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Cross-Sectional Variation in Stock Returns due to Leverage in Exchange Istanbul

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Abstract

The objective of this study is to test the existence of leverage premium in Exchange Istanbul during the period 2006 to 2013 by a four-factor asset pricing model. A sample of 470 firms is examined for this purpose. The results provide proof for negative effect of leverage on excess stock returns. However size mimicking portfolios have significant effect on the stock returns there is no evidence of value-effect in Exchange Istanbul. The significant negative relation between excess returns and leverage levels for firms with medium debt ratios after controlling for other risk factors implies a premium for the ability to raise funds for prospective investment projects.

Keywords: leverage, stock returns, exchange Istanbul

1. Introduction

Leverage ratio of a company gives the degree of funding of a firm's activity by owners' funds versus creditors' funds. It is considered as a source of financial risk yet asset pricing models largely ignore it as a risk factor. According to Modigliani and Miller (1958) firm value is independent from its choice of leverage level hence increasing leverage should cause higher risk and so higher required returns. On the other hand Lintner (1956) states that firms have optimal leverage ratios that equates the benefits and costs of debt. Various factors may affect corporate borrowing such as financial distress and bankruptcy costs, agency costs, and benefits from tax shield. Myers' (1977) debt overhang theory which explains the high leverage ratios would reduce the investment in positive NPV projects implies a negative relation between returns and leverage level.

This study includes leverage as a risk factor in an asset pricing model which is an expanded version of Fama-French (1992; 1993) three factor model as a four factor model to see the role of leverage in variation of excess returns in Exchange Istanbul between the years of 2006–2013. By this model it is aimed to test the existence of the leverage premium, the direction of relationship between excess returns and leverage factor in Exchange Istanbul. To the best of our knowledge this is the first study testing the leverage as a risk factor to explain the variations of stock returns in Exchange Istanbul. Findings will elucidate how the capital structure decisions affect the stock returns of firms.

In the following section the literature review after providing an overview of the well-known risk factors in the literature focuses on the role of leverage. The subsequent section describes the four-factor model and presents data. Section 4 and 5 presents empirical results and concluding remarks.

2. Literature Review

There is a vast literature on asset pricing models, which focuses on various risk factors, and also on the relationship between the capital structure and the firm value. However the literature on the link between the capital structure choice and the stock returns is rather limited, especially for emerging markets. Along with the other risk factors debt ratio of a firm can be an expository factor for the variations in stock returns.

The capital asset pricing model (CAPM) explains the variations in stock returns with market factor. CAPM developed by Sharpe—Lintner states that the expected return on a stock is determined by the risk free interest rate and a risk premium (Note 1). In an efficient market the market price is an unbiased estimate of the true value. Hence errors are unbiased; deviations from true value are random. According to CAPM in an efficient market risk adjusted returns of any asset should be equal (Note 2). The differences in returns of financial assets should

be due to the risk premiums.

Researches on asset pricing identify a number of variables that help to explain cross sectional variation in stock returns in addition to the market risk. Existence of explanatory variables other than market risk can be interpreted as a violation of market efficiency. Asset pricing anomaly, which causes abnormal returns, can be defined as the statistically significant difference between the realized return of a portfolio and the return which is predicted by CAPM (Brennan & Xia, 2001). However inclusion of appropriate risk factors may dissipate these abnormal returns. Best known anomalies in the literature are January effect, weekend effect, size effect, book-to-market effect and earnings-to-price ratio. (Basu, 1977; Branch, 1977; Ritter & Chopra, 1989; Lakonishok & Maberly, 1990; Fama & French, 1992; Kim & Burnie, 2002; Brusa, Liu, & Schulman, 2005; Rosenberg, Reid, & Lanstein, 1985; Best, Best, & Yoder, 2000; Griffen & Lemmon, 2002)

Asteriou and Kavetsos (2006) show the existence of January effect in four emerging countries, Hungary, Poland, Romania and Slovakia, out of eight. Ritter and Chopra (1989) reports significant January effect especially for small firms. Kohers and Kohli (1991) report January effect even for large firms in S&P 500 in the period 1930-1988. Lakonishok and Maberly (1990) following Ritter's hypothesis, January effect arises from the individual investors buy and sell decisions, investigate weekend effect and reports that in NYSE trade volume of individual investors increases on Mondays. Brusa et al. (2005) find reverse weekend effect for large firms and traditional weekend effect for small firms with CRSP data.

Fama-French (1992; 1993) showed that cross-sectional variation in stock returns due to characteristics of firms can be explained by a multifactor model. Fama-French three factor model introduces size and value as a risk factor along with the market risk. Criticizing Fama-French, Daniel and Titman (1997) claims that firm characteristics have explanatory power on stock return variation rather than factor loadings.

Loughran (1997) examine NYSE, Amex and Nasdaq securities for book-to-market effect controlling for size, seasonality, and exchange listing. Loughran concludes that for large companies there exists no book-to-market effect. Lev and Sougiannis (1999) focus on science based companies for which R&D capital is related to returns, and show that R&D effect comprises the book-to-market effect. Chui and Wei (1998) study the cross-sectional variation of stock returns in five Pacific-Basin emerging markets (Note 3), and find significant book-to-market effect for Hong Kong, Korea and Malaysia. They report insignificant size effect for Taiwan and significant size effect for the rest of all. Wang (2000) using Compustat and CRSP data, in period 1976–1995, examines survival bias for size effect. Wang states that inclusion of delisted small firms in the analysis mitigates the size effect.

Other than January, weekend, size and book-to-market effect, several departures from Efficient Market Hypothesis (EMH), which can be exploited in order to gain abnormal returns, are reported in the literature. One of the common explanations for departures from the EMH is over or under reaction of investors to new information. For example investors selling stocks that have experienced recent losses or buying stocks that have enjoyed recent gains are overreacting to the performance. Such reactions push prices beyond their fair value. Also overreaction implies contrarian investment strategies, buying "losers" and selling "winners". Stock returns are found to exhibit shorter-term cross-sectional momentum (Jegadeesh & Titman, 1993) which arises from overreaction and long-term cross-sectional reversals (DeBondt & Thaler, 1985) as a result of market corrections in time. DeBondt and Thaler reported that the winners and losers in one 36-month period tend to reverse their performance over the next 36-month period. Jegadeesh and Titman provide evidence for price momentum in stock prices over time periods of up to eight months eight and in the subsequent periods the reversals occur. Cooper, Gutierrez, and Hameed (2004) test the theory that overreaction is the source of these return patterns. They find that short-run momentum profits exclusively follow UP periods. Lo (1991) constructs a test for long-term memory that is robust to short-term correlations and states that departures from the random walk can be fully explained by short-term dependence. Chan (1988) states that there is no accounting for risk in the contrarian investment strategies profitability calculations so the profitability of contrarian investment strategies cannot be evidence against the EMH.

Carhart (1997) in his study on persistence in mutual fund performance includes momentum as a risk factor and employed 4-factor model. He constructs 4-factor model using Fama and French's 3-factor model plus an additional factor capturing Jegadeesh and Titman's one-year momentum anomaly. He proposed that the model can be interpreted as a performance attribution model. In the model the coefficients of factors indicate the proportion of mean return attributable to four strategies which are high versus low beta stocks, large versus small market capitalization stocks, value versus growth stocks, and one-year return momentum versus contrarian stocks. Carhart notes that relatively high variance of the factor mimicking portfolios and low correlations between each of the factor mimicking portfolios and the market proxies implies explanatory power of the

4-factor model. Also the high mean returns on three factors for size, value and momentum indicate that the model explains much of the cross-sectional variation in the mean return on stock portfolios.

Acharya and Pedersen (2005) take illiquidity as a risk factor and apply CAPM to returns net of illiquidity costs. Their model provides better fit then CAPM with same degrees of freedom. According to their findings increasing covariance between stock illiquidity and market illiquidity means increasing required return. Amihud (2002) use average of the daily ratio of absolute stock return to dollar volume as illiquidity measure and shows illiquidity effect for small firms is stronger. Avramov and Chordia (2006) inspect the predictive ability of size, book-to-market, turnover, and past returns at firm-level; and find liquidity and momentum as significant determinants of cross-section variation in stock returns.

Leverage level of a firm can be regarded as a risk factor in asset pricing along with the other factors mentioned above, the literature on relation between leverage and stock returns is limited yet growing. Studies on the relationship of leverage and stock returns report conflicting results. Bhandari (1988) states that alongside market beta, average stock returns in the U.S. are related to leverage. Bhandari shows that the expected returns on common stocks are positively related to the debt/equity ratio controlling for the beta and firm size, and tests the results both including and excluding January effect.

Contradictory results with Bhandariare are reported by several authors. Penman, Richardson, and Tuna (2007) decompose book-to-price ratio (B/P) into two components reflecting operating risk and financing risk (leverage component). They show leverage component of B/P is negatively related with stock returns for firms that have both high and low B/P ratios, and this relation lasts after controlling for size, beta, return volatility, momentum, and default risk. Korteweg (2010) tests the relation between leverage and firm value and finds negative relation between value and leverage. Sivaprasad, Muradoglu, Gough, and Adami (2010) provide empirical evidence that abnormal returns and book leverage of firms are negatively related even after controlling for effective tax rates and industry concentration yet abnormal returns diminishes with the inclusion of these factors.

George and Hwang (2009) propose an explanation for negative relation between leverage and returns. Firms with high distress costs choose low leverage levels and return premium for low leverage firms can be seen as a compensation for default probability.

Muradoğlu and Sivaprasad (2010; 2012) focus on the role of leverage in forecasting stock returns and establishing trading strategies. They use leverage as a risk factor in a five factor model following Fama-French three factor model. They form portfolios to mimic the underlying risk factor related to leverage. They find that the returns of low leverage firms are negatively correlated with the leverage factor. For utilities sector Muradoglu and Sivaprasad find a positive relation between leverage and returns.

Cai and Zhang (2011) find evidence for Myers' (1977) debt overhang theory which explains that increasing leverage will increase the probability of future debt obligations and end up in sub-optimal investment. Cai and Zhang reported significant negative effect of change in leverage on returns is larger for higher leverage levels. Findings of Cai and Zhang for high leverage levels may indicate the fact that high leverage ratios imply the firms' inability to raise funds in the future.

Several studies employ Fama-French three factor model to explain the stock returns' variation in Exchange Istanbul (Note 4). Akdeniz, Altay-Salih and Aydoğan (2000) find that stock returns in Istanbul Stock Exchange (ISE) vary directly with book-to-market and inversely with firm size. Aydoğan and Gürsoy, (2000) employ P/E ratio and book-to-market ratio to explain cross section of expected returns in emerging markets. They find that these ratios are not explanatory factors in emerging markets. Aksu and Önder (2003) apply F-F three factor model to ISE and find significant size effect on returns. Gonenc and Karan (2003) test book-to-market and size effect on returns in ISE and find no evidence of value premium in ISE; also they report higher average return for large cap stocks. Bildik and Gulay (2007) investigate the momentum and contrarian effects in ISE and report that there are significant abnormal returns for contrarian strategy about 15% annually. Findings on size and value effect in Exchange Istanbul (formerly ISE) are contradictory. This study aims to provide new proofs for the effects of size and value factor along with the investigation of the effect of leverage factor on returns.

3. Methodology

In this study factor mimicking portfolios are used in the same manner of Fama-French three factor model by extending the three-factor model as four-factor model to see the effect of leverage on monthly excess returns of portfolios for different leverage levels.

Fama-French (1993) include size and value factor in addition to market risk factor in CAPM. The model considers the fact that value stocks which have high book value relative to market value (B/M ratio) and small

cap stocks outperform markets on a regular basis. Fama and French aren't particular about the reasons of these anomalies yet these patterns persist in multiple time frames as reported by many authors mentioned in section 2. The aim is to see whether there is a leverage premium in Exchange Istanbul and what is the direction of relationship between excess returns and leverage factor. Also it is tested that whether there is a change in the relation between returns and leverage factor through different leverage levels.

3.1 Data

All listed non-financial companies in Exchange Istanbul are included in the data set between years 2005–2013, including delisted stocks; financial firms are excluded due to high leverage ratios. The total sample consists of 470 firms. For each year sample size is between 277–325 firms.

Monthly returns from the closing price at the end of the each month are provided by FINET. Data span for return series is July, 2006–June, 2013. Factor mimicking portfolios and leverage portfolios are formed yearly from June of year t to June of year t+1. A firm should have a fiscal year end leverage ratio and B/M ratio, and stock price series for that year in order to enter the sample of that year. Stocks are ranked according to December of year t-1 B/M and leverage ratios and June of year t market capitalization.

Size mimicking portfolios are constructed according to market capitalization as small and big caps. Stocks are ranked on size and then median size is used to split the firms into two groups (S, B). Value mimicking portfolios are constructed by separating stocks as bottom 30%, middle 40% and top 30% B/M groups as low, medium and high (L, M, H). Leverage mimicking portfolios are constructed by grouping stocks according to leverage ratio (total debt/total assets) as bottom 30%, middle 40% and top 30% leverage group as low leverage, medium leverage and high leverage (LL, ML, HL).

Size factor, SMB, is calculated from the difference of returns of portfolios for small firms and large firms. Value factor, HML, is calculated from the difference of returns of portfolios for high B/M firms and low B/M firms.

The monthly returns of each factor mimicking portfolios are calculated as value weighted monthly returns of the common stocks following Fama-French. Returns of portfolios that are constructed according to leverage quintiles are equally weighted. Table 1 reports the average returns for each leverage quintiles.

Table 1. Average returns for each leverage quintiles (from lowest, L1, to highest, L5)

	L1	**L2**	**L3**	**L4**	**L5**	**Whole sample**
Average monthly returns	1.91	1.44	1.69	1.95	1.42	1.68

3.2 Model

To investigate the explanatory power of the leverage over the variation in stock returns, the average monthly excess returns of the five portfolios which are formed due to leverage quintiles are employed as the dependent variable in the regression. Monthly returns of portfolios in excess of risk free rate (Note 5) are regressed on market excess return and factor mimicking portfolios for size, book-to-market equity and leverage.

In the first part of the analysis CAPM, two-factor model (market and leverage factor) and Fama-French three factor model is formed then the 4-factor model is utilized to see the incremental effects of leverage.

Model 1: CAPM

$$ER_{i,t} = \alpha + \beta_1 ER_{M,t} + \varepsilon_t \quad (1)$$

Model 2: CAPM-Leverage

$$ER_{i,t} = \alpha + \beta_1 ER_{M,t} + \beta_4 HLMLL_t + \varepsilon_t \quad (2)$$

Model 3: Three factor model

$$ER_{i,t} = \alpha + \beta_1 ER_{M,t} + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_t \quad (3)$$

Model 4: Four factor model

$$ER_{i,t} = \alpha + \beta_1 ER_{M,t} + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 HLMLL_t + \varepsilon_t \quad (4)$$

Where,

$ER_{i,t}$: the excess return on portfolio i over risk free rate of return for month t (i=1,2,3,4,5),

$ER_{M,t}$: the excess return on market over risk free rate of return for month t,

SMB_t: the difference between the simple average of the returns on the small stock portfolios and the big stock portfolios for month t,

HML_t: the difference between the simple average of the returns on the high B/M portfolios and low B/M portfolios for month t,

$HLMLL_t$: the difference between the simple average of the returns on the high leverage portfolios and the low leverage portfolios for month t,

ε_t: error term for month t,

β_1 coefficients show the explanatory power of the market risk on returns. β_2 coefficients, β_3 coefficients and β_4 coefficients provide information about the effect of size, value and leverage mimicking factorson stock returns.

4. Empirical Results

The effect of firms' leverage on stock returns is investigated through a four-factor model. Leverage mimicking factors are included in the model along with market risk, size and value factors. There are conflicting findings in the literature about the effect of leverage on stock returns. A firm with high leverage ratio exhibits high risk, so the required return of the stock should be high. Hence β_4 coefficients should be high in highly levered portfolios. On the other hand low leverage ratios may be the indicator of the high distress costs as George and Hwang (2009) propose that explains negative relation between leverage and returns.

The results of the regression analysis of 4 models (CAPM, CAPM-Leverage, Three-factor, and Four-factor) for each portfolio of leverage quintiles are provided on Table 2. The coefficients of all models are jointly significant, and R-squares are sufficiently high. The inclusion of leverage mimicking factor increases the adjusted R-squares of the models also improves the Akaike information criterions. Incremental effects of leverage factor on the explanatory power of the model can be seen in the second model more precisely.

Table 2. Estimation results for each model across leverage quintiles (from lowest, L1, to highest, L5)

MODEL	**CAPM**	**CAPM-LEVERAGE**		**3-FACTOR**			**4-FACTOR**			
	β_1	β_1	β_4	β_1	β_2	β_3	β_1	β_2	β_3	β_4
L1	0.676973*	0.750772*	-0.427403*	0.659393*	0.794280*	0.023276	0.679241*	0.743656*	0.018744	-0.105357
	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.7653)	(0.0000)	(0.0000)	(0.8098)	(0.2416)
	[0.59305]	*[0.65859]*		*[0.80244]*			*[0.80341]*			
	{5.89710}	*{5.73304}*		*{5.19736}*			*{5.203707}*			
L2	0.722081*	0.817143*	-0.550543*	0.732628*	0.785590*	0.136050	0.787808*	0.644847*	-0.148649	-0.29291*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.1678)	(0.0000)	(0.0000)	(0.1186)	(0.0084)
	[0.57169]	*[0.66568]*		*[0.73496]*			*[0.754314]*			
	{6.11319}	*{5.87698}*		*{5.65614}*			*{5.591576}*			
L3	0.773488*	0.847824*	-0.430509*	0.769814*	0.728263*	0.049522	0.799470*	0.652621*	-0.056294	-0.15742***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.5165)	(0.0000)	(0.0000)	(0.4552)	(0.0720)
	[0.68416]	*[0.74335]*		*[0.83342]*			*[0.838127]*			
	{5.77000}	*{5.57400}*		*{5.15316}*			*{5.135738}*			
L4	0.769820*	0.854247*	-0.488950*	0.759087*	0.813327*	-0.01755	0.792974*	0.726894*	-0.025291	-0.17988**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.8189)	(0.0000)	(0.0000)	(0.7367)	(0.0403)
	[0.65403]	*[0.72837]*		*[0.83732]*			*[0.843855]*			
	{5.89582}	*{5.66545}*		*{5.16420}*			*{5.134428}*			
L5	0.891381*	0.972432*	-0.469400*	0.885665*	0.938367*	-0.05822	0.903304*	0.893376*	-0.062251	-0.093633
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.3477)	(0.0000)	(0.0000)	(0.3139)	(0.1891)
	[0.71535]	*[0.77085]*		*[0.91380]*			*[0.914615]*			
	{5.90589}	*{5.70055}*		*{4.73415}*			*{4.735995}*			

(p-value), *[adjusted R square], {Akaike information criterion}*

*1% significance level, **5% significance level, ***10% significance level.

The market beta is significant in all models and for all conventional significance levels. The coefficient of value mimicking factor is insignificant in all models and in every leverage quintiles. There is no evidence for value effect in Exchange Istanbul in the examined period. The coefficient of size mimicking factor, SMB, is significant in all models and in every leverage quintiles. Small firm effect seems significant in Exchange Istanbul between years 2006–2013. Size effect diminishes with the inclusion of leverage factor yet it stays sufficiently high and significant. Small firm premium seems highest for high leverage firms.

In the second model leverage factor has a significant negative effect on returns for every leverage quintiles. Yet the inclusion of other risk factors, size and value, in the fourth model diminishes the effect of leverage on returns. Also by inclusion of other risk factors effect of leverage on returns for extreme portfolios with highest and lowest leverage ratios turn out to be insignificant. For the portfolios with medium level leverage ratios the effect stays significantly negative.

The construction of the leverage factor, HLMLL, is as the difference between the returns on the high leverage portfolios and the low leverage portfolios. Negative coefficient of the leverage factor implies a premium for low leverage portfolios.

5. Conclusion

The paper investigates the effect of leverage ratio on the returns in Exchange Istanbul by constructing a four-factor model which includes leverage as a risk factor between years 2006–2013 by a sample of 470 firms. The results show that the leverage factor significantly affects the required returns. Leverage mimicking factor increases the explanatory power of the model and provides better explanation for cross-sectional variation of stock returns in Exchange Istanbul than CAPM or the three-factor model.

Size effect in Exchange Istanbul is high and it is persistent to the inclusion of other risk factors. Size effect is the highest for the high leverage firms. Similar with Aydogan and Gursoy (2000) and Gonenc and Karan (2003) findings do not support value effect in Exchange Istanbul.

After the inclusion of the other risk factors the negative effect of leverage factor on returns became insignificant for extreme portfolios (highest and lowest leverage portfolios) yet it is significant for portfolios of medium levels of leverage. High small firm premium for high leverage quintile indicates that high debt ratios for small firms go along with high returns. This phenomenon may be investigated deeply by an analysis which focuses on small firms financing characteristics.

The direction of the relation between the leverage and the returns is parallel with Cai and Zhang (2011). Negative relation of returns and leverage implies a premium for low leverage levels which provides a reserve of untapped borrowing power. For firms with medium level leverage existence of leverage premium may indicate that the possibility to raise funds for future investments is appealing for investors.

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Notes

Note 1. Beta (β) of an asset which measures the risk of an asset shows the amount of compensation investors need for taking on additional risk. $E(r_i) = r_f + \beta_i [E(r_m) - r_f]$, where E is the expectation operator, r_i is the return of stock i, r_f is the risk free rate, r_m is the market return.

Note 2. In every test for market efficiency a joint test is conducted. Market efficiency and the efficiency of the model used for expected returns have to be tested jointly. An evidence of excess returns may be caused by an inefficient market or misspecification of the model used to compute expected returns or both (Roll,1977).

Note 3. Hong Kong, Korea, Malaysia, Taiwan, and Thailand.

Note 4. Before April, 2013 Exchange Istanbul was named as Istanbul Stock Exchange (ISE).

Note 5. One month average deposit rates announced by Central Bank of Turkey.

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