Aliyev, Fuzuli; Soltanli, Aysel

Article

Empirical test of capital asset pricing model on selected banking shares from Borsa Istanbul

Academic journal of economic studies

Provided in Cooperation with:
Dimitrie Cantemir Christian University, Bucharest

Reference: Aliyev, Fuzuli/Soltanli, Aysel (2018). Empirical test of capital asset pricing model on selected banking shares from Borsa Istanbul. In: Academic journal of economic studies 4 (1), S. 74 - 81.

Academic Journal of Economic Studies
Vol. 4, No. 1, March 2018, pp. 74–81
ISSN 2393-4913, ISSN On-line 2457-5836

Empirical test of Capital Asset Pricing Model on Selected Banking Shares from Borsa Istanbul

Fuzuli Aliyev[1], Aysel Soltanli[2]

[1,2]Baku Engineering University, [1]E-mail: faliyev@beu.edu.az (Corresponding author), [2]E-mail: asoltanli@beu.edu.az

Abstract *In this paper we tested Capital Asset Pricing Model (shortly CAPM hereafter) on the selected banking stocks of Borsa Istanbul. Here we tried to explain how to price financial assets based on their risks in the case of BIST-100 index. CAPM is an important model in the portfolio management theory used by economic agents for the selection of financial assets. We used 12 random banking stocks' monthly return data for 2001–2010 periods. To test the validity of the CAPM, we first derived the regression equation for the risk-free interest rate and risk premium relationship using January 2001–December 2009 data. Then, estimated January–December 2010 returns with the equation. Comparing forecasted return with the actual return, we concluded that the CAPM is valid for the portfolio consisting of the 12 banks traded in the ISE, i.e. The model could predict the overall outcome of portfolio of selected banking shares.*

Key words CAPM, Stock return prediction, Expected return, Banking shares, Ordinary Least Squares

JEL Codes: G11, G12

1. Introduction

An important challenge of all people including finance professionals is to maximize their return in market. Finance scholars are concentrated on increasing return and mitigating risk factors adversely affecting it, which led to emergence of risk concept, relationships, and pricing concepts. One of the basic subjects of Modern Portfolio Theory is pricing financial assets. In portfolio management and finance theory, there are some prominent models designed to describe pricing of financial assets and the expected returns of assets: CAPM, APT, factor models and others.

This paper tests CAPM on the selected banking stocks of Borsa Istanbul test, that the model is an extension of Markowitz Portfolio Theory developed by Harry Markowitz in 1952. It is an equilibrium model that examines the relationship between systematic risk, measured by beta coefficient and expected return in a competitive capital market. In the paper, using the CAPM model I tried to explain how to price financial assets based on their risks in the case of BIST-100 index. CAPM is an important model in the portfolio management theory used by economic agents for the selection of financial assets.

Existing literature includes mass of studies measuring risk-return relationship that is the source of the problems encountered in the pricing of assets. CAPM model is the most widely used model in these studies for asset pricing due to its ease of applicability and possibility to measure risk with a single variable. The model basically relates the expected returns from any asset or portfolio to the systematic risk. According to this relationship, the return of any asset is linearly related to the systematic risk. At the same time systematic risk is measured by the beta coefficient. In other words, the beta coefficient indicates the sensitivity of a stock to the market portfolio (market index). Some stocks are less affected by market fluctuations than others. According to this interaction, investment managers distinguish between defensive and aggressive. Defensive stocks are not very sensitive to market fluctuations, they have a small beta. On the contrary, aggressive stocks get "excited" with the smallest market movement (i.e. their beta is greater than 1).

About 12 years after Markowitz revealed the foundations of modern portfolio theories, William Sharpe (1964), John Lintner (1965), and Jan Mossin (1966), independently of each other's work, introduced an equilibrium model that examined the relationship between systematic risk and expected return in a competitive capital market. Konuralp (2001) stated that, CAPM is an extension of Markowitz's Portfolio Theory. This model, as mentioned above, demonstrates the relationship between the systematic risk of an entity and its expected return. This relationship fulfills two important tasks. First of all, what should be the return on an investment given a risk level? Secondly, it helps to predict how much return can be expected from new stocks that are not yet been traded in the market. General CAPM formula is:

$$r_e = r_f + \beta(r_m - r_f) \quad (1)$$

Expected return = risk-free interest rate + β x Market risk premium

Vol. 4 (1), pp. 74–81, © 2018 AJES

Beta measures the sensitivity of the return on a stock to market portfolio return. It is the coefficient that measures the contribution of a stock to the variance of the market portfolio (as part of the total variance). If beta is greater than 1, it means that the related stock is extremely sensitive to market movement and when it is less than 1, the stock is less sensitive to market movement. Beta is with the slope of the straight line passing through the points of return on the security and market return.

Beta of the portfolio is calculated as follows:

$$\beta_p = \sum_{i=1}^{n} w_i \beta_i = w_1\beta_1 + w_2\beta_2 + \cdots + w_n\beta_n \quad (2)$$

In the formula, w_i is the weight of stock *i* in the portfolio; *n* is the number of securities in portfolio; β_i indicates beta coefficient of stock *i* in the portfolio; and β_p shows the sensitivity of portfolio's return to the market's portfolio return. So:

r_f - risk-free interest rate. It is the interest rate on Treasury bills for the respective period;

r_m - expected market return. It is the return on the index for the respective period;

$(r_m - r_f)$ - market risk premium. It is the difference between market return and the short-term Treasury bills.

1.1. Assumptions of CAPM

Brealey *et al.* (2001) listed CAPM assumptions as following:

- As securities market is large in volume, investors cannot influence the price (i.e. they are price takers);
- There is a systematic relationship between risk and expected return;
- The investor's objective is to maximize the return on the shares held until the end of the period;
- Investors have the same (homogeneous) expectations on risk and expected return;
- Investors account the same time frame;
- Investors have access to all information on stocks;
- All investors can borrow and lend an unlimited amount at risk-free interest rate;
- All investors use Markowitz's efficient portfolio model. Investor's indifference curve, namely utility function, determines where the investor is placed on the active set;
- There are no charges such as transaction fees, commissions and taxes.

The basic idea behind CAPM is that investors should be rewarded for both their expectations and risk taking. The bigger is the risk, the larger reward is. Investors invest in risk-free Treasury bills and benefit from return on bond in return for their waiting. When investing in risky stocks, they get an extra return or risk premium in return for their risk taking.

In CAPM, expected return on a financial asset or portfolio is a function of systematic risk, i.e. beta coefficient. The layout that CAPM has put forth to explain the prices of financial assets and, accordingly, their expected return seems quite simple and intriguing, but its assumptions has little to do with real life. Many studies have been done on the model's power to explain the expected return of financial assets and portfolios in the market, and this has always been a matter of debate.

2. Literature review

Sharpe and Cooper's (1972) work is one of the first tests of CAPM. This study was conducted for stocks traded on the New York Stock Exchange for the period 1931-1967. The study examined the relationship between systematic risk and expected return. As a result of the study they found a strong and linear relationship between systematic risk and expected return.

Fama and Macbeth (1973) used monthly data for the years 1935-1938 in their studies to examine the relationship between return rates and risk for stocks traded on the New York Stock Exchange. As a result of the regression analysis they were able to identify the existence of a positive relationship between beta and return.

Lintner (1965) carried out his work for the 301 stocks between 1954 and 1963. In his study, Lintner used a two-stage regression model with annual data. In the first stage, with time series regression beta coefficient was estimated[8]. In the first step, estimation was made the following equation: $R_{it}=a_i+b_iR_{mt}+e_{it}$.

Here, b_i is the beta value of the stock, and this coefficient was estimated by regression. Lintner used the S&P425 index as a market portfolio. In the first stage, Lintner put into regression return of each stock he used in the study with the S&P index return.

Gibbons (1982) concluded that both the Standard CAPM and the Zero Beta CAPM were not valid as a result of his work. Stambaugh (1982) carried out a study similar to the Gibbons test, but he conducted a sensitivity analysis of inferences drawn on the CAPM to different proxies of the market portfolio. Gibbons used the Lagrange multiplier test instead of the likelihood ratio test and obtained different results. He found strong evidence to the validity of the Zero Beta form; the contrary hold for the standard form of CAPM.

Black, Jensen and Scholes (1972) used following equation for a series of studies: $R_{it} – R_{ft} = α_{it} + β_i(R_{mt} – R_{ft})$. When this equation is estimated as the result of the regression with the time series data, the regression coefficient $α_i$ must be equal to zero if the standard CAPM can account for the return. Black, Jensen and Scholes calculated beta values on monthly data for the past 5 years using a technique called instrumental variable in econometrics. Instrumental variable has a high correlation with the actual beta, but also it is a variable that can be measured independently. This technique has been an example in other studies and has been used in many researches in beta calculations.

Black, Jensen and Scholes implemented instrumental variable technique as follows. The beta values of stocks were estimated using 5 years monthly data and as a result all the shares were divided into 10% groups according to their beta values. Ten group shares created in this way constituted ten different portfolios in the following year (sixth year). Then, betas for the five-year period from the second year up to the sixth year were estimated, the stocks were reordered according to their betas and ten portfolios in the seventh year were obtained with this new ranking. This process was carried out for a period of 35 years between 1931 and 1965.Thus, annual return values for each 10% group were calculated for 35 years period and the return values of ten portfolios with different beta values were obtained. The intersection, beta and correlation coefficient values of these ten portfolio were obtained as a result of the regression with market.

In finance literature, CAPM test studies for developing country stock exchanges exist as well. In their study of Taiwan, Sheu et al. (1998) investigated the relationship between beta, sales/price ratio and transaction volume variables and return using monthly data from July 1976 to June 1996. According to the results they obtained, there was a positive relationship between beta and return in the rising market periods and a negative relationship in the falling market periods. In addition, the other findings were that the sales/price ratio and transaction volume variables were also strong factors in the explanation of the return. In his work for Bulgaria, Matteev (2004) investigated the role of beta and other variables (size, book value/market value, asset value/market value, asset value/book value and price) in explaining cross-sectional variability of the average return of businesses traded in the Sofia Stock Exchange (BSE-Sofia) from January 1998 to December 2002. His findings indicated that while book value/market value and price effects were not observed for BSE; beta, size, market and book-value leverage were important variables in explaining variability. The results show that the relationship between the mean return of firms traded in BSE and the beta coefficients is linear and the size and book-to-market value effects are statistically significant and differ from those of other markets.

In their studies for Bangladesh, Rahman *et al.* (2006) have tested the relationship of independent variables beta, book-to-market value and firm size with expected return in the Bangladesh Stock Exchange between 1999-2003 with Fama and French Three Factor Models. According to the findings of the study, beta coefficient is not the only factor affecting stock returns, book-to-market value and firm size variables are also important factors. It has also been demonstrated that CAPM is a valid model in explaining the returns of companies traded in Bangladesh Stock Market. Febrian and Herwany (2007) investigated the validity of the CAPM and the Arbitrage Pricing Model (AFM) in explaining the excess returns of portfolios of business stocks traded on the Jakarta Stock Exchange, using monthly data between 1992 and 2007. According to the findings, beta is not the only factor explaining the excess returns of portfolios.

Akdeniz *et al.* (2000) found that monthly return rates of the shares of the companies traded on the Istanbul Stock Exchange (ISE) for the period January 1992-December 1998 have been used for Turkey's CAPM test. According to the results obtained, they found that there is a positive relationship between the return and the market-to-book value ratio and a negative relationship between the return and the size of the firm, but they found that there was no relation between the beta value of the market value and the return. Karatepeet *et al.* used daily data for the period 02.01.2000-27.05.2001. They investigated the validity of the conditional CAPM on the portfolio of the ISE-30 companies traded on the ISE, which can give more realistic results than the static CAPM in underdeveloped markets where the market depth is not high enough. According to the results obtained, conditional CAPM method gave better results than the static CAPM method in the prediction of expected returns. Nevertheless, they found that there was no positive linear relationship between the beta coefficient and expected returns of stocks and portfolios as stipulated by the static CAPM method, and therefore high systematic risk did not always produce higher expected return. In their studies, Gursoy and Rejepova (2007) tested the validity of CAPM in Turkey using regression analysis of weekly risk premiums and beta for the period of 1995-2004. In the research results obtained by the approach of Fama and MacBeth, no significant relationship was found between the beta coefficients of the portfolios and the actual risk premiums, but they found a strong beta-risk premium relationship with the findings obtained using the Pettengill methodology.

3. Methodology and Data Analysis

In order to test the CAPM in this paper, we used monthly data between 2001 and 2010 of 12 randomly selected companies from the banking sector of Turkey. This sector was selected because of the fact that the nominal interest rate changes is reflected more quickly in this sector, meaning this sector is sensitive to interest rate changes; and the banking sector is subject to more stringent controls and inspections. The rate of return forecasted with the CAPM formula should be near or equal to the risk-free interest rate plus the market risk premium. The portfolio of 12 banks (Garanti, Akbank, İşbank (C), Finansbank, Denizbank, Yapikredi, Fortis, Şekerbank, Halkbank, Vakıfbank, Alternatifbank, Tekstilbank) shares were tested from January 2001 to October 2010.Monthly yield data of the portfolio is TL based and taken from the ISE database.

The return of the portfolio is calculated as the average return of the portfolio with an equal number of shares per month ($G_p = \frac{g_1+g_2+g_3+g_4+\cdots+g_{12}}{12}$). 3-month Treasury Bills interest rates (dividing by 3) issued at the related period is taken as risk-free interest rate.The data were obtained from the Undersecretariat of Treasury data.

Risk premium data were calculated as $r_{market} - r_{treasury\ bills}$. The daily closing prices of the ISE100 (XU100) were taken as the market price.The monthly price index was found by taking the geometric mean of the daily indices.This price index is then converted to a return index ($G = \frac{F_1-F_0}{F_0}$). Betas are found using the formula $\beta = \frac{Cov(r_{stock},\ r_{market})}{Var\ (r_{market})}$. Following beta of each share (12 shares of the banking sector) was found, and then the portfolio beta was calculated using the formula $\beta_p = \sum_{i=1}^{n} w_i\beta_i = w_1\beta_1 + w_2\beta_2 + \cdots + w_{12}\beta_{12}$.

We assumed equal weight of shares in the portfolio. And we employed CAPM regression model to test the linear relationship between variables. Dependent variable, return on the portfolio, (portfolio of 12 shares in the bank - Garanti, Akbank, Isbank (C), Finansbank, Denizbank, Yapıkredi, Fortis, Şekerbank, Halkbank, Vakifbank, Alternatifbank, Tekstilbank) and the independent variables - treasury bills interest rate and market risk premium have been calculated. To test the validity of the CAPM, we first drive the regression equation for the risk-free interest rate and risk premium relationship using January 2001 - December 2009 data. Then, according to the equation, January-December 2010 returns will be estimated. By comparing this estimated return with the actual return, it will be concluded whether or not the CAPM is valid for the portfolio consisting of the 12 banks traded in the ISE. Ordinary Least Squares method is used in the analysis of the relationship. Hypotheses for the CAPM test are as follows:

H_0; there is no relationship between expected return and market risk premium and risk-free interest rates (CAPM does not apply);

H_1; risk-free interest rate and the market risk premium is effective in determining the expected return.

At 0.05 level of the significance - α (0.95 confidence interval) is preferred in the estimation and Eviews software package is used.

5. Empirical Findings

Because the data is time series, of the absence of autocorrelation, multicollinearity, normality and equal variance is tested before the data is processed. The results of the autocorrelation test show that there is generally no autocorrelation between variables at the 0.05 significance level. Running the model (the dependent variable - return, independent variables - Treasury bills and the risk premium) with the least squares method gives the following results (Table 1).

Probability value of the result shows that the model is valid (0.05 significance level), and the 44.76% coefficient of determination (R^2), risk-free interest rate and the risk premium explain 44.76% of the variance in return. It can be concluded that Independent variables and constant coefficients are valid in the 0.05 significance level. The F statistic, which indicates the general validity of the model, is also significant. When the Durbin Watson statistic (2.05) is compared with the table values, it can be concluded that here is no autocorrelation between errors in this model. The result of heteroscedasticity assumption test (Table 2).

Table 1. Regression model outputs

Dependent Variable: Return
Method: Least Squares
Sample: 2001M01 2009M12
Included observations: 108

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.505603	1.577400	0.954484	0.0342
RISKSIZ	0.866417	0.541640	1.599617	0.0112
PRIM	0.862466	0.094204	9.155274	0.0000

R-squared	0.447615	Mean dependent var	3.112135
Adjusted R-squared	0.437094	S.D. dependent var	12.61457
S.E. of regression	9.464342	Akaike info criterion	7.360324
Sum squared resid	9405.247	Schwarz criterion	7.434828
Log likelihood	-394.4575	Hannan-Quinn criter.	7.390533
F-statistic	42.54246	Durbin-Watson stat	2.051053
Prob(F-statistic)	0.000000		

Table 2. ARCH test outputs

F-statistic	5.487690	Prob. F(1,105)	0.0210
Obs*R-squared	5.314464	Prob. Chi-Square(1)	0.0211

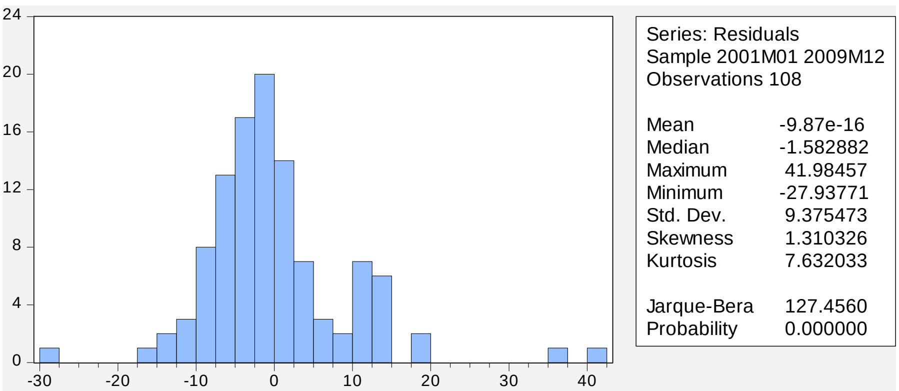
This test result indicates that there is no equal variance between errors at a significance level of 0.05. With the results of the Breusch-Godfrey serial correlation test, it can be seen that there is no serial correlation between variables at 5% significance level.

Table 3. Correlation test outputs

F-statistic	13.72432	Prob. F(2,103)	0.0000
Obs*R-squared	22.72506	Prob. Chi-Square(2)	0.0000

The Jarque-Bera test we use for the assumption of normality shows that the assumption of normality is not satisfied:

Figure 1. Normality test outputs



Since the assumptions are not met, we go on with the changes in the variables. We can take the logarithm of the data for the change and do the regression again, or take the difference with the rest of the period in itself. However, there are some minus (-) sign (missing) returns in our dataset, and logarithmic changes cannot be applied to these series. Therefore, "1 period difference" operation has been applied to all data series (portfolio return, risk-free interest rate and risk premium). As a result of this process, the first semester data was not processed because the first semester data could not be derived, so the number of observations decreased to 59. The resulting data set running the least-squares regression model is as follows:

Table 4. Revised regression model outputs

Dependent Variable: DReturn
Method: Least Squares
Sample (adjusted): 2001M02 2009M12
Included observations: 107 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.096856	1.471808	-0.065808	0.0504
DRISKSIZ	1.574221	2.162558	-1.190360	0.0236
DPRIM	0.674689	0.122216	5.520453	0.0000

R-squared	0.474222	Mean dependent var	0.038145
Adjusted R-squared	0.460265	S.D. dependent var	17.68508
S.E. of regression	15.21056	Akaike info criterion	8.309493
Sum squared resid	24061.54	Schwarz criterion	8.384432
Log likelihood	-441.5579	Hannan-Quinn criter.	8.339872
F-statistic	19.64729	Durbin-Watson stat	2.041310
Prob(F-statistic)	0.000000		

According to these results, model and variables are valid at 5% significance level. And risk premium combined with risk-free interest rate can account for only 47.4% of the return. Regression assumptions need to be met in order to predict and interpret with this model. Firstly, if we look at the Durbin-Watson coefficient, we can see that no correlation between errors (autocorrelation) assumption is achieved. At the same time equal variance assumption is parsimonious at a significance level of 0.05:

Table 5. Revised ARCH test outputs:

F-statistic	16.21809	Prob. F(1,104)	0.0501
Obs*R-squared	14.29999	Prob. Chi-Square(1)	0.0002

Although the return data are derived from price data, ($G = \frac{F_1 - F_0}{F_0}$) as with most of the time series, assumption of normality is not met here, but we continue with the prediction:

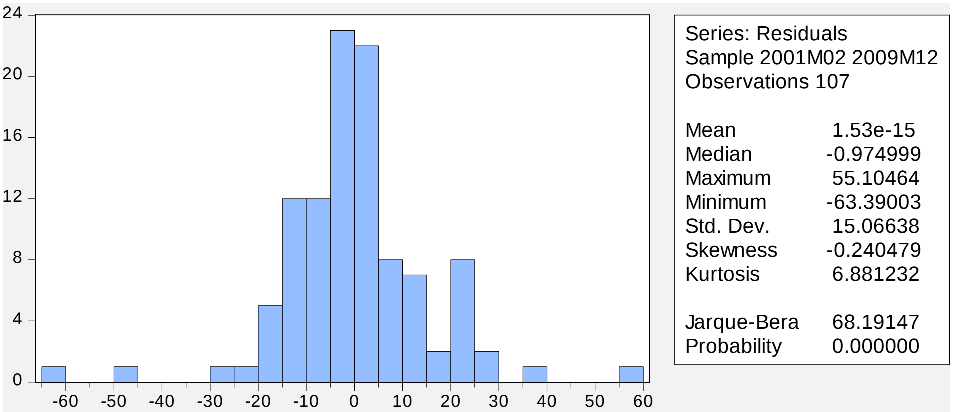


Figure 2. Revised Normality test outputs

With 0.47 coefficient of determination, the equation of expected return with the risk-free interest rate and market premium will be as follows:

Expected Return = -0.09 + 1.57 x risk-free rate + 0.67 x risk premium

With this equation, we will try to estimate the January - December 2010 expected returns.

Table 6. Estimated returns

	Risk-free rate	Risk Premium	Expected Return
Jan.10	0.6	5.807900889	4.743293595
Feb.10	0.59	-4.923463201	-2.462420345
Mar.10	0.588	2.496985423	2.506140234
Apr.10	0.69	8.598493128	6.754290396
May.10	0.81	-7.758798268	-4.01669484
Jun.10	0.72	-0.585762656	0.647939021
Jul.10	0.65	3.262423652	3.116323847
Aug.10	0.65	0.845224361	1.496800322
Sep.10	0.61	4.399499571	3.815364713
Oct.10	0.63	34.63453802	24.10424047
Nov.10	0.59	11.63	8.6284
Dec.10	0.659	7.35	5.86913

Actual returns were as follows:

Table 7. Actual returns

Jan.10	0.847709931
Feb.10	-0.494745542
Mar.10	10.686833
Apr.10	3.52550387
May.10	-10.01615058
Jun.10	3.356270999
Jul.10	7.542190758
Agu.10	-1.686448987
Sep.10	9.203124622
Oct.10	7.127696047
Nov.10	-5.227298751
Dec.10	-2.271234794

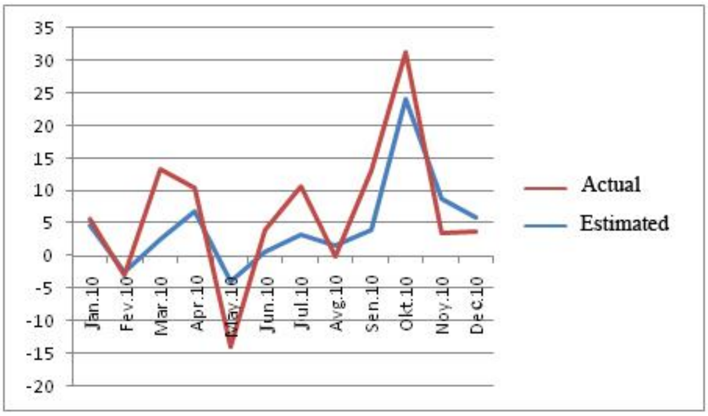


Figure 3. Comparison

If we compare the estimated return with the realized return, we can say that the general trend can be estimated, but it cannot be estimated numerically.

6. Conclusions

There are many studies so far on CAPM no definite judgment has been made as to whether the model is valid or not. CAPM is a pricing model that examines the relationship between, the systematic risk, that is the beta coefficient, and the expected in competitive capital market. CAPM has a very important place in the finance literature and despite of many criticisms on the model, it's widely used in pricing, securities management and cost of capital estimation. Because of the shortcomings in the assumptions, many variants of CAPM have developed (zero beta, consumption-based etc.). In practice, it is possible to determine the appropriate risk measure for these assets, and establish the risk-return ratio relationship with the CAPM. In the first years of its existence, this model has been repeatedly tested and validated. The results of tests by experts such as Black, Jensen, Scholes, Fama and MacBeth have provided strong support for CAPM.

However, as a result of criticism by R. Roll in 1976 for CAPM's testability due to inability to observe the actual market portfolio, Arbitrage Pricing Theory was proposed as a testable alternative to CAPM.

We examined randomly selected banking stocks traded in the ISE-100 index to find out whether results support the CAPM. In the study, the return of portfolio of 12 companies from the banking sector was associated with risk-free interest rate and market risk premium between January 2001 and December 2009.The raw data obtained from the databases have been processed for the purpose of the study. We employed regression analysis in the study to determine the relationship between realized returns, risk-free interest rate and risk premium. After further changes to provide the assumptions of model, year 2010 monthly returns have been estimated with the derived equation and these returns have been compared to actual returns. Although the model could estimate the general trend, it gave different numbers for some periods perhaps due to the fact that our coefficient of determination was small or we attempted to predict the sector return with the ISE100 index. In general, we can say that CAPM is valid in ISE100 Index as it could predict the overall outcome of portfolio of banking securities.

Thus, there is a statistically significant relationship between the return of the portfolio consisting of banking sector shares sensitive to interest rate changes and the return on the market (ISE100), risk-free interest rate, and beta values of related stocks, and this shows that CAPM is valid for the expected return of these shares between 2000 and 2010.

References

Akdeniz, L., Salih, A., Aydoğan, K. (2000). Cross Section of Expected Stock Returns in ISE. Russian & East European Finance & Trade. 36, 6-26.

Black, F., Jensen, M.C. and Scholes, M. (1972). The CAPM Some Empirical Tests, in Jensen, Studies in the Theory of Capital Markets, New York: Peger Publishers, pp. 79-121.

Brealey, R.A., Myers S.C., Marcus, A.J. (2001). Fundamentals of corporate finance, U. Bozkort, T. Arıkan, H.Dogukanlı (tran.), İstanbul: Literature Publishing, p. 275.

Fama, E.F., MacBeth, J.D. (1973). Risk, Return and Equilibrium: Empirical Tests. The Journal of Political Economy, 81, 607-636.

Febrian, E., Herwany, A. (2007). CAPM and APT Validation Test Before, During, and After Financial Crises in Emerging Market: Evidence from Indonesia. The Second Singapore International Conference on Finance, Singapore, 19 and 20 July 2007.

Gibbons, M.R. (1982). "Multivariate Tests of Financial Models: A New Approach" Journal of Financial Economics. 10:1, pp. 3-27.

Gürel K. (2001). Capital Markets-Analysis, Theory and Portfolio Management, 1.Edition, İstanbul:Alfa Publication, p. 208.

Gürsoy C.T., Rejepova, G. (2007). Test of Capital Asset Pricing Model in Turkey, Journal of Ankara University Faculty of Political Sciences, 63, 43-64.

Karatepe, Y., Karaaslan, E., Gökgöz, F. (2002). An Application In the Conditional CAPM and IMKB. İMKB Magazine. 6, 21-36.

Lintler, J. (1965). "Security Prices, Risk, and Maximal Gains from Diversification", The Journal of Finance, Vol.20, No.4 (December 1965), s. 611.

Matteev, M. (2004). CAPM Anomalies and the Efficiency of Stock Markets in Transition: Evidence from Bulgaria. South Eastern Europe Journal of Economics, 2, 35-58.

Rahman, M., Baten, A., Alam, A.U. (2006). An Empirical Testing of Capital Asset Pricing Model in Bangladesh. Journal of Applied Sciences, 6, 662-667.

Sharpe, W.F., Cooper, G.M. (1972). Risk-Return Classes of New York Stock Exchange Common Stocks, 1931-1967. Financial Analysts Journal, 28, 46-54.

Sheu, H.J., Wu, S., Ku, K.P. (1998). Cross Sectional Relationships Between Stock Returns and Market Beta, Trading Volume, and Sales-To-Price in Taiwan. International Review of Financial Analysis, 7, 1-18.

Tanik, M. (2006). An Application of Financial Asset Pricing Model and the Istanbul Stock Exchange. Unpublished Master's Thesis, Nigde University Institute of Social Sciences.

Temizkaya, Ü.B. (2006). Capital Asset Pricing Model and the Istanbul Stock Exchange, Unpublished Master's Thesis, Marmara University Institute of Social Sciences.