The current issue and full text archive of this journal is available at
www.emeraldinsight.com/0307-4358.htm

Testing the relation between beta and returns in the Athens stock exchange

Nikolaos G. Theriou, Vassilios P. Aggelidis and Dimitrios I. Maditinos
Department of Business Administration, School of Business and Economics, Kavala Institute of Technology, Kavala, Greece, and
Željko Šević
The Business School, Glasgow Caledonian University, Glasgow, UK

Abstract

Purpose – The purpose of this paper is to examine the relationship between beta and returns in the Athens stock exchange (ASE), taking into account the difference between positive and negative market excess returns' yields.

Design/methodology/approach – The data were taken from DataStream database and the sample period consists of 12 years divided into four six-year periods such that the test periods do not overlap. Regression analysis is applied, using both the traditional (unconditional) test procedure and the conditional approach.

Findings – The estimation of return and beta without differentiating positive and negative market excess returns produces a flat unconditional relationship between return and beta. However, when using the conditional capital asset pricing model (CAPM) and cross-sectional regression analysis, the evidence tends to support the significant positive relationship in up market and a significant negative relationship in down market.

Research limitations/implications – The small number of listed companies in the ASE led to the inclusion of the financial and insurance companies in the sample, and to the formation of a small number of portfolios. The same research methodology could be applied to individual stocks of the ASE and with the exclusion of all financial companies.

Originality/value – The results tend to support the existence of a conditional CAPM relation between risk and realized return trade-off.

Keywords Greece, Stock exchanges, Capital asset pricing model, Portfolio investment, Rate of return

Paper type Research paper

1. Introduction

The capital asset pricing model (CAPM) has become one of the main tools in the analysis of the risk-return trade-off of assets and can be considered as a contribution of academic research to finance. It asserts that the return for any asset is a positive function of only one variable, its market beta, or the systematic risk, which can be defined as the covariance of an asset's return and the market return (Black, 1972; Lintner, 1965; Sharpe, 1964). The main implication of the CAPM is the mean-variance efficiency of the market portfolio. The efficiency of the market portfolio implies that a positive linear relationship between *ex ante* expected returns and market beta exists, and that there are no other variables except the market beta that can have power in the examination of the time series and the cross-sectional tests of asset returns (Alexander *et al.*, 2001).

This paper has been presented at the Second International Conference on Accounting and Finance in Transition (ICAFT 2004) held at the Kavala Institute of Technology, Kavala, Greece, from 9 to 11 July 2004.

Managerial Finance
Vol. 36 No. 12, 2010
pp. 1043-1056

0307-4358
DOI 10.1108/03074351011088441

Though initial empirical studies supported the CAPM (Fama and MacBeth, 1973; Black *et al.*, 1972), there are empirical variables e.g. the market value of equity ratio (MVE), the earnings to stock price ratio (E/P), and the book-to-market equity ratio that had explanatory power greater than the beta of the market (Banz, 1981; Basu, 1983; Lakonishok and Shapiro, 1984; 1986; Rosenberg *et al.*, 1985).

Ross's (1976) arbitrage pricing theory (APT) commenced a new family of models which have tried to verify that beta is not the only component that could measure the systematic risk or undiversified of stock returns and other securities, e.g. the macroeconomic APT showed that there are many different variables that have an effect on stock returns (Chen *et al.*, 1986; Chen and Jordan, 1993).

The CAPM studies attempted to test for an unconditional, systematic, and positive trade-off between average returns and beta, but failed to take into account the fact that the relationship between realized returns and beta is conditional on the relationship between the realized market returns and the risk-free rate.

Pettengill *et al.* (1995) developed a conditional relationship between beta and realized returns by separating periods of positive and negative market excess returns. Using US stock market data in the period 1936-1990, they found a significant positive relationship between beta and realized returns when market excess returns are positive and a significant negative relationship between beta and realized returns when market excess returns are negative. This significant relationship is also found when data are divided by months in a year. Furthermore, they found support for a positive risk-return relationship.

The aim of the current study is to determine whether beta has a role to play in explaining cross-sectional differences in the returns of the general Greek index. The main purpose of this paper is to examine whether the conditional relationship between beta and returns, which has been shown to exist in developed markets, like the USA (Pettengill *et al.*, 1995), UK (Fletcher, 1997), Brussels (Crombez and Vennet, 1997), Japan (Hodoshima *et al.*, 2000), Germany (Elsas *et al.*, 2003), and Switzerland (Isakov, 1999), holds for the Athens stock exchange (ASE) too. It tries to verify whether coefficient beta is an important measure of systematic risk. There will also be a try of observing a symmetrical relation between return and beta in up and down markets. Pettengill *et al.* (1995) support this notion of symmetry in up and down markets, while Fletcher (1997) had different results in his research in the UK, i.e. the slope equality hypothesis was rejected in comparison to Pettengill *et al.* (1995).

The methodology follows an applied research procedure and has a positivist explanatory form as it is focused on causal relationships between returns and systematic risk.

Next section covers the literature review of the relation between beta and returns. In the subsequent sections the data collection is presented and there is a detailed analysis on the time-series data. In the last section there is a presentation of the conclusions from the data analysis and the limitations of the study. Finally, there are proposals for future research on the risk-return trade-off.

2. Literature review

The empirical evidence to date on the CAPM has been mixed. While the results of many studies, particularly those of the earlier classical work of Black *et al.* (1972) and Fama and MacBeth (1973), support the CAPM, some researchers, such as Fama and French (1992), report an inconsistent or a flat relationship between returns and beta.

The findings for non-US studies are also inconclusive. For example, studies for France (Hawawini *et al.*, 1983) and Japan (Hawawini, 1991; Chan *et al.*, 1991) point to a positive relationship between returns and beta, but the empirical findings in Canada (Calvet and Lefoll, 1989), Belgium (Hawawini *et al.*, 1989), Finland and Sweden (Ostermark, 1991), the UK (Corhay *et al.*, 1987; Chan and Chui, 1996), Singapore (Wong and Tan, 1991), Hong Kong (Cheung and Wong, 1992; Ho *et al.*, 2000a; b), and Korea and Taiwan (Cheung *et al.*, 1993) suggest either no relationship or an inconsistent relationship between returns and market risk.

In 1974, Levy made a suggestion regarding the computation of betas for bull and bear markets separately. This concept was originally tested by Fabozzi and Francis (1977). They estimated betas over the bull and bear markets and the results showed no sign of beta instability. After a short time, Fabozzi and Francis (1978) came to some interesting empirical results and suggested that the downside risk, which is measured by the beta reflecting the bear market, is a more valid measure of portfolio risk than the single beta of the standard version of the model.

Kim and Zumwalt (1979) examined the variation in the returns of portfolios in up and down markets. They suggested that an up market is the market for those months where the market return exceeds:

- the mean of the market return;
- the mean of the risk-free rate e.g. measured by a three-month government treasury bill rate; or
- it is zero.

The alternative holds for the down market. Their results showed similarities with Fabozzi and Francis (1978), as Kim and Zumwalt (1979) found that the downside risk is a more valid measure of risk than the standard single beta. Chen (1982) also found the same results regarding the significance of downside risk.

Further, Pettengill *et al.* (1995) suggested that when realized returns are used in an analysis, the relationship between the systematic risk and the expected returns is conditional on the excess return of the market. The model employed in their research in order to complete the cross-sectional analysis was the following:

$$R_{it} = a_{0t} + a_{1t}Db_{it} + a_{2t}(1 - D)b_{it} + e_{it}$$

where $D = 1$, if $(R_{mt} - R_{ft}) > 0$ (the market excess return is positive) and $D = 0$, if $(R_{mt} - R_{ft}) < 0$ (the market excess return is negative).

This cross-sectional regression and the subsequent test of the mean of the coefficients estimated in the monthly regressions can be interpreted as a test of two joint hypotheses. The hypothesis that there is a positive relationship between beta and realized return is tested jointly with the hypothesis that the average market risk premium is positive. One important explanation for this result lies in the fact that realizations of the market risk premium are often negative even if the expected, or *ex ante*, risk premium is positive. An *ex post* formulation of the CAPM predicts that stocks with a higher beta have higher returns only when the market return is higher than the return of the riskless asset. If the market return falls short of the riskless rate, stocks with a higher beta have lower returns. Pettengill *et al.* (1995) call this the conditional (*ex post*-) relation between beta and return.

They modify the Fama and MacBeth (1973) test procedure in a way that takes the conditional nature of the relation between beta and return into account. Their empirical results support the conclusion that there is a positive and statistically significant relationship between beta and realized returns. The idea underlying the modified test approach of Pettengill *et al.* (1995) rests on the distinction between the *ex ante* CAPM and its *ex post* representation used for empirical tests. A crucial difference between these formulations is the fact that the expected market risk premium is always positive *ex ante* whereas the realizations of the risk premium may be, and often are, negative. Their empirical results, based on estimations conditional on the sign of the market excess returns, indicate that betas and returns are positively related in the US capital market. This conditional positive relationship is observed in the UK (Fletcher, 1997), Germany (Elsas *et al.*, 2003), Brussels (Crombez and Vennet, 1997), and Taiwan (Jagannathan and Wang, 1996) as well.

More recent studies attempt to answer whether the standard CAPM can be applied to emerging capital markets in order to estimate the cost of equity capital in these markets. Since the individual emerging market has its unique market structure, institutional background, history, level of the market integration, local risk-free return, etc., the answer may differ across countries. Karacabey (2001) studies the beta-return relationship in the Istanbul stock exchange and shows that only the conditional relationship holds. Thus, beta is still a useful risk measure in this emerging market. Estrada (2001) gives evidence that the cross-section of returns in emerging markets can only be explained by "downside risk" measures as the semideviation of the means. The semideviation method uses negative deviations from a benchmark return such as the mean return of the asset or a specified target mean. Thus, downside risk defines risk as volatility below the benchmark (Nawrocki, 1999; Sortino and Meer, 1991). One of the advantages of the downside risk approach is that a desired benchmark return can be chosen, and the investors care more about downside than upside risk. Estrada (2001) points out that for skewed distributions the semideviation is a more appropriate risk measure.

The ASE for a number of years has been characterized as an emerging market and has attracted international interest. During the past 15 years it has entered a period of new structural reforms and development. As a result, the market has become potentially more efficient and competitive. The number of listed companies increased significantly, market liquidity improved, and structural and legislative reforms provided for a modern and adequate regulatory framework. The ASE contains two market segments, the "main" and the "parallel market". The main market primarily includes larger firms with higher equity capital and operating profits. In contrast, the parallel market, typically, include firms with lower equity capital, smaller scale of operation, and lower profits.

There has been limited research on the behaviour of stocks traded on the ASE. Papaioannou (1982, 1984) reports price dependencies in stock returns for a period of at least six days. Panas (1990) provides evidence of weak-form efficiency for ten large Greek firms. Koutmos *et al.* (1993a, b) find that an exponential generalized ARCH model is an adequate representation of volatility in weekly Greek stock returns. Barkoulas and Travlos (1998) test whether Greek stock returns are characterized by deterministic non-linear structure (chaos).

Papaioannou and Philippatos (2000) examined the impact of non-synchronous trading on the beta estimates of the market model using Greek stock market returns. Niarchos and Georgakopoulos (1986) found that the Greek stock prices respond very slowly to new information and conclude that the Greek market is not efficient.

Diacogiannis and Diamandis (1997) examined the effect of the price/earnings (P/E) ratio and the dividend yield (DY) on expected returns of ASE common stocks for the period 1990-1995. They found that P/E is statistically significant variable explaining the cross-section variation of expected returns, while the explanatory power of DY was documented rather weak.

Karanikas (2000) examined the role of size, book-to-market ratio and DYs on average stock returns in the ASE for the period from January 1991 to March 1997. He followed the Fama and MacBeth's (1973) cross-sectional regression methodology enhanced with Shanken's (1985) adjustments for the error in variables (EIV) problem. He found that a statistically significant positive relationship exists between book-to-market ratio, DYs, and average stock returns. He also found that the market capitalization variable ("size effect") does not seem to explain a significant part of the variation in average returns.

Theriou *et al.* (2005a, b) found that β cannot explain cross-section variations of average returns of the ASE non-financial firms, for the period from July 1993 to June 2001, even when beta is the only explanatory variable. More, it was found that both size and book-to-market variables can explain excess returns, although the predictive power of these models were increasing significantly when beta coefficient was also included in the model as one more independent variable.

Niarchos and Alexakis (2000) investigated whether it is possible to predict stock market returns with the use of macroeconomic variables in the ASE for the period from January 1984 to December 1995 on a monthly base, using cointegration analysis and as explanatory variables some macroeconomics factors. Based on their outcoming results, they statistically rejected the efficient market hypothesis and they noted the statistical significance of the lagged returns, which suggest that the monthly returns in the ASE are positively correlated. The above findings cannot be explained as a thin trading effect or as non-synchronous trading effect because of the monthly time interval used in the investigation.

Finally, Theriou *et al.* (2004) examined the determinants of stock returns in ASE using two frameworks, the classical unconditional CAPM and the statistical APT model. They found that, over the period January 1987-December 2001, unconditional CAPM had poor overall explanatory power, whereas the APT model, which allowed multiple sources of systematic risks to be taken into account, performed better than the CAPM, in all the tests considered. Moreover, few years later (2005) they performed the same study, using the framework of conditional CAPM (Pettengill *et al.*, 1995). Their findings tended to support significant positive relationship in up market and a significant negative relationship in down market (Theriou *et al.*, 2005a, b).

In summary, emerging markets have proved extremely attractive over the last ten years to international investors hoping to benefit from abnormal returns as well as portfolio risk diversification (Harvey, 1995), and therefore the extent to which cross-sectional return behaviour matches that of more developed markets is of particular interest. However, studies of such markets present a number of problems, ranging from the availability of suitable data on the one hand to methodological problems on the other. The few studies that have been conducted on this market have focused on the dynamic behaviour of Greek stock prices, the market's informational efficiency, or the reaction to announcements such a rights issues (e.g. Koutmos *et al.*, 1993a, b; Karathanassis and Patsos, 1993; Tsangarakis, 1996; Barkoulas and Travlos, 1998; Phylaktis *et al.*, 1999; Barkoulas *et al.*, 2000; Papaioannou *et al.*, 2000).

3. Data and methodology

Our data are daily closing prices of the common stocks traded in the ASE. They are row prices in the sense that they do not include dividends but are adjusted for capital splits and stock dividends. The data were taken from Datastream database.

The market return is obtained from the ASE composite (general) share price index. Time series of excess returns on the market and individual securities are taken over the three-month government treasury bill rate, which is considered to be the short-term interest rate (risk-free interest rate).

Daily returns are calculated using the logarithmic approximation:

$$R_{i,t} = \log(P_{i,t}/P_{i,t-1}) \tag{1}$$

where $P_{i,t}$ is the closing price of day t for asset i.

Then daily returns are aggregated to compose the monthly returns that are the input of our investigation.

The sample period for our study extends from 1991 to 2002 (see Table I). The 12 years of our sample period are divided into four six-year periods such that the test periods do not overlap.

Each six-year period is then subdivided into a two-year portfolio formation period, a two-year estimation period, and a two-year test period. Securities are included in a six-year period sample if they have a complete price relative history (no missing values and no suspensions) in that period.

In the "formation period" the excess returns ($R_{i,t} - R_{f,t}$) of each security are estimated from a time series of returns of ASE listed stocks and the market premium ($R_{m,t} - R_{f,t}$). Then the excess returns (dependent variable) are regressed on the market premium (independent variable). The outputs of the regressions are the beta coefficients of the individual shares. The formula used for the above estimation is the following:

$$R_{i,t} - R_{f,t} = (R_{m,t} - R_{f,t})\beta_i \tag{2}$$

where $R_{i,t}$ is the average monthly returns of the security i (dependent variable), $R_{f,t}$ is the risk-free interest rate and R_{mt} is the average monthly return of the market (independent variable).

Based on these beta estimates the stocks are sorted into 15 equally weighted portfolios. Portfolio 1 contains the stocks with the highest beta, portfolio 15 the stocks with the lowest beta.

In the "estimation period" the portfolios' betas are estimated by taking the average of the betas of the stocks assigned to that portfolio, which are estimated using the second two-year period (as explained in Fama and MacBeth (1973), this calculation of beta corrects the phenomenon known as reversion to the mean).

In the "testing period", using the third two-year period, the portfolios' excess returns are estimated by averaging the excess returns of the stocks of each portfolio. Then monthly portfolio excess returns are regressed on the portfolio betas. The number of observations in the cross-sectional regressions is equal to the number of portfolios.

Then regression analysis is applied, using both the traditional (unconditional) test procedure and the conditional approach.

Portfolio formation period	Estimation period	Test period
1/1991-12/1992	1/1993-12/1994	1/1995-12/1996
1/1993-12/1994	1/1995-12/1996	1/1997-12/1998
1/1995-12/1996	1/1997-12/1998	1/1999-12/2000
1/1997-12/1998	1/1999-12/2000	1/2001-12/2002

Table I.
Separation of the sample period

Traditional test:

$$R_{pt} = \widehat{\gamma}_{0t} + \widehat{\gamma}_{1t} * \beta_{pt} + \varepsilon_{pt} \quad \mathrm{p} = 1, \ldots, \mathrm{N} \quad \mathrm{t} = 1, \ldots, \mathrm{T} \tag{3}$$

where R_{pt} is the portfolios excess return estimated in the third step, β_{pt} is the portfolios beta estimate in the second step, ε_{pt} denotes an error term with $\mathrm{E}(\varepsilon_{pt}) = 0$ and N and T are the number of portfolios and observations, respectively.

Conditional approach:

$$R_{pt} = \widehat{\gamma}_{0t} + D_t{}^* \widehat{\gamma}_{2t}{}^* \beta_{pt} + (1 - D_t)^* \widehat{\gamma}_{3t}{}^* \beta_{pt} + \varepsilon_{pt} \quad \mathrm{p} = 1, \ldots, \mathrm{N} \quad \mathrm{t} = 1, \ldots, \mathrm{T} \tag{4}$$

where D_t a dummy variable which takes on the value 1 [0] if the market risk premium in the month under consideration is positive [negative].

Discarding the earliest two years of data and adding two new years this three-step procedure of six years is repeated. This procedure was used by Lakonishok and Shapiro (1984) and is very similar to the 5-5-5 procedure used by Pettengill *et al.* (1995).

Finally, the coefficients estimated in the cross-sectional regressions were averaged and hypothesis tests are based on these averages.

The main objective of this study is to examine the conditional relationship between beta and return. Pettengill *et al.* (1995) argued that studies focusing on the relationship between return and beta need to take account of the fact that *ex post* returns have been used in the tests and not *ex ante* returns. When realized returns are used, a conditional relationship between beta and return should exist. This occurs, as there must be some probability where investors expect that the realized return on a low beta portfolio should be greater than the return on a high beta portfolio. This is because no investor would hold the low beta portfolio if this was not the case. Pettengill *et al.* (1995) assumed that this occurs when the market return is lower than the risk-free return, which, they suggested, is implied by the excess returns market model. The implication of this is that there should be a positive relationship between beta and return when the excess market return is positive, and a negative relationship when the excess market return is negative.

To test the conditional relationship, the sample period was divided into up market months and down market months for all the months. The hypotheses, predicted by Pettengill *et al.* (1995) are:

$$\begin{aligned} \mathrm{H}_0 &: \bar{\gamma}_2 = 0 \\ \mathrm{H}_a &: \bar{\gamma}_2 > 0 \\ \mathrm{H}_0 &: \bar{\gamma}_3 = 0 \\ \mathrm{H}_a &: \bar{\gamma}_3 < 0 \end{aligned}$$

where $\widehat{\gamma}_2$ and $\widehat{\gamma}_3$ are the average values of the coefficients $\widehat{\gamma}_{2t}$ and $\widehat{\gamma}_{3t}$. These can be tested by the standard t tests of Fama and MacBeth (1973).

Hence, given the time series of γ_i we could test the implications using a standard t-test.

Defining ω as the t-statistic, we have:

$$\omega(\widehat{\gamma}_i) = \frac{\widehat{\gamma}_i}{\sqrt{T}\ {}^* s(\gamma_i)}$$

where T is the number of months in the period, which is also the number of the estimates γ_i used to compute the mean $\widehat{\gamma}_i$ and the standard deviation $s(\gamma_i)$ of γ_i.

Pettengill *et al.* (1995) pointed out that the above conditional relationship does not guarantee a positive risk-return trade-off. They stated that two conditions are necessary for a positive trade-off between risks and return:

(1) the excess market return should be positive on average; and

(2) the risk premium in up markets and down markets should be symmetrical.

The symmetrical relationship can be tested by the following hypothesis:

$$H_0 : \bar{\gamma}_2 - \bar{\gamma}_3 = 0$$

This can be tested by a two-population t tests, but the sign of the $\widehat{\gamma}_{3t}$ coefficients needs to be reversed and the average value recalculated.

4. Results

The statistics in Table II give some insights into the characteristics of the "up" and "down" market periods during the 96-month test period from January 1995 to December 2002. It is observed that there are significant positive (8.05 per cent per month) and negative (−6.07 per cent per month) rewards for bearing market risk during the "up" and "down" market periods, respectively. This could imply that the relationship between realized returns and beta is conditional on market situations. Whilst the evidence indicates a marginally negative compensation (−0.4 per cent per month) for holding the market portfolio during the entire test period, this does not necessarily mean that a negative relationship exists between beta and returns.

Furthermore, the existence of a large number of negative excess market return periods suggests that all previous studies that tested for an unconditional positive correlation between beta and realized returns were biased in finding a systematic relationship. They should have employed, as Pettengill *et al.* (1995) did, the segmentation process of the period under examination in "up" and "down" market periods.

Table III presents the results for both the full sample and the two subperiods of equal length (48 months). The coefficients estimated in the monthly cross-sectional regressions are averaged. Then, a t-test is used to determine whether the mean of the coefficient is

Table II.
Average monthly excess market returns

		All months		Up markets		Down markets	
Full sample 1995-2002	*Number of months*	96		41		55	
	Excess market return	−0.04%		8.05%		−6.07%	
		T-statistics	*p-value*	*T-statistics*	*p-value*	*T-statistics*	*p-value*
		−0.042	0.96	7.174	0.000	−7.828	0.000
Period 1 1995-1998	*Number of months*	48		22		26	
	Excess market return	1.34%		8.97%		−5.11%	
		T-statistics	*p-value*	*T-statistics*	*p-value*	*T-statistics*	*p-value*
		0.913	0.65	4.75	0.000	−4.37	0.000
Period 2 1999-2002	*Number of months*	48		19		29	
	Excess market return	−1.42%		6.97%		−6.938%	
		T-statistics	*p-value*	*T-statistics*	*p-value*	*T-statistics*	*p-value*
		−1.15	0.5	6.65	0.000	−6.75	0.00

significantly different from zero. The results for an unconditional relationship between beta and realized returns are, as expected, not significant and are consistent with Fama and French (1992) and many other studies that document no statistical significant relation between beta and return. According to the CAPM, $\widehat{\gamma}_1$ should equal the expected excess return on the market portfolio and since the investors are risk averse it should be positive. For the overall period and one of the two subperiods average $\widehat{\gamma}_1$ is negative and only in the second subperiod becomes positive, but none of them is statistically significant. Sequentially, the null hypothesis of no relation between beta and returns cannot be rejected for both the full sample and the subperiods.

The main propose of this paper is to examine the conditional relation between beta and returns. Thus, the second step is to run the regression Equation (4) that takes under consideration the conditional nature between beta and returns.

Table IV presents the results of the overall sample period and the two subperiods, separately for the up (positive) and the down (negative) market periods.

The mean value of $\widehat{\gamma}_2$ during the up markets (positive market excess returns) is 3.76 per cent for the full sample, 5.3 per cent for the first subperiod, and 1.8 per cent for the second subperiod. The values for the overall period and the first period are significant at the 0.05 level while the value of the second subperiod is insignificant.

The mean value of $\widehat{\gamma}_3$ during down markets (negative market excess returns) is −3.08 per cent for the full sample, −5.89 per cent for the first subperiod, and

Period	$\widehat{\gamma}_1$	T-statistics	p-value
Full sample 1995-2002	−0.00155	−0.142	0.888
Period 1 1995-1998	−0.00721	−0.5265	0.601
Period 2 1999-2002	0.00410	0.2368	0.814

Notes: The slope coefficient estimates from the unconditional cross-sectional regression $R_{p,t} = \gamma_{0,t} + \gamma_{1,t}\beta_p + \varepsilon_{p,t}$ were averaged over the indicated periods. The third column reports the t-statistics and the fourth column reports the corresponding p-value for a t-test of the null hypothesis that the mean is zero

Table III.

Period	Positive market risk premium $\widehat{\gamma}_2$		Negative market risk premium $\widehat{\gamma}_3$		Symmetry H_o: $\widehat{\gamma}_2 - \widehat{\gamma}_3 = 0$	
Full sample 1995-2002	0.0376		–0.03082			
	T-statistics	*p-value*	*T-statistics*	*p-value*	*T-statistics*	*p-value*
	2.479	0.017	–2.1420	0.036	3.23	0.001
Period 1 1995-1998	0.053		–0.05891			
	T-statistics	*p-value*	*T-statistics*	*p-value*	*T-statistics*	*p-value*
	3.533	0.002	–3.69699	0.001	5.14	0.000
Period 2 1999-2002	0.018		–0.0056			
	T-statistics	*p-value*	*T-statistics*	*p-value*	*T-statistics*	*p-value*
	0.689	0.500	–0.251	0.804	0.632	0.530

Notes: The slope coefficient estimates from the conditional cross-sectional regression $R_{p,t} = \gamma_{0,t} + \gamma_{2,t}D_t\beta_p + \gamma_{3,t}(1 - D_t)\beta_p\varepsilon_{p,t}$ were averaged over the indicated periods. T-statistics and p-values are reported for a t-test of the null hypothesis that the mean is zero

Table IV.

−0.56 per cent for the second subperiod. The values for the overall period and the first period are significant at the 0.05 level, while the value of the second subperiod is insignificant.

The results show that there is a statistically significant relation between beta and return only in the first subperiod and the full sample period. The coefficient means have the expected signs in the full sample and all the subperiods. Stocks with higher betas have higher returns when the market risk premium is positive and lower returns when the market risk premium is negative. Thus, the results of the conditional test tend to support the prediction of CAPM that betas are related to the realized returns. However, they do not satisfy Pettengill *et al.*'s (1995) first condition that the excess market returns should be positive on average.

Furthermore, Pettengill *et al.* (1995) argue that the results indicating a systematic conditional relation between beta and returns do not guarantee a positive risk-return trade-off. In order to examine this positive risk-return trade-off, there must be tested whether the risk premium is symmetrical in both up and down markets, i.e. $H_o: \overline{\gamma}_2 - \overline{\gamma}_3 = 0$. The last column of Table IV reports the results of this test. The hypothesis that the relation between beta and return in up and down market is symmetrical is accepted for the overall period and the first subperiod. This is consistent with Fletcher's (1997) and inconsistent with Pettengill's *et al.*'s (1995) results.

5. Conclusions

The existence of a large number of negative excess market return periods, suggests that previous studies that tested for an unconditional positive correlation between beta and realized returns were biased in finding a systematic relationship. They should have employed the segmentation process of the period under examination in up and down market periods.

The results of the present study, for an unconditional relationship between beta and realized returns, are, as expected, not significant and consistent with the findings of Fama and French (1992) that document, among others, no significant positive relationship between risk and return.

However, when the conditional nature between beta and returns is taken into consideration, the results prove the existence of a statistically significant relation between beta and return: stocks with higher betas have higher returns, when the market risk premium is positive, and lower returns when the market risk premium is negative. Thus, the results of the conditional test support, partly, the prediction of CAPM that betas are related to the realized returns. Although these results indicate a systematic conditional relation between risk and returns, they do not guarantee a positive risk-return trade-off. For such a positive relation to hold, two conditions are necessary:

(1) the excess market return should be positive on average; and
(2) the risk premium in up and down markets should be symmetrical.

Examining the conditions in order to support the conditional relation between risk and realized returns, and guarantee a positive risk-return trade-off, we found the following:

- Concerning the first subperiod (1995-1998) conditional relations between realized returns and risk, as well as, symmetry are all statistically significant (Table IV). Additionally, the average excess market return is positive (Table II).
- Concerning the second subperiod (1999-2002), there is a conditional relation between realized returns and risk but not statistically significant (Table IV).

Also, none of the two necessary conditions hold, because symmetry is not statistically significant (Table IV), and the average excess market return is negative (Table II). These results are quite logical for the ASE, during this specific period, because of the existence of the "bubble" effect.

- Concerning the overall period (1995-2002), conditional relations between returns and risk, as well as, symmetry, are all statistically significant (Table IV). However, the average excess market return is negative (Table II).

In summary, the conclusions drawn from our results tend to support the existence of a conditional CAPM relation between risk and realized return trade-off. However, the support of this relation is not 100 per cent sure, because one of the conditions of Pettengill, i.e. the existence of positive average excess market return, does not hold in the case of ASE during the whole period under examination.

Limitations of the study

The present study has several limitations:

- ASE is a relatively small institution with a small number of listed companies. This limitation led to the inclusion of the financial and insurance companies in our sample too, knowing that the expected high leverage in these firms do not have the same value as for the non-financial firms, where it is likely the indicator of financial distress. This limitation also led to the formation of a small number of portfolios (ten in total, instead of 20 or 30). Thus, the small number of portfolios does not give us much confidence in estimating beta coefficients, because of the possible arise of the EIV problem.
- In calculating beta coefficients, the existence of high volatility of beta is noticed between different periods. Thus, instead of using only two years' period for the estimation of betas, it should be better to expand this period to four or five years, like in the Fama-MacBeth (1973) two pass methodology.

Further research

The same research methodology, described in the present study, should be applied to individual stocks of ASE, without the formation of portfolios, and with the exclusion of all financial companies.

References

Alexander, L.G., Sharpe, F.W. and Bailey, V.J. (2001), *Fundamentals of Investments*, Pearson Education, Upper Saddle River, NJ.

Banz, R.W. (1981), "The relationship between return and market value of common stocks", *Journal of Financial Economics*, Vol. 9 No. 1, pp. 3-18.

Barkoulas, J.T. and Travlos, N.G. (1998), "Chaos in an emerging capital market? The case of the Athens stock exchange", *Applied Financial Economics*, Vol. 8, pp. 231-43.

Barkoulas, J.T., Baum, C.F. and Travlos, N.G. (2000), "Long memory in the Greek stock market", *Applied Financial Economics*, Vol. 10, pp. 177-84.

Basu, S. (1983), "The relationship between earnings yield, market value, and return for NYSE common stocks: further evidence", *Journal of Financial Economics*, Vol. 12 No. 1, pp. 51-74.

Black, F. (1972), "Capital market equilibrium with restricted borrowing", *Journal of Business*, Vol. 45 No. 3, pp. 444-55.

Black, F., Jensen, M.C. and Scholes, M. (1972), "The capital asset pricing model: some empirical tests", in Jensen M. (Ed.), *Studies in the Theory of Capital Markets*, Praeger Publishers, New York, NY, pp. 79-121.

Calvet, A. and Lefoll, J. (1989), "Risk and return on Canadian capital markets: seasonality and size effects", *Finance*, Vol. 10, pp. 21-39.

Chan, A. and Chui, A.P.L. (1996), "An empirical re-examination of the cross-section of expected returns: UK evidence", *Journal of Business Finance and Accounting*, Vol. 23 Nos. 9/10, pp. 1435-52.

Chan, L.K.C., Hamao, Y. and Lakonishok, J. (1991), "Fundamentals and stock returns in Japan", *Journal of Finance*, Vol. 46 No. 5, pp. 1739-64.

Chen, N.F., Roll, R. and Ross, S.A. (1986), "Economic forces and the stock market", *Journal of Business*, Vol. 59 No. 3, pp. 383-403.

Chen, S.J. and Jordan, B.D. (1993), "Some empirical tests in the arbitrage pricing theory: macrovariables vs. derived factors", *Journal of Banking and Finance*, Vol. 17 No. 1, pp. 65-89.

Chen, S.N. (1982), "An examination of risk-return relationship in bull and bear markets using time-varying security betas", *Journal of Financial and Quantitative Analysis*, Vol. 17 No. 2, pp. 265-86.

Cheung, Y. and Wong, K. (1992), "An assessment of risk and returns: some empirical findings from the Hong Kong stock exchange", *Applied Financial Economics*, Vol. 2, pp. 105-14.

Cheung, Y., Wong, K. and Ho, Y. (1993), "The pricing of risky assets in two emerging Asian markets – Korea and Taiwan", *Applied Financial Economics*, Vol. 3, pp. 315-24.

Corhay, A., Hawawini, G. and Michel, P. (1987), "The pricing of equity on the London stock exchange: seasonality and size premium", in Dimson, E. (Ed.), *Stock Market Anomalies*, Cambridge University Press, Cambridge, pp. 197-212.

Crombez, J. and Vander Vennet, R. (1997), "The performance of conditional betas on the Brussels stock exchange", working paper, Department of Financial Economics, University of Gent.

Diacogiannis, G.P. and Diamandis, F.P. (1997), "Multi-factor risk-return relationships", *Journal of Business Finance and Accounting*, Vol. 24 Nos 3/4, pp. 559-71.

Elsas, R., El-Shaer, M. and Theissen, E. (2003), "Beta and returns revisited – evidence from the German stock market", *Journal of International Financial Markets, Institutions and Money*, Vol. 13 No. 1, pp. 1-18.

Estrada, J. (2001), "The cost of equity in emerging markets: a downside risk approach", *Emerging Market Quarterly*, Fall, pp. 19-30.

Fabozzi, F.J. and Francis, J.C. (1977), "Stability tests for alphas and betas over bull and bear market conditions", *The Journal of Finance*, Vol. 32 No. 4, pp. 1093-9.

Fabozzi, F.J. and Francis, J.C. (1978), "Beta as a random coefficient", *Journal of Financial and Quantitative Analysis*, Vol. 13 No. 1, pp. 101-16.

Fama, E. and French, K. (1992), "The cross-section of expected stock returns", *Journal of Finance*, Vol. 47 No. 2, pp. 427-65.

Fama, E. and MacBeth, J. (1973), "Risk, return, and equilibrium: empirical tests", *Journal of Political Economy*, Vol. 81 No. 3, pp. 607-36.

Fletcher, J. (1997), "An examination of the cross-sectional relationship of beta and return: UK evidence", *Journal of Economics and Business*, Vol. 49 No. 3, pp. 211-21.

Harvey, C.R. (1995), "Predictable risk and returns in emerging markets", *Review of Financial Studies*, Vol. 8 No. 3, pp. 773-816.

Hawawini, G.A. (1991), "Stock market anomalies and the pricing of equity on the Tokyo stock exchange", in Ziemba, W.T., Bailey, W. and Hamao, Y. (Eds), *Japanese Financial Market Research*, Elsevier, Amsterdam, pp. 231-50.

Hawawini, G., Michel, P. and Corhay, A. (1989), "A look at the validity of the capital asset pricing model in light of equity market anomalies: the case of Belgian common stocks", in Guimaraes, R.M.C., Kingsman, B.G. and Taylor, S.J. (Eds), *A Reappraisal of the Efficiency of Financial Markets*, Springer-Verlag, Berlin, pp. 231-50.

Hawawini, G., Michel, P. and Viallet, C. (1983), "An assessment of the risk and return of French common stocks", *Journal of Business Finance and Accounting*, Vol. 10, pp. 333-50.

Ho, R.Y.W., Strange, R. and Piesse, J. (2000a), "An empirical examination of risk, return, and equilibrium in the Hong Kong equity market", *International Review of Economics and Business*, Vol. 47, pp. 625-50.

Ho, R.Y.W., Strange, R. and Piesse, J. (2000b), "CAPM anomalies and the pricing of equity: evidence from the Hong Kong market", *Applied Economics*, Vol. 32, pp. 1629-36.

Hodoshima, J., Garza-Gomez, X. and Kunimura, M. (2000), "Cross-sectional regression analysis of return and beta in Japan", *Journal of Economics and Business*, Vol. 52, pp. 515-33.

Isakov, D. (1999), "Is beta still alive? Conclusive evidence from the Swiss stock market", *European Journal of Finance*, Vol. 5 No. 3, pp. 202-12.

Jagannathan, R. and Wang, Z. (1996), "The conditional CAPM and the cross-section of expected returns", *Journal of Finance*, Vol. 51, pp. 3-53.

Karacabey, A. (2001), "Beta and return: Istanbul stock exchange evidence", working paper series, SSRN, available at: http://ssrn.com/abstract=276229

Karanikas, E. (2000), "CAPM regularities for the Athens stock exchange", *Spoudai*, Vol. 50, pp. 40-57.

Karathanassis, G. and Patsos, C. (1993), "Evidence of heteroscedasticity and mis-specification issues in the market model: results from the Athens stock exchange", *Applied Economics*, Vol. 25, pp. 1423-38.

Kim, K.M. and Zumwalt, J.K. (1979), "An analysis of risk in bull and bear markets", *Journal of Financial and Quantitative Analysis*, Vol. 14 No. 5, pp. 1015-25.

Koutmos, G., Negakis, C. and Theodossiou, P. (1993a), "Stochastic behaviour of the Athens stock exchange", *Applied Financial Economics*, Vol. 3, pp. 119-26.

Koutmos, G., Theodossiou, P. and Negakis, C. (1993b), "The international relation between the US and Greek stock markets: a conditional variance tale analysis", *The International Journal of Finance*, Vol. 5, pp. 492-508.

Lakonishok, J. and Shapiro, A.C. (1984), "Stocks returns, beta, variance and size: an empirical analysis", *Financial Analysis Journal*, July/August, pp. 36-41.

Lakonishok, J. and Shapiro, A.C. (1986), "Systematic risk, total risk and size as determinants of stock market returns", *Journal of Banking and Finance*, Vol. 10, pp. 115-32.

Lintner, J. (1965), "The valuation of risk assets and the selection of risky investments in stock portfolios and capital budget", *Review of Economics and Statistics*, Vol. 47, pp. 13-37.

Nawrocki, D. (1999), "A brief history of downside risk measures", *Journal of Investing*, Fall, pp. 9-25.

Niarchos, N.A. and Alexakis, C.A. (2000), "The predictive power of macroeconomic variables on stock market returns: the case of the Athens stock exchange", *Spoudai*, Vol. 50, pp. 74-86.

Niarchos, N.A. and Georgakopoulos, M.C. (1986), "The effect of annual corporate profit reports on the Athens stock exchange: an empirical investigation", *Management International Review*, Vol. 26, pp. 64-72.

Ostermark, R. (1991), "Empirical evidence on the capital asset pricing model in two Scandinavian stock exchanges", *Omega*, Vol. 19 No. 4, pp. 223-34.

Panas, E. (1990), "The behaviour of the Athens stock prices", *Applied Economics*, Vol. 22, pp. 1715-27.

Papaioannou, G.J. (1982), "Thinness and short-run price dependence in the Athens stock exchange", *Greek Economic Review*, Vol. 4, pp. 315-33.

Papaioannou, G.J. (1984), "Informational efficiency tests in the Athens stock market", in Hawawini, G.A. and Michel, P.A. (Eds), *European Equity Markets: Risk, Return, and Efficiency*, Garland Publishing Inc., New York, NY.

Papaioannou, G.J. and Philippatos, G.C. (2000), "The intervaling effect under non-synchronous trading and price adjustment lags in the Athens stock exchange", *Spoudai*, Vol. 4, pp. 627-39.

Papaioannou, G.J. Travlos, N.G. and Tsangarakis, N.V. (2000), "Valuation effects of Greek stock dividend distributions", *European Financial Management*, Vol. 6, pp. 515-31.

Pettengill, G.N., Sundaram, S. and Mathur, I. (1995), "The conditional relation between beta and returns", *Journal of Financial and Quantitative Analysis*, Vol. 30 No. 1, pp. 101-16.

Phylaktis, K., Kavussanos, M. and Manalis, G. (1999), "Price limits and stock market volatility in the Athens stock exchange", *European Financial Management*, Vol. 5, pp. 69-84.

Rosenberg, B., Reid, K. and Lanstein, R. (1985), "Persuasive evidence of market inefficiency", *Journal of Portfolio Management*, Vol. 11, pp. 9-17.

Ross, S. (1976), "The arbitrage theory of capital asset pricing", *Journal of Economic Theory*, Vol. 13 No. 6, pp. 341-60.

Shanken, J. (1985), "Multivariate tests of the zero-beta CAPM", *Journal of Financial Economics*, Vol. 14, pp. 327-48.

Sharpe, W.F. (1964), "Capital asset prices: a theory of market equilibrium under conditions of risk", *Journal of Finance*, Vol. 19, pp. 425-42.

Sortino, F.A. and Van der Meer, R. (1991), "Downside risk", *Journal of Portfolio Management*, Vol. 17 No. 2, pp. 7-31.

Theriou, N., Aggelidis, V. and Maditinos, D. (2005a), "Testing the relationship between beta and returns in ASE: a second attempt", *Proceedings of the 3rd International Conference on Accounting and Finance in Transition-ICAFT 2005, 13-16th July, University of Greenwich, London*.

Theriou, N., Maditinos, D. and Aggelidis, V. (2004), "Testing the relationship between beta and returns using CAPM and APT: the case of Athens stock exchange", *Proceedings of the 2nd International Conference on Accounting and Finance in Transition-ICAFT 2004, 9-11 July, Kavala*.

Theriou, N., Maditinos, D., Chatzoglou, P. and Anggelidis, V. (2005b), "The cross-section of expected stock returns: an empirical study in Athens stock exchange", *Managerial Finance*, Vol. 31 No. 12, pp. 58-78.

Tsangarakis, N.V. (1996), "Shareholder wealth effects of equity issues in emerging markets: evidence from rights offerings in Greece", *Financial Management*, Vol. 25, Autumn, pp. 21-32.

Wong, K.A. and Tan, M.L. (1991), "An assessment of risk and return in the Singapore stock market", *Applied Financial Economics*, Vol. 1, pp. 11-20.

Further reading

Fletcher, J. (2000), "On the conditional relationship between beta and return in international stock returns", *International Review of Financial Analysis*, Vol. 9 No. 2000, pp. 235-45.

Corresponding author

Nikolaos G. Theriou can be contacted at: ntheriou@teikav.edu.gr