Analysis of the systematic-risk determinants for companies listed on Bucharest Stock Exchange

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Introduction

The purpose of this paper is to investigate the empirical determinants of systematic risk through the analysis of the firm’s underlying characteristics, specifically, the firm’s size, liquidity, profitability, operating efficiency, debt leverage, growth, and its dividend record.

Findings from 15 companies listed on the Bucharest Stock Exchange indicate that operating efficiency, liquidity, growth and firm size are negatively associated with the systematic risk, while the debt leverage is positively related to the risk. These results are confirmed by empirical evidences, except a negative relationship between systematic risk and firm profitability, which is disproved by this study.

The effects of firm-specific variables on systematic risk have been empirically investigated and verified in previous studies. For example, Beaver, Kettler, and Scholes (1970) found the significant correlations between beta and financial variables. Logue and Merville (1972) confirmed that debt leverage, profitability, and firm size were significant beta determinants. Hamada (1972) verified that financial leverage had a significant positive relationship with beta. Many researchers suggest that movement of systematic risk should be related to changes in financial, investing, and operating management practices (Breen & Lerner, 1973; Delcoure & Dickens, 2004; Kim & Gu, 2004; Logue & Merville, 1972).

Following the empirical study, we identified a high degree of causality between the systematic risk and some financial characteristics such as operational efficiency, profitability, debt leverage and size of the company. Financial ratios that explains these characteristics are determinant factors for beta coefficient according to statistical tests of the significance of the model parameters. Thus, results indicate that financial ratios have significant predictive power for the systematic risk of a financial investment.
Financial data (2010) for Bucharest Stock Exchange traded companies were obtained from the official site www.bvb.ro. The main tool for the selection of the sample is the market capitalization and trading volume of securities. The estimated beta is derived by regressing a firm’s daily stock return against the market return. A firm’s daily stock return is measured by the daily percentage change of stock prices, while daily percentage change in the capital market index (BET-C) represents a proxy for market return. Linear regression analyses are conducted to estimate yearly betas for each company for the year 2010.

**Literature review**

People make investments to earn a return on their money, but often they receive less than expected. Sometimes, the return can be negative, and the investor lose some or all of the original investment. The risk of an investment is the chance that an actual return will be different than expected. Risk includes the possibility of receiving less than the initial investment.

Rational investors make predictions about the future performance of their investments projects. Often uncertainty of the expected returns, due to extraordinary economic events make possible the existence of deviations from the anticipated results. These deviations are quantified by total risk of a financial asset.

There are many types of risk that are caused by different factors, or which affect different investments to varying extents. Some factors affect most investments and are called systematic risks. Other risks, such as sector risks affect only a particular sector of the economy. Some risks are specific to a business or asset, and are called specific (unsystematic) risks.

Investment management aims to meet specified investment goals for the benefit of the investors. Many companies now allocate large amounts of money and time in developing risk management strategies to help manage risks associated with their business and investment dealings. A key component of the risk management process is risk assessment, which involves the determination of the risks surrounding a business or investment.

Benjamin Graham affirms that “the essence of investment management is the management of risks, not the management of returns”.

Investment decisions are often constrained by time pressure, social rules and regulations, continuous change and uncertainty. Investors base their decisions on internal,
intrinsic factors (return, risk, duration, and exit) and on external, market factors of anticipation of other market players’ reaction to the respective factors.

Investors decisions varies depending their risk tolerance, which is the degree of uncertainty that an investor can handle in regard to a negative change in the value of his securities. Investors who are risk averse are careful and conservative persons who dislikes risk and prefers to deposit their money in "safer" investments like index funds and government bonds, which generally have lower returns. At the opposite end of the spectrum, there are risk-seeking investors who are looking for greater volatility and uncertainty in investments in exchange for anticipated higher returns. A risk-indifferent investor is one who regards only the expected return without any consideration for the risk.

There is always a risk/return tradeoff in investing. Asset pricing models imply a positive relationship between risk and return under the assumption of investor risk aversion. Lower returns are usually associated with lower risk investments. Higher potential returns are associated with investments of higher risk, as most investors expect to be compensated for taking on additional risk. Risk lovers, however, go against this principle: they acquire investments of higher risk with a lower expected return. In all cases investors demand compensation for assuming risk, or else everyone would invest only in 'safe' investments

The asset pricing theory was introduced by Sharpe (1964) and Lintner (1965) who argued that there is a simple linear relationship between the expected return and risk. The CAPM suggests that the expected rate of return on a risk asset can be obtained by adding risk-premium to risk-free rate, and the expected risk premium varies in direct proportion to beta in a competitive market.

Mathematically, the expected rate of return is described as:

$E(R_i) = R_f + \beta_i(E(R_m) - R_f)$

The general idea behind CAPM is that investors need to be compensated in two ways: time value of money and risk. The time value of money is represented by the risk-free (Rf) rate in the formula and compensates the investors for placing money in any investment over a period of time. The other half of the formula represents risk and calculates the amount of compensation the investor needs for taking on additional risk. This is calculated by taking a risk measure (beta) that compares the returns of the asset to the market over a period of time and to the market premium (Rm-Rf).
According to Capital Asset Pricing Model (CAPM), a company’s total risk consists of two types of risk: unsystematic and systematic risk (Sharpe, 1964; Lintner, 1965). The total risk is measured by variance or standard deviation of stock return. The more individual returns deviate from the expected return, the greater the risk and the greater the potential reward. The degree to which all returns for a particular investment or asset deviate from the expected return of the investment is a measure of its risk.

The systematic risk, also known as "un-diversifiable risk" or "market risk" is the risk inherent to the entire market or entire market segment and represents the relative volatility of individual stock returns against market returns. Betas are estimated, by most practitioners, by regressing returns on an asset against a stock index, with the slope of the regression being the beta of the asset. Aswath Damodaran, shows in his approach, “Estimating Risk Parameters”, the flaws in regression betas, especially for companies in emerging markets: the market index can be dominated by a few stocks, the beta estimate can be noisy and the firm itself might have changed during the course of the regression.

Beta reflects the collective judgment of investors on the extent to which macroeconomic conditions influence firms and depends on marketing policy, production policy, and firm policies and decisions, all of which are affected by corporate financial policy (Ben-Zion & Shalit, 1975; Logue & Merville, 1972).

Models of risk and return in finance take the view that the risk in an investment should be the risk perceived by a well diversified investor, and that the expected return should be a function of this risk measure. Differences exist, however, between different models in how to measure this market risk. At one end, the capital asset pricing model measures the market risk with a beta measured relative to a market portfolio, and at the other are multi-factor models that measure market risk using multiple betas estimated relative to different factors.

The systematic risk is the relevant portion of an asset’s risk, attributable to market factors that affect all firms such as interest rates, inflation, recession, war, international incidents, and political events. It cannot be avoided through diversification.

Specific risk represents the portion of the total asset’s risk that is associated with random causes that can be lowered or even eliminated through diversification. It’s attributable to firm-specific events, such as lawsuit, strikes, regulatory actions, and loss of a key account. Unsystematic risk is due to factors specific to an industry or a company like labor
unions, product category, research and development, pricing, marketing strategy etc. The combination of a security’s non-diversifiable risk and diversifiable risk is called total risk.

In the other words systematic risk is due to risk factors that affect the entire market such as investment policy changes, foreign investment policy, change in taxation clauses, shift in socio-economic parameters, global security threats and measures etc. Systematic risk is beyond the control of investors and cannot be mitigated to a large extent. In contrast to this, the unsystematic risk can be mitigated through portfolio diversification. It is a risk that can be avoided and the market does not compensate for taking such risks.

**Empirical review**

Substantial attention in finance and accounting literature has been devoted to identifying the determinants of systematic risk. The effects of firm-specific variables on systematic risk have been empirically investigated and verified in previous studies.

The systematic risk research is based on the capital asset pricing model (CAPM) of William Sharpe (1964) and John Lintner (1965) which describes the relationship between risk and expected return and is used in the pricing of risky securities. Recent studies (for example, Graham and Harvey 2001) demonstrated that CAPM is still used by American corporations (about 73 %) as main tool in assessing the cost of equity capital.

To identify the determinants of systematic risk, previous studies have focused on the relationship between beta and liquidity, debt leverage, operating efficiency, profitability, dividend payout, firm size, and growth. Most of the empirical studies used multiple regressions with beta as the dependant variable and firm financial ratios as independent variables.

The first significant attempt to link market risk and financial variables was made by Beaver, Ketter and Scholes (1970). They found evidences that supports the contention that accounting measures of risk are impunded in the market-price based risk measure. They identified a high degree of contemporaneous association between estimated betas and several financial variables such as dividend payout, financial leverage and earnings yield.

Several researchers suggest a negative relationship between beta and liquidity. This means that firms with higher liquidity are expected to have less exposure to systematic risk. In contrast, according to Jensen (1984), liquidity is positively related to beta because high liquidity may raise a firm's agency cost of free cash flow and hence its systematic risk. Since more
empirical studies advocate the inverse relationship, this study hypothesizes the negative relationship of liquidity to beta. In this study, liquidity is measured by the quick ratio (sum of cash, marketable securities, and accounts receivable to current liabilities).

Many studies propose that debt leverage exposes shareholders to higher systematic risk. Hamada (1972) verified that financial leverage had a significant positive relationship with beta. This conclusion was further supported by Bowman (1980) as he indicated that leverage (debt to equity ratio) is an important variable that have influence on the systematic risk of a firm.

Several researchers suggest that operating efficiency has negative relationship with systematic risk (Borde, 1998; Gu & Kim, 2002; Logue & Merville, 1972). The empirical studies confirms that firms which efficiently utilize their assets in generating revenues are more likely to reduce possible losses and consequently could have a low level of beta. Thus, operating efficiency (total revenue to total assets) is hypothesized to have the negative relationship with beta in this study.

Previous research and financial intuition indicates a negative relationship of profitability to systematic risk (Borde, 1998; Gu & Kim, 2002; Logue & Merville, 1972). High profitability can enhance companies’ ability to lower financial instability and thus lessen systematic risk. This study uses return on asset (ROA: net income to total assets) as a profitability measure and hypothesizes the negative relationship between profitability and beta.

Chan & Chen (1991) concluded that small firms reports high levels of risk, unlike developed companies, which are considered to be more stable and less exposed at risk of bankruptcy. Thus, this study posits the inverse relationship between beta and firm size, as measured by total assets.

Rapidly growing firms, often measured with asset growth and revenue growth, are often considered vulnerable to economic changes. Borde (1998) confirms the positive relationship between systematic risk and growth, using as growth rate the earnings before taxes (EBT) ratio.

In summary, the study intends to test the relationships of six controllable firm-specific variables to systematic risk as hypothesized below:

- Liquidity is negatively related to beta
- Debt leverage is positively related to beta
- Operating efficiency is negatively related to beta
- Profitability is negatively related to beta
- Firm size is negatively related to beta.
- Growth is negatively related to beta.

**Data and methodology**

This study aims to investigate firm-specific variables as they relate to systematic risk (beta). The major purpose of this analysis is to discover the extent to which accounting risk measures are impounded in the market risk measure. Empirically this issue will be addressed by examining the contemporaneous association between the accounting risk measures and the market risk (beta).

The study is conducted for the period of January 2010 – December 2010 for 15 companies listed on BVB and calculate six financial ratios (independent variables) for each firm. The main tool for the selection of the sample is the market capitalization and trading volume of securities. Were sampled only companies that have non-financial business object and eliminated those firms that had indicators of extreme values calculated.

Beta is calculated using regression analysis and explains the tendency of a security’s returns to respond to swings in the market. A beta of 1 indicates that the security’s price will move with the market. A value of beta less than 1 means that the security will be less volatile than the market. Greater than 1 betas indicates that the security’s price will be more volatile than the market.

Financial data for the year 2010 were obtained from the online database of Bucharest Stock Exchange. The financial ratios were calculated using the balance sheet and profit and loss statements for the year 2010. Data were processed and transformed in order to obtain relevant measures of the financial indicators accountants.

Financial characteristics of which contained information on the systematic risk is verified using the regression model are: liquidity, debt leverage, operational efficiency, profitability, firm size, firm growth quantified using the following financial ratios: quick ratio, debt ratio, total asset turnover ratio, return on assets ratio, total assets and gross income growth rate.

Liquidity is an important feature of a business, stock market investors are looking to place their investments in securities with high liquidity. Liquidity express company’s ability to meet its short-term obligations with its most liquid assets. The higher the liquidity
ratio, the better the position of the company. The financial ratio selected for explaining liquidity is quick ratio, calculated as current assets, minus inventories, divided by current liabilities.

Leverage measures the financial health of a company and help investors to determine a company's level of risk. The financial ratio selected for explaining leverage of firms is debt ratio indicates what proportion of debt a company has relative to its assets. The measure gives an idea to the leverage of the company along with the potential risks the company faces in terms of its debt-load.

Determining the operational efficiency of the analyzed companies is made with the total assets turnover ratio which determines the amount of sales that are generated from each dollar of assets. Companies with low profit margins tend to have high asset turnover, those with high profit margins have low asset turnover.

The profitability is the most important selection item for the investors. Business results are analyzed and compared, especially for firms in the same sector through economic and financial rates of return. Return on assets (ROA) measures the return on the total invested capital in the company and is calculated as a percentage ratio between net profit and total assets. The level of this ratio is important for the current and potential investors, which compares with other forms of investment return, and managers, for which a high rate means that an effective management of invested capital.

The size of a company was determined as the total assets that it holds. It is obvious that in order to reflect the true value of a firm it is necessary to determine the company's net assets by reducing the total debt, but this research will use to quantify the size of a firm of its total assets.

The growth of a company was determined by calculating the percentage change in gross income of companies in 2010 than the previous year.

This six financial ratios were selected for study because they are related to the systematic risk of firms. Availability of the informations and previous empirical approaches were also relevant for the selection.
Results

The study aims to realize a comparative analysis between the simple relationship of systematic risk and operational efficiency and multifactor relationship between systematic risk and overall financial indicators selected.

Testing a relationship between the selected financial ratios and the systematic risk, measured by beta, requires application and interpretation of a regression model with EViews software. The objective of using such a model is to build a relationship which describe, predict and control the systematic risk taking into account the evolution of independent variables.

In developing regression models, to avoid obtaining wrong results is necessary to verify the model assumptions and parameter estimation methods. The first regression model aims to verify the relationship between total asset turnover ratio and the coefficient of volatility, and the second model will consist of a multiple regression, quantifying the impact of all the financial characteristics on systematic risk.

To determine if estimates of the independent factors are significant for the analyzed process were performed the following checks: data accuracy by comparing the modeling results with previous research and economic reality, the statistical significance of each parameter estimate and of the overall model and the residual variable behavior.

After comparing the modeling results with previous empirical research, the assumptions made regarding the degree to which the effect variable (systematic risk) is related to the independent factors included in the model were confirmed. The positive association of the profitability with the risk is the only hypothesis which was invalidated by this study.

The significance of the model, both overall (F test) and individual for each estimated parameter (t test) is verified. Selected financial ratios, explains in a very large proportion systematic risk (adjusted $R^2 = 75\%$), compared with the unifactorial regression model, in which operational efficiency individually explains only 40% of the volatility of systematic risk.

After testing the behavior of the residual variable of the multifactorial regression model, it results the validation of the three assumptions of the model: the normal distribution, homoskedasticity and non-autocorrelated errors. The validation of these assumptions shows that
the model’s parameters obtained through the least squares method are efficiently estimated. In contrast, simple regression model rejects the hypothesis of non-autocorrelation errors.

The assumption of normal distribution of the residuals says that deviations of empirical values from the values generated by the model should be some positive, others negative, compensating each other so that their mean is 0. To check if the assumption holds it is recommended to apply the Jarque-Bera test.

The expression of homoskedasticity characterize the equal scattering of the error values. Testing homogeneity of residual variables can be made using tests such as Goldfeld-Quandt test, Breusch-Pagan-Godfrey test or White test. This study applied the test developed by White which tests the null hypothesis described by the lack of heteroskedasticity.

The non-autocorrelation errors assumption (the independence assumption), which says that the time-ordered error terms display no positive or negative autocorrelation is verified using three specific tests: Durbin-Watson test, Breusch-Godfrey LM test and Q-statistic test. Durbin-Watson is the most used test of the residual autocorrelation and the p-value = 1.8 confirms the independence assumption of error terms. Q-statistic test and Breusch-Godfrey test also confirms that the residuals are not autocorrelated with a level of significance $\alpha = 0.9$.

The conclusion resulting from this study is that systematic risk is significantly determined by financial characteristics. The information contained in financial indicators is relevant for investors on the Bucharest Stock Exchange. The results demonstrates that operating efficiency, profitability, firm’s size and debt leverage are significantly related to systematic risk.

Findings from 15 companies listed on the Bucharest Stock Exchange indicate that operating efficiency, liquidity, growth and firm size are negatively associated with the systematic risk, while the debt leverage is positively related to the risk. These results are confirmed by empirical evidences, except a negative relationship between systematic risk and firm profitability, which is disproved by this study.
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