments. Because of this, firms with a high debt-to-equity

ratio can be seen as more risky investments and investors therefore require a higher expected return on the investments in these firms.

2.3 Modern Portfolio Theory

A number of concepts which describes the relation of risk and assets and are developed by Harry Markowitz (1959) is called modern portfolio theory. He introduced a measurement of assets risk and developed methods for combining them into risk-efficient portfolios, thus creating an important base for further evolution of financial theory. The two most important values of any asset are its returns over time and the volatility of these returns. Measured over some fairly short interval of time, the rates of returns conform closely to normal distribution, while studying longer periods of time exhibits the distribution that could be described as lognormal i.e. skewed to the right. However it is commonly assumed that rates of returns are distributed normally. To describe such a distribution we need only two numbers: mean and standard deviation. Translating into financial definitions, mean describes expected return of the asset and standard deviation is a measurement of the risk. Risk and return are the only things that investors pay attention to while making their investment decisions.

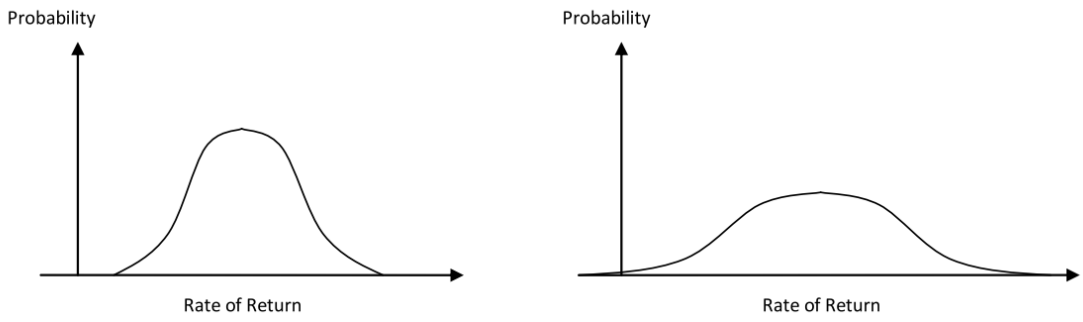

Figure 3: The Relationship between investment and rate of return

The Figure 3 shows two investments with the same average expected return but different risk. A rational investor should choose Investment 2 since its standard deviation of returns is much lower than that of Investment 1. A rational investor in this example is a risk-averse investor. This means that in risk-return framework he/she will always strive to achieve the highest possible return with lowest possible risk.Most investors do not put their money into just one asset but combine many assets into portfolios. To measure the rate of return such a portfolio one simply takes the weighted average of returns on the individual assets:

$$E(r_p) = \sum x_i E(r_i)$$

Chapter 3

BORSA ISTANBUL

3.1 Introduction

The biggest stock market in Turkey is located in Istanbul. It is called The Borsa Istanbul (abbreviated as BIST) which is the combination of Istanbul stock exchange, Istanbul gold exchange and Derivatives Exchange of Turkey. The stock market was firstly published by having the capital of 240$ Million on in early 2013.

3.2 History

According to Borsa Istanbul magazine, there are two markets for trading securities on the Borsa İstanbul namely; the Equity Market, the Emerging Companies Market. Companies that satisfy the listing/registration criteria and fulfill the obligations specified in the legislation are traded on the Equity Market. Companies that fail Borsa İstanbul listing requirements are traded on the ECM. On Borsa İstanbul equity markets, companies may be traded on National Market, Collective Products Market, Second National Market, New Economy Market and on Watch list Companies Market. Shareholders of the companies whose equities are traded on the equity exchange utilize the liquidity of the market. Publicly-traded companies are able to utilize low-cost and long-term financing facilities. While continuous delivery of company information to domestic and international investors contributes to publicity, the audit mechanisms of the capital markets speed up the institutionalization process.

3.3 BIST fluctuation from 2009 to 2013

The figure 4 shows the historical changes of rate of return in BIST 30 index from 2009 to 2013. The graph shows a volatile return during this period. This matter caused the emerging market to suffer from account deficit. Most of investors found out staying in emerging markets could be risky, hence they pulled out their money and tried to invest in other markets such as USA or even Japan. Again after a while, investors found out that they need to diversify their investments to decrease the possible risk of failure. They have already had the sweet experience of emerging markets hence they started to diversify to emerging markets again and the index increased again. Changes in BIST has not only been because of tapering talk but also because of different domestic political issues. These issues again caused the index to decrease in 2013 and early 2014.(the graph is adopted from Bloomberg website)

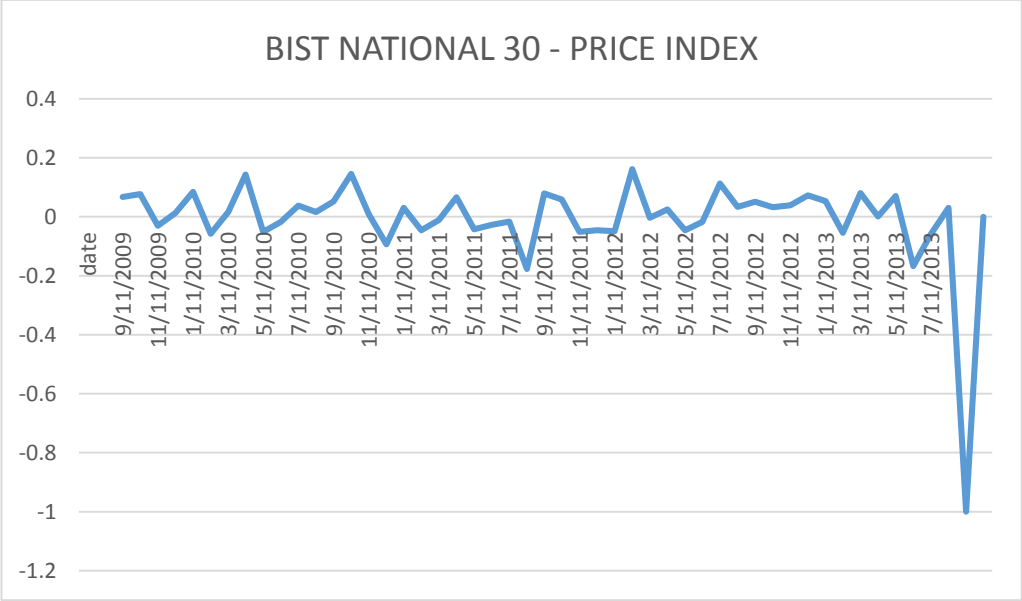

Figure 4: BIST fluctuation from 2009 to 2013

3.4 Information on Firms

The current study has chosen 30 firms from BIST 30. These firms are actively trading their stock in different industries.The table 1 shows the firms and the industry they are related to. The study has chosen these firms from, Banking industry, Steel & Metal, automobile industry, beverages and food industry, telecommunication industry and consumers' supplies industry.

Table 1 : Name & Sector of companies

Company	Sector
T. GARANTI BANKASI A.S.	Banking
AKBANK T. A.S.	Banking
BIM BIRLESIK MAGAZALAR A.S.	Retail
T. HALK BANKASI A.S.	Banking
HACI OMER SABANCI HOLDING A.S.	Conglomerates
T. IS BANKASI A.S.	Banking
TURKCELL ILETISIM HIZMETLERI A.S.	Telecom
TUPRAS-TURKIYE PETROL RAFINELERI A.S.	Petrochemicals
KOC HOLDING A.S.	Conglomerates
EMLAK KONUT GAYRIMENKUL YATIRIM ORTAKLIGI A.S.	Real Estate
EREGLI DEMIR CELIK FABRIKLARI A.S.	Steel & Metal
TURK HAVA YOLLARI A.O.	Transportation
VAKIFLAR BANKASI A.S.	Banking
TURK TELEKOMUNIKASYON A.S.	Telecom
TAV HAVALIMANLARI HOLDING A.S.	Transportation
YAPI VE KREDI BANKASI A.S.	Banking
ENKA INSAAT VE SANAYI A.S.	Construction
ÜLKER BİSKÜVİ	Food and Beverage
ARCELIK A.S.	Consumer Durables
TOFAS TURK OTOMOBIL FABRIKASI A.S.	Automotive
T. SISE VE CAM FABRIKALARI A.S.	Conglomerates
KARDEMIR KARABUK DEMIR CELIK SANAYI VE TICARET A.S.	Steel & Metal
PETKIM PETROKIMYA HOLDING A.S.	Petrochemicals
KOZA ALTIN ISLETMELERI A.S.	Steel & Metal
ACIBADEM SAGLIK HZM.VTC. DEAD	Healthcare
TEKFEN HOLDİNG A.S.	Conglomerates
ASELSAN ELEKTRONIK SANAYI VE TICARET A.S	Telecom
MİGROS TİCARET A.Ş.	Retail
ASYA KATILIM BANKASI A.S.	Banking
KOZA ANADOLU METAL MADENCILIK ISLETMELERI A.S.	Steel & Metal

To sum up it could be said that, Borsa istnabul is established to bring Turkish firms and foreign investors and also domestic economy and foreign economy, closer together. To do so, the stock market has a unique R&D segment which uses highly qualified economists to analyze the market. The final mission of the market is to promote and strengthen the Turkish economy as well as turning this economy to an international economy with stable conditions and international standards. So far the staff of this market has been successful and they are trying their best by using the latest theories and methodologies as well as instruments to increase the credibility of this market among investors.

Chapter 4

DATA, MODEL AND METHODOLOGY

4.1 Data

According to the research framework for the study a number of 30 firms as monthly are chosen for the from BIST 30 index with in the period of 2009 to 2013. The firms chosen for the study are the 30 firms which are actively trading in Borsa Istanbul BIST exchange. The selected variables are follows; Rate of return is referred to as annual return, the return on market is defined as the return on the stock prices of the firms actively trading assets in the market and Risk Free Rate of Return is defined as those returns on assets which have absolutely no risk to invest on. Usually those notes or bills issued by governments are among them. The current study is used the risk free rate of return on 3-months T-bill issued by Turkish government.

4.2 Model

The relevant statistical techniques such as the first pass regression and the second pass regression are conducted to test the security market line for the selected firms.

4.2.1 First-Pass Regression

Time Series Regression: For each security, the following regression is applied.

$$Rit = \alpha i + \beta i\ Rmt + eit \quad \text{(raw returns)} \qquad (1)$$

$$Rit\text{-}Rf = ai + Bi\ (Rmt\text{-}Rf) + eit \quad \text{(excess returns)} \qquad (2)$$

Rit = return rate of i capital asset in t period,

Rmt = return rate of market portfolio in t period,

Rf=risk-free interest rate,

Where, Rit-Rf, Rmt-Rf = excess returns of i capital asset and market αi and βi : regression coefficients, βi = at the same time, beta, systematic risk indicator of the capital asset, eit = residuals. Ultimately, in the first pass regression, monthly logarithmic returns of the 30 companies and BIST return are calculated for the relevant period. For each asset, we regressed the returns on BIST returns to estimate alpha and beta.

4.2.2 Second-Pass Regression

Second-Pass Regression can be used for Cross-Sectional Regression. The Second-Pass regression is a simple regression of portfolio returns against the portfolio betas obtained by Equation 2, testing CAPM.

$$R\ (average) = \gamma 0 + \gamma 1 \beta i + ui \qquad (3)$$

Where, R (average) = estimated value of the average return rate of portfolio βi =beta of portfolio obtained from the first regression and γ0 as well as γ1 second regression coefficients ui residual terms. It is important to mention that the second step of the analysis is to test whether the asset betas are related to the average returns in the way predicted by CAPM to observe if the SML holds.

Chapter 5

EMPIRICAL RESULTS

5.1 Introduction

This section continues the different statistical tests ran on the collected data. Previously, the data was the subject of different tests such as descriptive statistics. However, this part is more based on regression analysis. As it is said in the previous chapter, first and second pass regression methodologies are used to test whether SML holds for the data ın the framework of CAMP.

5.2 Descriptive Statistics

Table 2 illustrates, mean, median, maximum and minimum are for each firm. This test tries to measure the tendency of variables and elements by calculating mean and median. To measure the variability of the whole data set it uses criteria such as minimum, maximum and kutosis and skewness.

The following table shows the results of this test in Excel. For each firm, mean, median, maximum and minimum are calculated separately. As it is seen in the table, ASELSAN has the highest rate of return. It is reported that the mean is equal to almost 5 for the chosen period. On the other hand the lowest rate of return goes to turkcell with mean of 0.59 for the period. Generally it could be said that the rate of return for BIST 30 firms have changed with mean of 0.59 to 4.8. It also has to be mentioned that even some firms experienced a negative rate of return. For instance, AYSA has the mean of -.28.

Table 2: mean, median, maximum and minimum

Firms	Mean	Median	Maximum	Minimum	Std.Dev
GARBANK	1.193751984	1.321874182	25.6	-20.9569378	9.050679937
AKBANK	0.628964081	1.416179708	20.12195122	-18.83767535	8.532322221
BIM	2.582280456	1.709702323	21.73913043	-10.98241098	6.430328315
HALK BANK	1.756788978	2.036807279	21.67689162	-18.80877743	9.500922443
SABANCI	1.471994582	2.176127238	24.21052632	-21.31147541	8.2041409
ISBANK	0.933903952	-0.755351654	21.22905028	-27.5862069	11.38458094
TURKCELL	0.590871425	1.032844344	16.05839416	-11.46245059	7.020843148
TUPRAS	1.91117303	2.594700447	26.63316583	-21.30750605	8.545925484
KOC	2.46377698	2.639692729	18.26086957	-17.52212389	8.282076381
EMLAK	1.202163094	0.554020872	17.98245614	-23.98523985	7.554630729
EREDEMIR	0.61271228	0.650362645	27.0531401	-19.92031873	8.205196915
THY	4.261858703	2.590802818	40	-26.73267327	13.10021535
VAKIFBANK	1.477092295	1.7816299	28.38983051	-25.50724638	11.52419393
TT	1.116267256	1.526265521	19.26605505	-21.93995381	7.748724107
TAV	2.499734468	3.185424548	24.41860465	-15.13647643	7.779380487
YAPIKREDI	1.440893183	2.334753831	26.86567164	-24.13793103	10.95395757
ENKA	1.422512439	0.332225914	18.68852459	-18.20895522	8.321066655
ULKER	2.847622526	1.80549737	27.13754647	-15.25974026	8.429405851
ARCELIK	3.190726422	4.969163266	35.36585366	-26.89486553	10.05508461
TOFAS	3.57758335	0.086441336	34.48275862	-19.83240223	10.69731887
sisecam	2.302243824	2.19009901	21.21212121	-12.06896552	8.529970992
KARDEMIR	2.16706102	1.59425813	29.16666667	-18.30985915	10.11433017
PETKIM	1.608868001	-0.182481752	31.55737705	-14.91935484	9.128177588
KOZALTIN	1.785628741	1.154522212	21.83098592	-20.19950125	7.931872171
ACIBADEM	3.014861341	0.282503099	52.90519878	-15.49295775	10.93805013
TEKFEN	1.395320994	1.563262121	20.91503268	-17.25067385	9.553192753
ASELSAN	4.885665142	3.020056285	47.39336493	-17.83783784	11.18762068
MIGROS	0.983874222	1.534782205	52.22772277	-23.42105263	12.61910561
ASYA	-0.282150779	-0.773665796	20.24539877	-29.7188755	9.129412403
kozamaden	1.627219309	1.676089125	40.33149171	-20.48192771	11.92786719

5.3 Regression Analysis

Regression analysis is conducted. Especially the first pass regression and the second pass regression are employed in this study[1].

[1] Excel is used to get study's results.

5.3.1 Regression Results

Firstly it is necessary to describe the different steps where this study has used to calculate different variables employed for the study. To start the analysis, the average return on asset of each firm and market is calculated. To do so, the average function is calculated by using excel. Secondly, the systematic risk associated to each firm is calculated separately. R-squared and intercept (alpha) are the other factors which are calculated using the return of firms. The results of this step are shown in table (3).

Table 3: Return, Intercept and R-Squared of firms

YEAR	av return	beta	Alpha
PI	1.24619799	1	0
GARBANK	1.193751984	0.727944089	0.37721329
AKBANK	0.628964081	0.742373631	0.779271641
BIM	2.582280456	0.55147144	-0.177855932
HALK BANK	1.756788978	0.680755751	0.050253789
SABANCI	1.471994582	0.702189786	0.21257843
ISBANK	0.933903952	0.405922937	0.867104955
TURKCELL	0.590871425	0.506784798	0.946753335
TUPRAS	1.91117303	0.560590765	0.174812039
KOC	2.46377698	0.737900667	-0.571824687
EMLAK	1.202163094	0.558966139	0.574229527
EREDEMIR	0.61271228	0.548748737	0.9099729
THY	4.261858703	0.334001565	-0.177269486
VAKIFBANK	1.477092295	0.556453126	0.424265365
TT	1.116267256	0.622759401	0.551032063
TAV	2.499734468	0.264495448	0.585029602
YAPIKREDI	1.440893183	0.599664701	0.382145211
ENKA	1.422512439	0.528139406	0.494913116
ULKER	2.847622526	0.339583407	0.27919263
ARCELIK	3.190726422	0.414916354	-0.077686583
TOFAS	3.57758335	0.448469332	-0.358238425
sisecam	2.302243824	0.534349222	0.015995795
KARDEMIR	2.16706102	0.348865671	0.490184794
PETKIM	1.608868001	0.380963496	0.633278013
KOZALTIN	1.785628741	0.245985807	0.806958664
ACIBADEM	3.014861341	0.163938491	0.751946173
TEKFEN	1.395320994	0.514220243	0.52869569
ASELSAN	4.885665142	0.391990007	-0.668933922
MIGROS	0.983874222	0.38638144	0.866047251
ASYA	-0.282150779	0.605468331	1.417031351
kozamaden	1.627219309	0.31035168	0.741187744

As it is shown above the average rate of return, intercept and R squared are shown in the table. Each one of them are calculated using the functions available in excel. The results of this table will be used for both first and second pass regression analysis.

5.4 The First Pass regression

As it is discussed in the previous sections, the current study uses the second pass regression model to calculate the regression results. There are many different

approaches to calculate the systematic associated to the assets of firms. For instance SLOPE of the reruns of markets and returns of assets of a firm could be a function in excel to calculate the beta. However this study follows the following formulation to calculate the systematic risk of asset and stocks. To be more accurate the CAPM is divided in to two different steps. The first step regress the returns of stocks minus risk free rate of return on market risk premium. The coefficient of the independent variable which is market risk premium is considered as Beta.

The formulation of this as follow:

$$E(r_i) = r_f + \beta_i[E(r_M) - r_f]$$

$$\beta_i = \frac{Cov[r_i, r_m]}{Var[r_m]}$$

Beta is known to show the systematic risk of an asset with respect to the market. For instance if beta is 1.3, it is said that the specific asset is likely to be more volatile than market by 30%.

Now by looking at the result of the beta (Table 4), interestingly all the firms have a beta lower than 1. In some firms such as Acibadem, the Beta is reported to be close to zero which shows that the volatility of return in the firms are likely to be less than those of market.

Table 4: Beta of Firms

YEAR	beta
PI	1
GARBANK	0.727944089
AKBANK	0.742373631
BIM	0.55147144
HALK BANK	0.680755751
SABANCI	0.702189786
ISBANK	0.405922937
TURKCELL	0.506784798
TUPRAS	0.560590765
KOC	0.737900667
EMLAK	0.558966139
EREDEMIR	0.548748737
THY	0.334001565
VAKIFBANK	0.556453126
TT	0.622759401
TAV	0.264495448
YAPIKREDI	0.599664701
ENKA	0.528139406
ULKER	0.339583407
ARCELIK	0.414916354
TOFAS	0.448469332
sisecam	0.534349222
KARDEMIR	0.348865671
PETKIM	0.380963496
KOZALTIN	0.245985807
ACIBADEM	0.163938491
TEKFEN	0.514220243
ASELSAN	0.391990007
MIGROS	0.38638144
ASYA	0.605468331
kozamaden	0.31035168

There are different methods introduced and used to calculate the beta. One is the approach the current study has used in excel by using the covariance of firms' stocks and those of market. However, to find the beta of each stock, the regression analysis could also be used for each stock and firm individually. In this case, the following Market risk premium is defined as the difference between the return on market portfolio and the risk free rate of return. The results of this procedure are known to

reflect the slope of SML line. When an investor decides to buy an asset in a capital market he needs to evaluate the returns. When deciding, the investor needs to compare the risk premium of the asset and the return of the asset to buy the most profitable asset.

5.5 The Second Pass Regression

To continue with the regression and testing CAPM, the excess returns on 30 firms are calculated with in the period chosen for the study. After that, the beta calculated in the previous section (first pass regression) is used as the independent variable to test the CAPM.The equation of this linear regression analysis is as follow:

$$Er - Rf = \gamma 0 + \gamma 1\, \beta i + \varepsilon i$$

Where Er-Rf is the Average excess of returns on asset i over the testing period, $\gamma 0$ is Regression intercept, $\gamma 1$ is the regression coefficient, βi is the Estimated beta of the asset i and εi is the variance of residuals.The inputs of the mentioned equation are shown in the Table 4.

Table 5: The Beta and Alfa calculated by regression

YEAR	av return	beta	Alpha
GARBANK	1.193751984	0.727944089	0.37721329
AKBANK	0.628964081	0.742373631	0.779271641
BIM	2.582280456	0.55147144	-0.177855932
HALK BANK	1.756788978	0.680755751	0.050253789
SABANCI	1.471994582	0.702189786	0.21257843
ISBANK	0.933903952	0.405922937	0.867104955
TURKCELL	0.590871425	0.506784798	0.946753335
TUPRAS	1.91117303	0.560590765	0.174812039
KOC	2.46377698	0.737900667	-0.571824687
EMLAK	1.202163094	0.558966139	0.574229527
EREDEMIR	0.61271228	0.548748737	0.9099729
THY	4.261858703	0.334001565	-0.177269486
VAKIFBANK	1.477092295	0.556453126	0.424265365
TT	1.116267256	0.622759401	0.551032063
TAV	2.499734468	0.264495448	0.585029602
YAPIKREDI	1.440893183	0.599664701	0.382145211
ENKA	1.422512439	0.528139406	0.494913116
ULKER	2.847622526	0.339583407	0.27919263
ARCELIK	3.190726422	0.414916354	-0.077686583
TOFAS	3.57758335	0.448469332	-0.358238425
sisecam	2.302243824	0.534349222	0.015995795
KARDEMIR	2.16706102	0.348865671	0.490184794
PETKIM	1.608868001	0.380963496	0.633278013
KOZALTIN	1.785628741	0.245985807	0.806958664
ACIBADEM	3.014861341	0.163938491	0.751946173
TEKFEN	1.395320994	0.514220243	0.52869569
ASELSAN	4.885665142	0.391990007	-0.668933922
MIGROS	0.983874222	0.38638144	0.866047251
ASYA	-0.282150779	0.605468331	1.417031351
kozamaden	1.627219309	0.31035168	0.741187744

After calculating the variables, the regression analysis is run. According to CAPM the following results are expected:

1) Regression intercept should be equal to Rf or $\gamma 0 = Rf$

2) Coefficient of beta must be equal to average excess market return

Now by looking at the table 6, the regression results could be interpreted.

Table 6: regression

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.442586064
R Square	0.195882424
Adjusted R Square	0.167163939
Standard Error	1.028803042
Observations	30

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	7.219355447	7.219355447	6.820778489	0.014320184
Residual	28	29.63619957	1.058435699		
Total	29	36.85555502			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	3.470604797	0.634038487	5.473807768	7.60763E-06	2.171835832	4.769373763
beta	-3.224466362	1.23464152	-2.611662017	0.014320184	-5.753514868	-0.695417855

The result of the regression shows that, the intercept is not equal to the average risk-free rate of return. At this point it is enough to point out that the average risk-free rate of return is equal to 0.0019.Hence the first assumption of two pass regression in CAPM is rejected. In fact the coefficient is larger than the average risk-free rate of return and is not statistically significant at any level. Hence, the CAPM is not correct according to the result of intercept.

According to CAPM (two pass regression), the coefficient of beta must be equal to average excess market return. The result of the regression shows that average excess market return which is equal to 1.89 is not equal to the coefficient of beta which is equal to -3.224466362. Hence it is more volatile than the market and CAPM is not true for this assumption.

5.6 Interpretation of SML

The CAPM can be used for pricing both individual securities and portfolios. Regarding individual securities, the security market line (SML) can be used to understand the relationship between the expected return and systematic risk (beta) and to discover how the market must price individual securities with respect to their risk level. The SML allows us to compute the reward-to–risk ratio for any security in relation to that of the overall market.

The SML displays individual asset risk premium as a function of asset risk. The relevant measure risk of individual assets held as parts of well-diversified portfolios is not the asset's standard deviation or variance it is instead, the contribution of the asset to the portfolio variance which we measure by assets beta. The SML is usable for both individual assets and efficient portfolios.

If the market portfolio is efficient, then the SML has a positive slope but if it is inefficient, the SML will be negatively sloped. In addition, those stocks that located above the SML are undervalued stocks because they have positive alphas and those that are located below the SML are overvalued stocks because they have negative alphas.

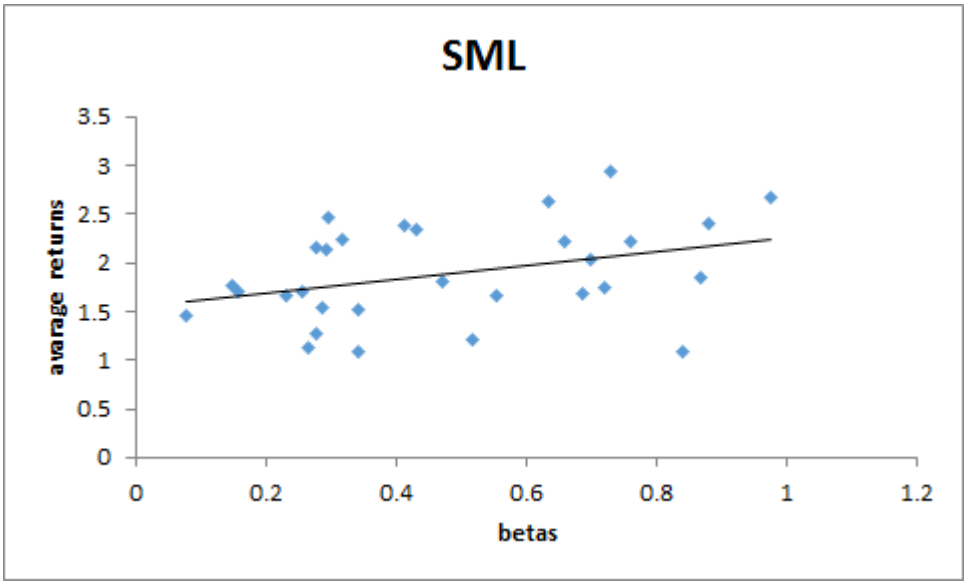

Figure 5: SML

Next, when we plot the average excess return against beta, we see a linear positive relationship which means that systematic risk is compensated with excess return in the market in long run. Figure 5 illustrates the result. But, overall, the regression estimates suggest that standard CAPM is not able to provide the results which could validate it.

5.7 Is there a relationship between individual asset return and BIST 30?

According to the test results on individual assets and BIST 30, T-Intercept and T-Slope are calculated. T-values of their slopes in Table 7 show that most of the firms are reported as statistically significant except Kozalti and Acibadem.

Now by looking at the R-squared results, the average R-squared is 0.445458117. When those stocks with r-squared lower than 20% are not considered the r-squared increases to 0.498982764. This value could be interpreted as, 49.89 % of variation in stock returns could be explained by BIST 30.

Table 7: T-statistic for intercept and slope

YEAR	av return	beta	Alpha	Rsq	t-stat for intercet	t-stat for slope
PI	1.24619799	1	0	1		
GARBANK	1.193751984	0.727944089	0.37721329	0.870799486	1.009860026	17.60783163
AKBANK	0.628964081	0.742373631	0.779271641	0.804895082	1.707982728	13.77572436
BIM	2.582280456	0.55147144	-0.177855932	0.252273742	-0.185021051	3.939522853
HALK BANK	1.756788978	0.680755751	0.050253789	0.839216254	0.119598354	15.49511441
SABANCI	1.471994582	0.702189786	0.21257843	0.665786429	0.351247588	9.572697716
ISBANK	0.933903952	0.405922937	0.867104955	0.428431097	1.109636138	5.871987366
TURKCELL	0.590871425	0.506784798	0.946753335	0.253971744	1.060289773	3.957254463
TUPRAS	1.91117303	0.560590765	0.174812039	0.460436542	0.225352962	6.265309695
KOC	2.46377698	0.737900667	-0.571824687	0.749262456	-1.061683157	11.72428096
EMLAK	1.202163094	0.558966139	0.574229527	0.3577315	0.686773338	5.061732574
EREDEMIR	0.61271228	0.548748737	0.9099729	0.40670994	1.143647742	5.615491484
THY	4.261858703	0.334001565	-0.177269486	0.384072821	-0.208311039	5.355758914
VAKIFBANK	1.477092295	0.556453126	0.424265365	0.824969689	0.976333869	14.72452452
TT	1.116267256	0.622759401	0.551032063	0.467154657	0.725191233	6.350510961
TAV	2.499734468	0.264495448	0.585029602	0.084934891	0.564693787	2.066312412
YAPIKREDI	1.440893183	0.599664701	0.382145211	0.865603054	1.003137456	17.21248625
ENKA	1.422512439	0.528139406	0.494913116	0.387449272	0.604925764	5.394054255
ULKER	2.847622526	0.339583407	0.27919263	0.164379083	0.280601871	3.008136515
ARCELIK	3.190726422	0.414916354	-0.077686583	0.349182337	0.280601871	3.008136515
TOFAS	3.57758335	0.448469332	-0.358238425	0.461716171	-0.449065716	6.281462794
sisecam	2.302243824	0.534349222	0.015995795	0.416778371	0.01961721	5.733432339
KARDEMIR	2.16706102	0.348865671	0.490184794	0.24977584	0.536964759	3.913439341
PETKIM	1.608868001	0.380963496	0.633278013	0.242602119	0.695473561	3.838523181
KOZALTIN	1.785628741	0.245985807	0.806958664	0.076371481	0.794831819	1.950275009
ACIBADEM	3.014861341	0.163938491	0.751946173	0.064506189	0.727059987	1.780980438
TEKFEN	1.395320994	0.514220243	0.52869569	0.484122338	0.70694025	6.570268464
ASELSAN	4.885665142	0.391990007	-0.668933922	0.385820376	-0.758096289	5.375560986
MIGROS	0.983874222	0.38638144	0.866047251	0.476924207	1.158899587	6.476215449
ASYA	-0.282150779	0.605468331	1.417031351	0.612954474	2.21012669	8.535166536
kozamaden	1.627219309	0.31035168	0.741187744	0.274911871	0.837094982	4.176190156

Chapter 6

CONCLUSION

The current thesis tried to follow one of the oldest and most famous approaches which shows the relation between returns and risks. To do so, capital asset pricing model (CAPM) is chosen as the methodology. The data set is selected from Bursa Istanbul Stock Exchange for years from 2009 to 2013. The data of this paper are chosen from ISE and all selected stocks are traded in, BIST 30 in BURSA ISTANBUL. The study made this choice since many investors consider emerging markets as the best destination to diversify. To start the analysis, the study is calculated the average return on asset of each firm and Market. To do so, the study is the average function in excel. Secondly, the systematic risk associated to each firm is calculated separately. R-squared and intercept are the other variables which are calculated from the return of firms. The results and inputs of this step are shown in the table 5 and table 6.

6.1 Discussion

According to the regression analysis it was revealed that CAPM is not true for Turkey since none of the coefficients were calculated as they were expected. The results of descriptive statistics showed that, mean of return in Turkey is generally low. On the other hand, the risk associated to these returns are far higher than the expected returns, hence investing in Turkish firms could be risky.

As it is shown in table 2, standard deviation associated to the average return of almost each stock, is higher than the mean itself. This phenomena expresses that investing in the selected firms could be risky and cause failure.

According to the regression analysis, the results show that, beta varies for each firm among the data set selected for the study. The average return for stock prices is also low. According to the results of the study, firms with higher bets are likely to offer a higher rate of return. In fact this result was expected. Usually investors are risk averse and they tend not to invest on risky assets. However, if the return on that investment is attractive, investors would see this as an opportunity and tend to invest on those risky assets, hoping to maximize their wealth.

Needles to mention, the findings of the current study, shows that Capital Asset Pricing Model is not true in Turkey and if investors are to invest in Turkey, they could find other approaches to select the best portfolios. There are many other approaches even extracted from CAPM with other conditions and formulation which could perfectly work for the chosen firm Turkey, however the results showed that CAPM is not able to accurately guess the returns and risks associated to these returns in Turkey.

6.2 Suggestions

The results of this study suggests that, Turkish stock market could provide new investment opportunities for international investors but since the economy is active in emerging markets the following risk could be associated to the returns.

There is always risk of foreign exchange rate risk which could appreciate or depreciate the total wealth of investors. This risk could be caused by different reasons from natural disasters to political issues. The second risk could be the non-normal

distribution. Unfortunately not only in Turkey, but all over the emerging market there is no pattern of normal distribution similar to north American stock markets. Hence predicting and even evaluating the historical data could lead to no meaningful result.

Turkish stock market is known to be less liquid with respect to those in developed markets. not only Turkey but all the emerging markets, hence investors should know that their assets will not be liquidated soon enough in case of emergency.

This study used Capital Asset Pricing Model while other methods such as Arbitrage pricing theory and 3 factors could also be used to generate results. The mentioned methods are used vastly in previous studies and there are many caparisons done between them.

Last but not least, unfortunately since the regulations in emerging economies are easier than those of Europe's and USA, the corporate governance system is poor.

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