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# Beta and Returns: Istanbul Stock Exchange Evidence

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## Abstract

Recent empirical studies show that beta is not a good measure of risk. These studies test the unconditional relationship between beta and returns. Pettengill et al. (1995) developed a conditional test procedure and showed that there is a conditional relation between beta and returns. This new test is applied to Istanbul Stock Exchange (ISE) data over the period of 1990-2000. Results of the paper showed that there is a conditional relationship between beta and returns, thus beta is still living in Istanbul and can be useful for portfolio managers and investors who want to invest in emerging markets.

## 1. Introduction

The Capital Asset Pricing Model (CAPM) which has been one of the premier models in finance has been widely used in cost of capital estimation and the performance measurement of managed funds. CAPM asserts that (1) there is a positive, linear relationship between the stocks' expected returns and its systematic risk ( $\beta$ ) and (2)  $\beta$  is sufficient to explain the cross section of stock returns. Although substantial criticism has already been raised in the early years of the CAPM, and alternative equilibrium model (Arbitrage Pricing Theory) has been developed, the CAPM remained popular.

Following the study of Fama and French (1992), interest in the CAPM has increased. Fama and French (1992) documented that, there was a flat relationship between return and beta. Most of the recent studies have tended to counter the findings of Fama and French.

Pettengill et al. (1995) argued that the statistical methodology used to evaluate the relationship between beta and return requires adjustment to take account of the fact that realized returns and not ex ante returns have been used in the tests. They developed a conditional relationship between return and beta that depends on whether the excess return on the market index is positive or negative. When the excess return on the market index is positive (negative), there should be a positive (negative) relationship between beta and return. Their empirical results support the conclusion that there is a positive and statistically significant relationship between beta and realized returns.

This paper investigates the evidence for the Istanbul Stock Exchange (ISE). This study can be interesting for two reasons. First, ISE is an emerging market and it should be useful to examine whether the conditional relationship between beta and return, which has been shown to exist in developed markets like US (Pettengill, et al., 95), UK (Fletcher, 1997) or Brussels (Crombez and Vennet, 1997), holds in an emerging market. Moreover, it is a fact that emerging markets are very volatile ones and the ISE is known to be the most volatile of all.

## 2. Methodology

The traditional Fama and MacBeth (1983) two pass regression methodology is used to analyze the unconditional relationship between beta and stock returns. At the first step,  $\beta_i$  is estimated from the regression equation (1).

$$R_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} + \varepsilon_{it}, \quad (1)$$

where  $R_{it}$  is the excess return on asset  $i$  in period  $t$ ,  $R_{mt}$  is the excess return on the market portfolio in period  $t$ ;  $\varepsilon_{it}$  is an IID error term and  $\hat{\beta}_i$  is the estimated beta of asset  $i$ .

In order to test the unconditional relationship a cross sectional regression is estimated each month as

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$$R_{it} = \hat{\gamma}_{0t} + \hat{\gamma}_{1t}\hat{\beta}_i + \mu_{it} \quad (2)$$

The test of the model is then based on the mean of the coefficients of the monthly regressions. According to CAPM  $\bar{\gamma}_0$  should be equal to zero<sup>1</sup> and  $\bar{\gamma}_1$  should be equal to the market excess return. In order to determine whether the unconditional relationship exists or not, the average value of  $\bar{\gamma}_1$  can be tested, to see if it is significantly different from zero.

The mean of the coefficients,  $\bar{\gamma}_1$ , is expected to be positive for months with positive risk premia and negative for months with negative risk premia. If the fraction of months with negative risk premia is sufficiently large, the null hypothesis that there is no relation between beta and return may not be rejected even if such a relation exists in each single month. Because of this problem, months with positive and negative market risk premia must be analyzed separately. This can be achieved by employing the cross-sectional regression (3) with a dummy variable  $D_t$  which takes the value 1 if the market risk premium is positive and 0 when the risk premium is negative:

$$R_{it} = \hat{\gamma}_{0t} + \hat{\gamma}_{1t}D_t\hat{\beta}_i + \hat{\gamma}_{2t}(1 - D_t)\hat{\beta}_i + \varepsilon_{it} \quad (3)$$

$\gamma_1$  is the relevant coefficient in up markets and  $\gamma_2$  – in down markets. The coefficient  $\gamma_1$  ( $\gamma_2$ ) should be equal to the expected value of the market risk premium, conditional on it being positive (negative). Also the mean of  $\gamma_0$  should equal the risk free rate or “0” if the excess returns are used as the dependent variable. Thus the null hypothesis  $\bar{\gamma}_1 = 0$  and  $\bar{\gamma}_2 = 0$  can be tested against the alternative hypothesis  $\bar{\gamma}_1 > 0$  and  $\bar{\gamma}_2 < 0$ . Here  $\bar{\gamma}_1$  and  $\bar{\gamma}_2$  are the average values of the coefficients  $\hat{\gamma}_1$  and  $\hat{\gamma}_2$ .

If the null hypothesis can be rejected in both cases, the results would indicate the existence of a systematic conditional relationship between beta and returns. But Pettengill et al. (1995) argue that the above conditional relationship does not guarantee a positive risk return trade off. Two conditions must be satisfied: (1) the excess market return should be positive on average, and (2) the risk premium in up and down markets should be symmetrical. The symmetrical relationship can be tested by the following hypothesis:

$$H_0 : \bar{\gamma}_1 - \bar{\gamma}_2 = 0.$$

Fletcher (1997) stated that the sign of the  $\hat{\gamma}_2$  coefficients needs to be reversed and the average value recalculated in order to test the symmetry.

### 3. Empirical Evidence

In order to analyze the conditional relationship between beta and return for Istanbul Stock Exchange, 10 years data which contain monthly adjusted price information for securities traded on the ISE from January 1990 to December 2000, are used. The sample excludes the stocks issued after 1998. Thus the sample covers all stocks that have been traded at least 24 months. In order to avoid survivorship bias non-survival stocks have also been included in the analysis. The number of stocks used in the analysis are shown in Table 1.

Table 1

The Number of Stocks Used In The Analysis

YEARS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
NUMBER OF STOCKS	53	81	114	123	141	165	192	216	221	209	200

<sup>1</sup> If rate of returns ( $r_{it}$ ) is used instead of  $R_{it}$   $\gamma_0$  should be equal to risk free rate.

For the first step of the analysis  $\beta_i$  coefficients are estimated from the equation (1). Then the cross section regression (2) is employed to examine the unconditional relationship between beta and return over the whole sample and for three subperiods. Monthly cross sectional regressions were run on stocks excess returns on a constant and the estimated beta for the period from January 1990 to December 2000. Table 2 represents the results both for the full sample and for three subperiods of equal length (44 months). The coefficients estimated in the monthly cross-sectional regressions are averaged. Then, a  $t$ -test to determine whether the mean of the coefficients is significantly different from zero is used.

Table 2

Tests of unconditional beta and return relationship

PERIOD	$\bar{\gamma}_0$		$\bar{\gamma}_1$	
01/90-08/93	-0,0251	(-1,5732)	0,0220	(0,6912)
09/93-04/97	0,0038	(0,2826)	-0,0115	(-0,3857)
05/97-12/00	-0,0101	(-0,5558)	0,0010	(0,0287)
01/90-12/00	-0,0136	(-1,5865)	0,0085	(0,4890)

The coefficients  $\bar{\gamma}_0$  and  $\bar{\gamma}_1$  are the time-series averages of  $\hat{\gamma}_{0t}$  and  $\hat{\gamma}_{1t}$  estimated by using ordinary least squares. The  $t$  statistics (in parantheses) are the Fama and MacBeth (1973)  $t$  statistics (one tail) and test whether the mean values are positive and negative.

The results are consistent with Fama and French (1992) and many other studies that document no significant relationship between beta and return. According to the CAPM,  $\gamma_1$  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 two of the three subperiods, average  $\gamma_1$  is positive but none of them is significant. The null hypothesis of no relation between beta and returns cannot be rejected for the full sample and subperiods.

The main purpose of this paper is to examine the conditional relationship between beta and return. Thus, the second step is to run the regression equation (3) which takes the conditional nature of the relation between beta and return into account. This monthly cross sectional regressions were run on stocks excess returns on a constant and the expected beta conditional on the market excess return for the period from January 1990 to December 2000. Table 3 reports the results of the regression for the overall sample period and three subperiods.

Table 3

Tests of conditional beta and return relationship

PERIOD	$N_1$	$\bar{\gamma}_1$		$N_2$	$\bar{\gamma}_2$		$\bar{\gamma}_1 - \bar{\gamma}_2 = 0$
01/90-08/93	12	0,2661	(9,8480)*	32	-0,0644	(-2,1889)*	(3,8129)*
09/93-04/97	12	0,1848	(5,8966)*	32	-0,0824	(-2,7773)*	(1,9582)
05/97-12/00	16	0,1687	(4,7660)*	28	-0,0698	(-2,6699)*	(2,2628)*
01/90-12/00	40	0,2011	(10,1919)*	92	-0,0723	(-4,4064)*	(4,5513)*

$N_1$  and  $N_2$  are the numbers of up market and down market months of the relative period. The coefficients  $\bar{\gamma}_0$  and  $\bar{\gamma}_1$  are the time-series averages of  $\hat{\gamma}_{0t}$  and  $\hat{\gamma}_{1t}$  estimated using ordinary least squares. The  $t$  statistics (in parantheses) test whether the mean values are positive and negative (one tail). The last column is a  $t$  test of  $\bar{\gamma}_1 - \bar{\gamma}_2 = 0$

\* Significant at 5%.

The results show that there is a statistically significant relation between beta and return both in the full sample and in each of subsamples. The coefficient means have the expected signs. 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 the prediction of CAPM that the betas are related to the realized returns.

Pettengill et al. (1995) argue that the results indicating the existence of a systematic conditional relationship between beta and returns do not guarantee a positive risk return trade off. To examine the positive risk return trade off, the risk premium in up and down markets being symmetrical should be tested. The hypothesis that the relationship between beta and return in up market and down market months is symmetrical is rejected both for the overall sample and for the two of the three subperiods. This is consistent with Fletcher (1997) and inconsistent with Pettengill et al. (1995). The beta and return relationship is found to be stronger in up markets.

According to the results there is a conditional relationship between beta and return in ISE stock returns. In up market periods where market return exceeds the risk free rate, investors could increase their investment performance by investing in high beta stocks or protect themselves by investing in low beta stocks during the down market periods. Thus portfolio managers should take care of beta for their investment decisions. Evidence supports the theory that beta is a good indicator of stocks' behaviour.

#### 4. Conclusions

The beta and return relationship of ISE stocks is examined between January 1990 and December 2000. To analyze unconditional relationship between beta and realized return Fama and MacBeth's cross-section regression model is employed. Consistent with findings for other countries, there is not any evidence of a significant unconditional relationship between beta and stock returns for ISE stocks over the sample period which implies that using beta as a systematic risk measure for asset selection purposes may add little value.

To test the conditional relationship another cross section regression model proposed by Pettengill et al. (1995) is applied. Recent studies employing this model for developed markets have found that conditional relationship between beta and stock returns exist. Consistent with these studies, a conditional relationship between beta and returns for ISE is also found to exist. Beta is strongly related to returns and the relations have the expected sign. Thus, beta is a reliable tool for portfolio management.

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