

The Value Premium

The Value Premium over the Bull-Bear Market and the Economical cycle

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Abstract

The master thesis “The Value Premium over the Bull-Bear Market and the Economical cycle” is devoted to the analysis of the time variations in the value premium during the bull-bear markets and the economic cycle. A regression model with a dummy variable was used as the main analytical tool. It was confirmed that the CAPM fails to explain the value premium in the later historical period in accordance with the studies of Lakonishok and Shapiro (1986) and Fama and French (1993 and 2006). It is found that the value stocks tend to do better in bear market which concretizes the hypothesis of Petkova and Zhang (2005) that the value premium is generated during the periods of loosely speaking “bad times”. In addition, the results of the thesis allow rejecting hypothesis of Gulen, Xing, and Zhang (2008 and 2010) that the value premium appears during economic recessions.

Keywords: Time-varying Value Premium; Value Stocks; Glamour Stocks; Bull-Bear Markets; Economic Cycle.

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Introduction

The research problem analysed in this master thesis is whether the bull-bear markets and the economic cycle have an impact on the time variations in the value premium.

The motivation for this research is to conduct study that has not been done before. According to the empirical evidence, the stocks with higher book-to-market equity ratio have higher average returns than stocks with low book-to-market equity ratio. [See, e.g., Rosenberg et al. (1985), and Fama and French (1992, 1993).] The value premium is then defined as “the average returns of the unconditional alphas of value-minus-growth portfolios” (Petkova and Zhang, 2005). Petkova and Zhang (2005) found that the value premium is positive during the periods of loosely speaking “bad times.” The motivation to conduct this research is to study the effects of bull-bear market, and economic cycle as a better proxy of “good” or “bad” times. Moreover, to find whether the value premium occurs in “bad times” using these proxies.

The empirical models were inspired by the models used in papers of Bhardaj and Brooks (1993) and Kim and Burnie (2002). These authors studied the impact of bull-bear markets, and the economic cycle on the size effect. The study performed in this master thesis is unique in the way that the models of Bhardaj and Brooks (1993) and Kim and Burnie (2002) are applied on the value effect.

Concerning the structure of the master thesis, the first chapter presents the theoretical background of the studied phenomenon with references on the essential academic papers. Firstly, the fundamental model of modern finance, the capital asset pricing model is explained. This model is followed by the arbitrage pricing theory and the Fama and French three factor model. Then, the term “value premium”, its discovery and the hypotheses for what gives rise to the value premium are described. Lastly, the time varying concept of the value premium is explained.

The second chapter covers the methodological part of the master thesis. The three main regression models are introduced to analyse the research problem. The first model is the simple index model that plays a role of the benchmark model. This benchmark model reflects the simple beta relationship of the capital asset pricing model. Other two models are the time varying models represented by the multiple regression models with a dummy for either the bull-bear market, or the economic cycle. The role of these models is to find whether these factors have an impact on time variation of the value premium.

The data source used for empirical testing of analysed models is described in the third chapter. The empirical results are reported and discussed in the fourth chapter. Overall conclusions with the summary of the findings are presented in the fifth chapter.

The multiple regression with dummies was used as a main analytical tool. The regression models were estimated for the total period from July 1926 to December 2010. For the purpose of Robustness testing the total period was divided into two equal subperiods, the first subperiod started in July 1926 and ended in September 1968, the second subperiod began in October 1968 and ended in December 2010. The models were estimated for both subperiods as well.

Based on the empirical results, it was confirmed that the CAPM fails to explain the value premium in the second subperiod in accordance with the studies of Lakonishok and Shapiro (1986), and Fama and French (1993, 2006). It is found that the value stocks tend to do better in bear market which concretizes the hypothesis of Petkova and Zhang (2008) that the value premium is generated during the periods of loosely speaking “bad times”. In contrast to Fama and French (2006) who reported that value premium did not appear from 1926 to 1963, it was found that value premium varies significantly over bull-bear market. The period of the “nifty-fifty” mania probably caused certain problems with the model validity in the second subperiod. After excluding the “nifty fifty” period, the significance of the model slightly increased. In addition, the empirical results allow rejecting hypothesis of Gulen, Xing, and Zhang (2008 and 2010) that the value premium appears during economic recessions.

1 The theoretical background

This chapter presents the theoretical background of the studied phenomenon with references on the essential academic papers. Firstly, the fundamental model of modern finance, the capital asset pricing model is explained. This model is followed by the arbitrage pricing theory and the Fama and French three factor model. Then, the term “value premium”, its discovery and the hypotheses for what gives rise to the value premium are described. Lastly, the time varying concept of value premium is explained.

1.1 The capital asset pricing model

The capital asset pricing model, often referred as the CAPM, is the fundamental model of modern financial economics. The capital asset pricing model gives a set of predictions of equilibrium expected returns on risky assets (Bodie et al, 2008)¹. The CAPM builds on the Markowitz portfolio theory² (1952). The CAPM was developed separately by William Sharpe³ (1964), John Lintner⁴ (1965), and Jan Mossin⁵ (1966).

The basic assumptions of the CAPM model are: (Bodie et al, 2008)

1. All investors make decision for one identical period.
2. All investors are risk averse.
3. All investors are rational and seek the optimal mean-variance portfolio following the Markowitz portfolio selection model.
4. All investors are price takers.

¹ Bodie, Z., Kane, A., and Marcus, A. J. (2008). *Investments* (7th edition). New York: McGraw-Hill/Irwin.

² Markowitz, H. (1952). Portfolio Selection. *The Journal of Finance*, 7(1), 77-91.

³ Sharpe, F. W. (1964). Capital Asset Prices: A Theory of Market Equilibrium. *Journal of Finance*.

⁴ Lintner, J., (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. *Review of Economics and Statistics*.

⁵ Mossin, J., (1966). Equilibrium in a Capital Asset Market,“ *Econometrica*.

5. All investors pay no taxes on returns and no transaction costs on security trade.
6. All investors have homogeneous expectations based on the same view of portfolio analysis and the same information.
7. All investors may invest into limited universe of risky assets, such as stock and bonds, and to risk-free assets.⁶
8. All investors may borrow or lend unlimited amount at a fixed, risk-free rate.
9. The equilibrium in the capital market.

Main implication of the CAPM model is that all investors hold the market portfolio as the optimal market portfolio. Only difference among the investors concerns the proportion invested in market portfolio versus proportion invested in risk-free asset.

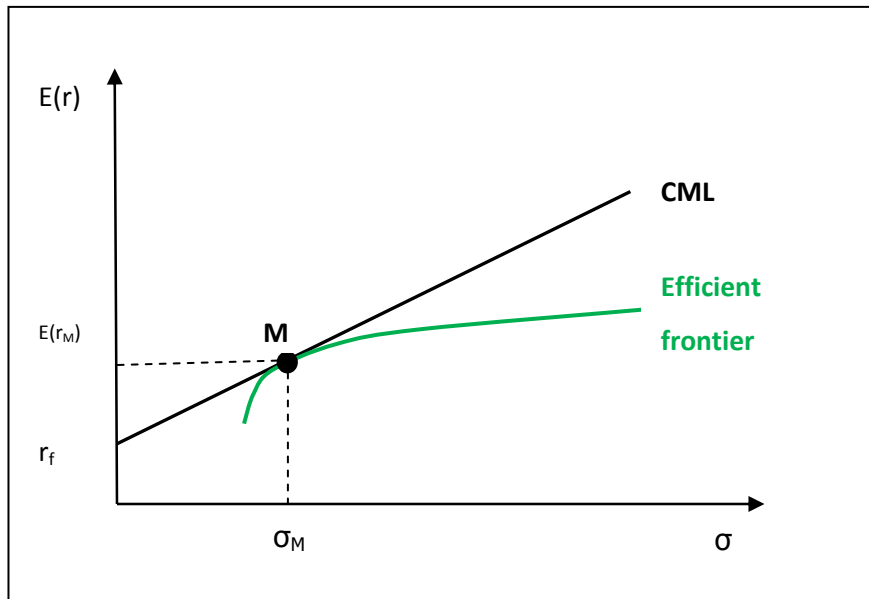
The market portfolio consists of all risky assets in the market. For simplicity, if we suppose that all risky assets are only stocks, the proportion of each stock in the market portfolio equals the market value of the stock divided by the total market value of all stocks. The stock exchange indexes, for example S&P 500, may be used as representative sample of market portfolio observed in real world which may be used an analytical purposes.

1.1.1 Capital market line

The CAPM is the model for pricing an individual asset or a portfolio, which implies two fundamental versions of CAPM. Firstly, the capital market line is used for pricing the portfolio consisting of risk-free asset (the money market account or T-bills) and the market portfolio. The structure of this portfolio is called the passive strategy. According to the CAPM, all investors would like to hold the passive strategy as optimal portfolio. Graphically, **capital market line (CML)** is special capital allocation line (CAL) constructed with passive portfolio which is the tangency line to the optimal portfolio efficiency frontier. The market portfolio, denoted by M in following graph, is the tangency portfolio that is optimal for all investors. See the figure 1.1.

⁶ Assumption 7 is limited only to the risky assets in Markowitz model.

Figure 1.1 Capital market line (Bodie et al, 2008)



Mathematically, the risk premium on the market portfolio is proportional to its variance and to the average coefficient of risk aversion across investor who neither borrows nor lends. See the following formula (Bodie et al, 2008).

$$E(r_M) - r_F = \bar{A} \sigma_M^2 \quad (1.1)$$

where $E(r_M)$ is the expected market return of the market portfolio, r_F is the risk free rate of return, $[E(r_M) - r_F]$ is the market excess return called as market premium or risk premium, \bar{A} is the average coefficient of risk aversion across investors, σ_M^2 is variance of the market portfolio.

1.1.2 Security market line

Security market line (SML) as another version of CAPM is used for pricing individual security. The CAPM implies that the risk premium on any individual assets or portfolio is the product of the risk premium on the market portfolio and the beta coefficient: (Bodie et al, 2008)

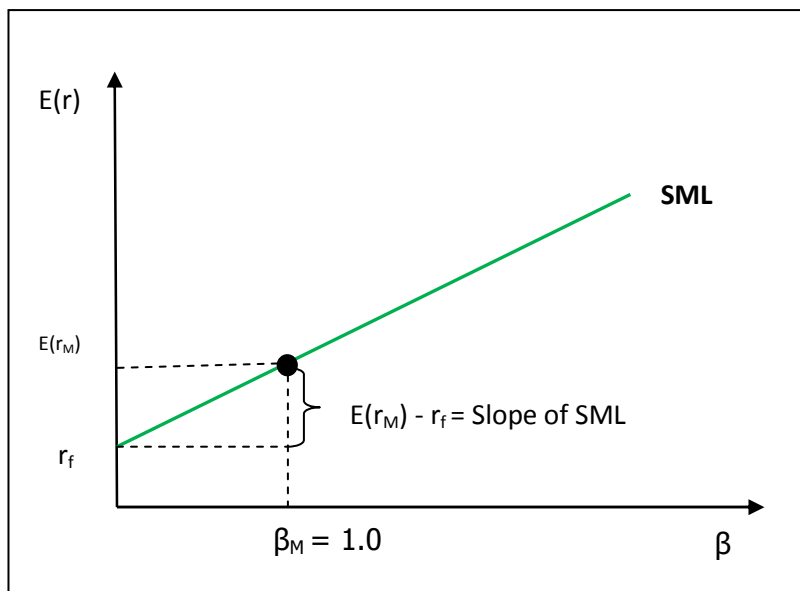
$$E(r_i) - r_f = \beta_i [E(r_M) - r_F] \quad (1.2)$$

where the beta coefficient is the covariance of the asset with market portfolio divided by the variance of the market portfolio

$$\beta_i = \frac{Cov(r_i, r_M)}{\sigma_M^2}. \quad (1.3)$$

The graphical projection of the expected return-beta relationship is the security market line (SML) which follows the reward-risk equation 1.2. The beta is the appropriate measure of risk since beta is proportional to the risk that the security contributes to the optimal risky portfolio. Since the market's beta equals one, the slope of the SML is the market premium. See the figure 1.2.

Figure 1.2 Security market line (Bodie et al, 2008)

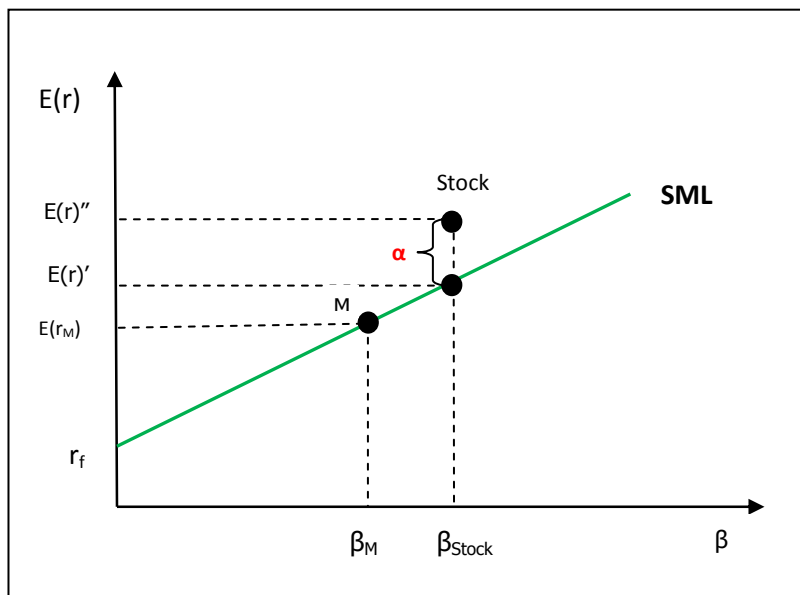


If we compare the SML to the CML, the SML graphs individual assets as a function of portfolio risk, in contrary the CML graphs risk premium of efficient portfolios (the portfolios of the market and the risk-free asset) as a function of standard deviation.

The security market line provides a benchmark for the evaluation of investment performance. The SML provides the required rate of return necessary to compensate investors for risk as well as time value of money. The “fairly priced” assets plot exactly on the SML. Given this assumption, all securities must lie on the SML in the equilibrium. The SML risk-return relationship is then used as a

benchmark. The underpriced stocks are located above the SML. Given their betas, their expected returns are higher than CAPM suggests. Over priced stock are located below the SML, their expected returns are lower than CAPM's predictions. The difference between the fair and actually expected rates of the stocks is called the stock's alpha, denoted as α . The figure 1.3 shows the case of underpriced stock, since the expected return proposed by the SML, denoted as $E(r)'$, is lower than one believes the stock's return should be, denoted as $E(r)''$, with the positive alpha.

Figure 1.3 SML as a benchmark model (Bodie et al, 2008)



The CAPM's suggestion for the security analysis lies in uncovering the securities with nonzero alphas. The starting point of portfolio management will be a passive market-index portfolio. In the next step the portfolio manager will increase the weights of risky assets with positive alphas and decrease the weights of risky assets with negative alphas.

1.1.3 Use of the CAPM

As mentioned above the primary use of CAPM is to price individual assets or portfolios. Another use, which has at least the same importance, concerns the capital budgeting decisions. In case of the project investment, the CAPM provides the required rate of return that project needs to yield base on its beta, to be acceptable to investors. In case of management decision concerning realization or not realization of project, the CAPM can provide the internal rate of return, often denoted by IRR, or so called “hurdle rate” of the project.

1.1.4 Empirical testing of the CAPM

The shortcomings of the CAPM empirical testing come from highly demanding theoretical assumptions of the model. Particularly, the assumption of market portfolio efficiency represents the most relevant one. According to the theory the market portfolio should contain all risky assets hold by investors. In practice, the equity indexes such as S&P 500 is widely used as a representative data set for the market portfolio returns, despite it can hardly satisfy the theoretical assumptions, the data set consists of realized returns instead of expected returns with limitation of risky assets only to equity.

The CAPM fails the empirical test of the model rejecting the hypothesis that the alpha values are uniformly zero at acceptable levels of significance.⁷ The CAPM is considered to be valid if the alpha values in security risk premium are identically zero. The actions of security analysts should drive the alpha to zero. However, if all alphas were identically zero, there would be no incentives to engage in the security analysis to reveal mispriced securities based on their positive or negatives alphas. Instead, the market equilibrium is characterized by the prices “near” their fair values, however with enough deviation to induce the importance of security analysis to be used.

⁷ The well known critique of the empirical testing of the CAPM is so called the “Roll’s critique”:

Roll, R. (1977). A Critique of the Asset Pricing Theory’s Tests: Part I. On Past Potential Testability of the Theory. *Journal of Financial Economics* 4.

It was developed further in Roll, R., Ross, S. (1955). On the Cross-Sectional Relation between Expected Return and Betas. *Journal of Finance* 50 (1955).

And further by Kandel, S., Stambaugh, R. F. (1995). Portfolio Inefficiency and the Cross-Section of Expected returns,” *Journal of Finance* 50. (Bodie et al, 2008)

Based on empirical tests it was proven that the SML is in reality much flatter than the CAPM suggests. Low-beta securities have positive alphas and high-beta securities have negative alphas. There can be found several explanations for the flatter SML. See for instance the work of Black (1972)⁸ regarding the capital market equilibrium with restricted borrowing or the work of Mayers (1972)⁹ regarding adjustment for the labour income.

Although the CAPM is built on very theoretical assumptions hardly observed in reality, the CAPM is considered as the simplest model for the security and portfolio return estimation due to the very straightforward linear regression relationship based on the theoretical background in financial economics. Moreover with easy data availability, it is considered as the fundamental model of financial economics taught to finance students around the world and widely practiced by financial public as the benchmark model for the security and portfolio return estimation or the IRR estimation.

1.1.5 Extensions to the CAPM

As mentioned before, the CAPM takes part as the centrepiece of modern finance due to the model simplicity in the expense of strong theoretical assumptions. However failures in empirical testing of the model called for the extensions of the CAPM to adjust the theoretical assumptions more to the reality in the expense of model complexity.

The CAPM was for instance adjusted for the labour income as nontraded asset⁷, different risky assets liquidity¹⁰ [see for instance (Acharya and Pedersen, 2005) or (Pastor and Stambaugh, 2003)] or transforming the model for multiperiod¹¹ of Merton (1993).

⁸ Black, F. (1972). Capital Market Equilibrium with Restricted Borrowing. *Journal of Business*.

⁹ Mayers, D. (1972). Nonmarketable Assets and Capital Market Equilibrium under Uncertainty. New York: Praeger

¹⁰ Acharya, V. V., Pedersen, L. H. (2005). Asset Pricing with Liquidity Risk. *Journal of Financial Economics*.

Pastor, L., Stambaugh, R. (2003). Liquidity Risk and Expected Stock Returns. *Journal of Political Economy* 111, 642-85.

¹¹ Merton, R. C. (1992). *Continuous-Time Finance*, Oxford.: Basil Blackwell.

1.2 Arbitrage Pricing Theory

The arbitrage pricing theory (APT) was developed by Stephen Ross¹² in 1976 as another theory for asset pricing after the origin the CAPM. The APT according to Ross has three **main prepositions**: (Bodie et al, 2008)

1. The returns on securities should be described by a factor model.
2. Sufficient securities will diversify away idiosyncratic risk.
3. Due to the well-functioning security markets there is no persistence of arbitrage opportunities.

Simple version of Ross's APT assumes that only one systematic factor affecting the security returns, however, the common APT calls for the multifactor model.

1.2.1 One factor model

The **one factor model** as an equilibrium model expresses the risk-return relationship for pricing securities or portfolios using only one factor that is often represented by the market excess return. Formally, the one factor model is demonstrated by the following formula:

$$r_i = E(r_i) + \beta_i F + e_i \quad (1.4)$$

where $E(r_i)$ is the expected return on stock i , F is the deviation of the common factor from expected value, β_i is the sensitivity of firm i to that factor, and e_i the firm specific disturbance.

1.2.2 Multifactor model

The APT enriched the common CAPM for the multifactor perspective of risk-return relationship. The multifactor APT, where influences of several factors on the stock or portfolio return are encompassed, looks like following formula:

$$r_i = E(r_i) + \beta_{i1} F_1 + \beta_{i2} F_2 + \beta_{i3} F_3 + \dots + \beta_{in} F_n + e_i \quad (1.5)$$

¹² Ross, S. A. (1976). The Arbitrage Theory of Capital Asset Pricing. *Journal of Economic Theory*, 341-60..

where $E(r_i)$ is the expected return on stock i ; $F_1, F_2, F_3 \dots F_n$ are the deviation of the common factors from their expected value, all the factors counts for the systematic or non-diversifiable risk; $\beta_{i1}, \beta_{i2}, \beta_{i3} \dots \beta_{in}$ are the sensitivities to each, often called as factor sensitivities or factor loadings; e_i counts for the firm specific risk.

Arbitrage is an essential term in the economics and finance. Arbitrage basically means making riskless profit on asset price differences between two or more different markets. Based on the law of one price the equivalent assets should be priced equally, in other words having the same price, in all economically relevant aspects. The law of one price should be maintained by arbitrageurs who observe a violation of this law, exploit the arbitrage opportunity, making riskless profit which in turn leads to price equality on different markets. The fundamental concept in capital market theory concerns that in efficient markets the market prices rule out arbitrage opportunities.

Based on APT, any investor, regardless of risk aversion or wealth, will want to take an infinite position in a risk-free arbitrage portfolio due to the fact that those large positions will quickly force the upward or downward price movements until the arbitrage opportunity will be ruled out. Security prices then should follow the non-arbitrage condition, the state on the market when the arbitrage opportunity can not be exploited.

1.2.3 The APT and the CAPM

In contrast to the CAPM, the APT identifies any well-diversified portfolio as the benchmark in SML relationship, compare to market portfolio used as benchmark in the CAPM. Thus, it helps to solve the problem with unobservable market portfolio. The well-diversified portfolio is defined as the portfolio that is diversified over a large enough number of securities with each weight small enough so that the non-systematic, in other words the firm specific risk, is negligible.

Same as the CAPM, the APT serves the asset pricing function. It provides a benchmark rate of return which can be used in security evaluation, portfolio evaluation or in capital budgeting during the investment decision making.

The common multifactor arbitrage pricing model advances the one factor SML (The excess market return can be considered as single factor in case the of the CAPM) to multifactor version of the SML counting for several different sources of systematic risk.

Despite these apparent advantages of the APT, the CAPM is still considered to be the core asset pricing model. The CAPM provides the expected risk-return for all securities, particularly due to the assumption of the “market portfolio”, whereas the APT relax this assumption introducing the well-diversified portfolio as the benchmark portfolio, the price for this is that APT does not guarantee its risk-return relationship for all securities at all times. For this reason, the CAPM has its dominance position among the asset pricing models.

1.2.4 Identification of relevant risk factors

The identification of relevant factors is not presented itself in the APT, however, we can find some suggestions regarding the nature of the suitable systematic risk factors:¹³

1. The unexpected factor movements should manifest an impact on asset prices.
2. The factors should represent non-diversifiable influences which have rather macroeconomic than firm-specific character.
3. There has to be available required factor data set regarding their relevance and occurrence in particular points of time during required time period.
4. The relationship between factors and expected return should be based on theoretical economical grounds.

For instance, Chen, Roll and Ross (1986)¹⁴ identified this following list of significant systematic risk factors in explaining the security returns:

- unanticipated inflation,
- unanticipated changes in GNP indicated by the changes in the industrial production index,
- changes in investor confidence due to changes in corporate bonds price, particularly in the default premium, and
- unexpected shifts in the yield curve.

¹³ Roll, R., Ross, S. (1980). An empirical investigation of the arbitrage pricing theory. *Journal of Finance*, 35 (5), 1073–1103.

¹⁴ Chen, N., Roll, R., Ross, S. A. (1986). Economic forces and the Stock Market. *The Journal of Business*, 59(3), 383-403.

In practice, indices, spot or futures market prices may be used as relevant systematic risk factors, which are reported with very short time frequency and often with significant estimation errors. Such factors, may be¹¹ the short term interest rates, the difference in long-term and short-term interest rates, a diversified stock index such as the S&P 500 or NYSE Composite Index, oil prices, gold or other precious metal prices, and currency exchange rates.

1.3 The Fama and French three factor model

The multifactor model that occupies centre attention of financial academics during the last couple of years is the three-factor model introduced by Fama and French.

The important implications which led to the origin of the Fama and French three factor model can be found in Fama and French (1992a)¹⁵ study where they discussed and analysed the joint roles of market β , size, E/P, leverage and book-to-market equity in the cross-section of average stock returns. (They found that, used alone, size, earnings to price ratio (E/P), leverage, and book-to-market equity have explanatory power.¹⁶ In combination, size (ME) and book-to-market equity (BE/ME) seem to absorb the effects of leverage and E/P in average return.) The main result of Fama and French (1992a) study is that two empirically determined variables, size and book-to-market equity well explain the cross-section average returns on NYSE, Amex, and NASDAQ stocks for the 1963-1990 period.¹⁷

The Fama and French three factor model can be found in the Fama and French (1993)¹⁸ study where there were identified five (three stock-related factors, two bond-related factors) different common

¹⁵ Fama, E. F., French, K. R. (1992). The Cross-Section of Expected Stock Returns. *The Journal of Finance*, 47(2), 427-465.

¹⁶ The size is defined as the market equity (ME) calculated as a stock price times shares outstanding. The book-to-market equity (BE/ME) is calculated as book value of equity divided by the market value of equity.

¹⁷ Compare to the CAPM model for the same period when its explanatory power disappeared.

¹⁸ Fama, E. F., French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33, 3-56.

risk factor in the returns on stock and bonds which seemed to explain the average returns on stocks and bonds. The three factors were the stock-market factors:¹⁹

- an overall market return,
- firm size related return, and
- book-to-market equity related return.

Fama and French three factor model is based on the three stock-market factors that stand for the systematic risk in the model. These factors were motivated by the empirically observations, that historical average returns on stocks of small firms are higher than predicted by the security market line of the CAPM and historical average returns on stocks with high book-to-market equity are higher than predicted by the security market line of the CAPM as well. These observations lead to that size and the book-to-market ratio could be proxies for systematic risk factors not captured by the CAPM beta and thus result in the return premiums associated with these factors.

Fama and French three factor model uses the market portfolio and mimicking portfolios for factors related to size and book-to-market equity to describe expected returns. The size factor for each period is measured as the differential return on small firms versus large firms. This factor is often denoted as “SMB”, standing for “small minus big”. Similarly, the factor related to the book-to-market equity ratio is obtained as the return on firms with high book-to-market ratios minus return on firms with low book-to-market ratios. The second factor is usually denoted as “HML”, standing for “high minus low” (Bodie et al, 2008). The second factor related to book-to-market equity is often associated with the term “value premium”.

Formally, Fama-French three-factor model is formulated as:²⁰

$$E(r_i) - r_f = a_i + b_i [E(r_M) - r_f] + s_i E[SMB] + h_i E[HML] \quad (1.6)$$

¹⁹ The two other factors were the bond-market factors: the factor related to maturity related factor, and the factor related to default risk.

²⁰ Fama, E. F., French, K. R. (1996). Multifactor Explanations of Asset Pricing Anomalies. *Journal of Finance*, 51(1), 55-84.

where coefficients b_i , s_i and h_i are the betas of the stock on each of the three factors, often called the factor loadings.

According to APT, if these chosen factors are the relevant factors, excess asset return should be fully explained by the risk premium due to the influences of these factor loadings which implies that the intercept of the equation should be zero (Bodie et al, 2008).

The extension of the Fama-French three factor model represents Carhart four-factor model (1997) which accounts also for the recent stock return called the momentum factor. This model is widely used as well. In the study of Carhart (1997)²¹ is presented the evidence of long prior-month winners and short prior-month losers due to the momentum effect of stock prices.

1.4 The value premium

The value premium can be defined as an anomaly of the capital asset pricing model. The discovery of value premium is dated in 1980's. Concretely, Stattman²² (1980) and Rosenberg, Reid, and Lanstein²³ (1985) found in their studies that average returns on U.S. stocks are positively related to the ratio of a firm's book value of common equity to its market value. In addition, Chan, Hamao, and Lakonishok²⁴ (1991) found that book-to-market equity ratio has a strong role in explaining the cross-section of average returns on Japanese stocks as well. According to Chan and Chen²⁵ (1991) the risk captured by the book-to-market equity is the relative distress factor. "They postulate that the earnings prospects of firms are associated with a risk factor in returns. Firms that the market judges to have poor prospects, signalled here by low stock prices and high ratios of book-to-market equity ratio, have higher expected stock returns, and are penalized with higher costs of capital, than firms

²¹ Carhart, M. M. (1997). On persistence in mutual fund performance. *Journal of Finance*, 52, 57-82.

²² Stattman, D. (1980). Book values and stock return. *The Chicago MBA: A Journal of Selected Papers*, (4), 25-45.

²³ Rosenberg, B., Reid, K., Lanstein, R. (1985). Persuasive evidence of market inefficiency. *Journal of Portfolio Management*, 11, 9-17.

²⁴ Chan, L. K., Hamao, Y., Lakonishok, J. (1991). Fundamentals and stock returns in Japan. *Journal of Finance*, 46, 1739-1789.

²⁵ Chan, K. C., Chen, N. (1988). An unconditional asset-pricing test and the role of firm size as an instrumental variable for risk. *Journal of Finance*, 43, 309-325.

with strong prospects. However it is also possible book-to-market equity ratio just captures the unravelling (regression toward the mean) of irrational market whims about the prospects of firms” (Fama and French, 1992).

Fama and French (1992) identified a value premium in the U.S. stock returns for the post-1963 period; that is, stocks with high ratios of the book value of equity to the market value of equity (called value stocks) have higher average return than stock with low book-to-market ratios (called growth stocks).²⁶ Later, the Davis, Fama, and French study (2000)²⁷ documented that the positive relation between average return and book-to-market equity was also as strong for 1929-97 as for the subsequent period studied in previous Fama and French papers.

The international evidence of value premium is presented in paper of Fama and French²⁸ (1998) where is documented that value stocks have higher returns around the world. In detail, for period from 1975 to 1995, the difference between the average returns on global portfolios of high and low book-to-market equity stocks is 7.6 % per year, and value stocks outperform growth stocks in 12 of 13 major world financial markets. Essentially, they found that an international CAPM cannot explain the value premium, but a two-factor model that includes a risk factor for relative distress captures the value premium in international returns.

The value premium in average returns can be explained by several theoretical approaches; basically these theoretical approaches can be dividend into two main groups:

- the efficient market theory, or
- the theory of behavioural finance.

²⁶ Fama, E. F., French, K. R. (2006). The Value Premium and the CAPM. *The Journal of Finance*, 61(5).

²⁷ Davis, J. L., Fama, E. F., French, K. R. (2000). Characteristics, Covariances, and Average returns: 1929-1997. *Journal of Finance*, 55, 389-406.

²⁸ Fama, E F., French, K. R. (1998). Value versus growth: The international evidence. *Journal of Finance*, (53), 1975-1999.

The more specifically, these hypotheses for what gives rise to the value premium comes for these three main approaches:

- the compensation for risk,
- the behavioural bias,
- the survivorship bias.

1.4.1 Compensation for risk

The concept of value premium as a compensation for risk is consistent with the Merton's (1973) intertemporal capital asset pricing model (ICAPM) as well as with Ross's (1976) arbitrage pricing theory (APT) in the way that the higher average returns on high book-to-market equity stocks are in fact the compensation for risk.

Further, Fama and French three factor model (1993, 1996) helps to explain the risk premium not captured by the beta in the CAPM. This risk premium in Fama and French three factor model is often called "the distress premium" based on the evidence that there is common variation in earnings of distressed firms that is left unexplained by market earnings, so that, in the return point of view, the common variation in returns of distress firms is left unexplained by market return (international evidence]. Fama and French showed the evidence that small stock with high book-to-market equity are firms with poor performance which are vulnerable to financial distress, so investors require a compensation for the risk premium investing it these stock that provided in higher returns compare to the growth stocks more precisely called "the glamour stocks" of firms with higher market capitalization.

Overall, the compensation for risk presents rational explanation for the value premium that the value stocks are more risky than growth stocks.

1.4.2 Behavioral bias

Behavioralists claim that the value premium is the result of investor overreaction that happens to be correlated across firms which can be wrongly associated with the risk compensation. In the behavioural view, the market tries to set prices following the CAPM, however, due to the mispricing there arise violations of the CAPM (Fama and French, 2006).

There are two mispricing models of De Bondt and Thaler²⁹ (1985) and Lakonishok, Shleifer, and Vishny³⁰ (1994) that have particular importance for behavioralists. These authors present evidence about underpricing of value stocks and overpricing of growth stocks, and that the higher average returns of value stocks are the result of slow price corrections.³¹

In particular, one version of the contrarian model argues that the overpriced glamour stocks are those which have performed well in the past and are expected by the market to perform well in the future. Similarly, the underpriced value stocks with poor performance in the past are expected to perform poorly in the future. The value strategies bet against investors who extrapolate past performance too far in the future and therefore value strategies produce superior return (see Lakonishok, Shleifer, and Vishny, 1994). In accordance with Lakonishok, Shleifer, and Vishny (1994) study, it led to the conclusion that “value strategies yields higher returns because these strategies exploits the suboptimal behaviour of the typical investor and not that these strategies are fundamentally riskier”.

²⁹ DeBondt, W., Thaler, R. (1985). Does the Stock Market Overreact?. *Journal of Finance*, 40, 793-805

³⁰ Lakonishok, J., Shleifer, A., Vishny, R. W. (1994). Contrarian Investment, Extrapolation, and risk. *Journal of Finance*, 49, 1541-1578.

³¹ Fama, E. F., French, K. R. (2008). Opportunistic Financing. Downloaded 11 March 2011, <http://ssrn.com/abstract=1120848>.

Haugen³² (1995) argue that “the value premium in average returns arises because the market undervalues distressed stocks and overvalues growth stocks. When these pricing errors are corrected, distressed (value) stocks have high returns and growth stocks have lower return.”³³

Later, the papers of Barberis, Shleifer, and Vishny (1996) and of Daniel, Hirshleifer, and Subramanyam (1997) proposed behavioural models that accommodated over-reaction and under-reaction. Both models predicted “post-event return reversals in response to long-term pre-event abnormal returns” (Fama, 1998).³⁴

All in all, the value premium according to behavioralists is result of behaviour bias, particularly, is caused by overreaction of investors that further leads to stocks mispricing, in the short term.

1.4.3 Survivorship bias

Survivorship bias in financial perspective is related with over time persistence of “winner” companies with a good economic performance and on the other hand with excluding “looser” companies those performances dropped significantly down, and consequently, they has been closed out. The survivorship bias has implication on persistence of the “winner” companies in the structure of mutual funds and the consequences for statistic data analysis since the “looser” companies were excluded from the tested sample. Since successful mutual funds will tend to persist in the future and the closed mutual funds with poor performance will be missed in data samples, there can be created wrong perception of over all successful mutual funds performance over the time. The survivorship bias in performance studies of mutual funds is further discussed in the paper of Brown, Goetzmann, Ibbotson, and Ross (1992).³⁵ More recently, the paper of Carhart, Carpenter, Lynch, and Musto³⁶ (2002) is devoted to mutual fund survivorship.

³² Haugen, R., (1995). *The New Finance: The Case against Efficient Markets* (2nd edition). New Jersey: *Prentice Hall*.

³³ Fama, E. F., French, K. R. (1998). Value Versus Growth: The International Evidence. *Journal of Finance*. 53(6), 1975-1999.

³⁴ Fama, E. F. (1998). Market Efficiency, Long-Term Returns, and Behavioral Finance. *Journal of Financial Economics*. 49, 283-306.

³⁵ Brown, S. J., Goetzmann, W., Ibbotson, R. G., Ross, S. A. (1992). Survivorship Bias in Performance Studies. *The Review of Financial Studies*, 5(4), 553-580.

Brailsford and Heaney (1998)³⁷ suggest that survivorship bias can be overcome if the statistical sample includes all existing companies, or at least the sample is drawn from both surviving and failed companies.³⁸

Value premium as a result of survivorship bias was raised up by Kothari, Shanken, and Sloan (1995)³⁹ in their cross-section study of expected stock returns. They challenged the Fama and French (1992) study claiming that relation between the book-to-market equity is weaker and less consistent, moreover conjecturing that „the past book-to-market equity results using the COMPUSTAT data are affected by selection bias and provide indirect evidence.“ Particularly, the survivorship bias in the COMPUSTAT database affects the high book-to-market stocks' returns and the period-specific performance of both stocks with low book-to-market equity that were "winner" stocks in the past, and stocks with book-to-market equity, previous "loser" stocks. They proposed using of an alternative data source, Standard & Poor's (S&P) industry data from 1947 to 1987, and they found that book-to-market equity is weakly related to average stock return.

However, the study of Chan, Jegadeesh, and Lakonishok⁴⁰ (1995) showed that using of COMPUSTAT file does not create severe selection bias in the context of the differential performance of value versus glamour stocks, which could be caused by excluding of close-end funds, compare to using another database from the Center for Research in Security Prices (CRSP) at the University of Chicago.

³⁶ Carhart, M. M., Carpenter, J. N., Lynch, A. W., Musto, D. K. (2002). Mutual Fund Survivorship. *The Review of Financial Studies*, 15 (5), 1439-1463.

³⁷ Brailsford, T. J., Heaney, R. (1998) .Investment: Concepts and Applications in Australia,“ Harcourt Brace & Co, pp. 449-520.

³⁸ Malin, M., Veeraraghavan, M. (2004). On the Robustness of the Fama and French Multifactor Model: Evidence from France, Germany, and the United Kingdom. *International Journal of Business and Economics*, 3(2), 155-176.

³⁹ Kothari, S. P., Shanken, J., Sloan, R. G. (1995). Another Look on Cross-section of Expected Stock Returns. *The Journal of Finance*. 50(1), 185-224.

⁴⁰ Chan, L. K. C., Jegadeesh, N., Lakonishok, J. (1995). Evaluating the Performance of value versus glamour stocks: The Impact of Selection Bias. *Journal of Financial Economics*, 38, 269-296.

1.4.4 Time-varying value premium

In original value premium studies [see for instance (Fama and French, 1993 and 1996)] there was assumption that value premium is constant over the time which means that the expected returns on the value stocks are continuously higher than expected returns on the glamour stocks, therefore there is no time related factor that would influence the value premium over the time.

However, the study of Fama and French⁴¹ (1989), even before the origin of the term “value premium”, revealed the countercyclicality of the expected market risk premium. Particularly, they discover that expected returns on common stocks and long-term bonds contain a term or maturity premium that has clear pattern following the business cycle which is low near peaks and high near troughs. They proposed that the expected returns are lower when economic conditions are strong and higher when conditions are weak.

More specifically, when the business conditions are poor, income is low and expected returns on bonds and stocks must be high to induce substitution from consumption to investment. In contrary, when the times are good and income is high, the market clears at lower levels of expected returns. However, they also claimed that variation in expected returns with business conditions is due to variation in the risks of bonds and stocks.

They appealed for further studies to find what economic forces drive the economy between long and short term good and bad times, whether is it invention, changes in tastes for current versus uncertain future consumption, government monetary or fiscal policies.

Empirically, the countercyclicality of the expected market risk premium has long been established in studies Fama and French (1989) and Ferson and Harvey (1991), the existence of the cyclical property of value premium is more recent research issue. (Petkova) -excluded

Petkova and Zhang⁴² (2003) tried to find the answer for the fundamental question concerning the value premium, particularly whether “value is riskier than growth.” They found that value stocks are riskier than growth stocks in bad times when the expected market risk premium is high. The opposite relation was valid for the growth stocks. These findings led them to support the rational asset pricing theory and to conclude the compensation for risk approach behind the value premium.

⁴¹ Fama, E. F., French, K. R. (1989). Business Conditions and Expected Returns on Stocks and Bonds. *Journal of Financial Economics*, 25, 23-49.

⁴² Petkova, R., Zhang, L. (2003). Is Value Riskier than Growth?. *Simon School of Business Working Paper*.

As the comprehensive study of the time-varying value premium is considered the study of Gulen, Xing, and Zhang⁴³ (2008) where is examined the strong countercyclical variation of expected value-minus-growth returns. In particular, they found that expected returns on value firms covary more with recessions than the expected returns of growth firms. They identified the inflexibility of value firms as the reason behind this close covariation. Using the proxies for real flexibility, they documented that value firms have higher ratios of fixed assets to total assets, higher frequency of disinvestment, higher financial leverage, and higher operating leverage than growth firms which lead to their problems in adjusting to the worsening economic conditions in recession measured by higher short term interest rate and higher default spread. Moreover, inflexible value firms incur higher cost of equity on average compare to the more profitable growth firms which have much less costs of equity on average. As the results, value firms are riskier than growth firms in recessions when the price of risk is high. Thus, the risk and the expected return of value firms are highest in recessions compare to the risk and the expected return of growth firms. Moreover, inflexible value firms incur higher cost of equity on average compare to the more profitable growth firms which have much less costs of equity on average.

The same authors Gulen, Xing, and Zhang⁴⁴(2010) documented in their recent study that expected value premium displays strong variations during the time. When conditional volatilities are high, the expected returns of value stock are more sensitive to aggregate economic conditions than the expected returns on growth stocks. As result, the value premium is time varying. It spikes upward in high volatility stage, referred to the recession, and declines more gradually in the low volatility stage, referred to the expansion. They used the predictors such as one-month Treasury bill rate, default spread, the growth in the money stock, and the dividend yield.

In conclusion, according to the findings of Gulen, Xing, and Zhang (2008 and 2010) the value premium appeared especially during the recession.

⁴³ Gulen, H., Xing, Y., Zhang, L. (2008). Value versus Growth: Time-Varying Expected Stock Returns. *Ross School of Business Paper*.

⁴⁴ Gulen, H., Xing, Y., Zhang, L. (2010) Value versus Growth: Time-Varying Expected Stock Returns. *Financial Management*.

2 Methodology

Methodology part of the master thesis stands on the three models:

- the single index model as a benchmark model,
- the dual beta market model for analysing the effects of bull or bear markets, and
- the dual beta market model for analysing the effects of economic cycle.

The two last models try to revealed whether the bull and bear markets, or whether the economic cycles has an impact on value premium. Both those factors are time-varying; therefore there is also the attempt to prove that value premium varies during the time due to those factors.

2.1 The single index model

The single index model was chosen as a benchmark model. The single index model is special type of a single factor model which uses market index as a proxy for the common factor. The regression equation of this model is following

$$R_{it} - R_F = \alpha_i + \beta_i (R_{Mt} - R_F) + \varepsilon_t \quad (2.1)$$

where $R_{it} - R_F$ is excess return on portfolio, $R_{Mt} - R_F$ is excess market return, β_i is the portfolio's sensitivity to market index, ε_t is the residual representing the firm-specific risk, and α_i is the portfolio's excess return when the market excess return is zero, in other words alpha stands for a nonmarket premium. Alpha has a crucial role. When security prices are in equilibrium the alpha is driven to zero.

The single index model provides a good approach how to empirically test the CAPM. The CAPM relationship is valid if the alpha is equal zero with the statistical significance.

2.2 Dual beta market model accounting for the bull-bear markets

The unique dual beta market model was constructed for analyzing the effect of bull and bear markets. This model was inspired by the study of Bhardaj and Brooks⁴⁵ (1993) where they analysed the effect of bull and bear markets on the size effect. Using their dual-beta market model to adjust for risk differences in bull and bear markets, they found contradiction of the size effect introduced by Fama and French (1993, 1996). In particular, they presented that large firm stocks on average earn significant positive excess returns and small firm stocks earn significant negative excess return.

For purpose of the master thesis the Bhardaj and Brooks (1993) dual beta market model was adjusted to reflect the impact of bull and bear markets on the value premium. The model equation is

$$R_{it} - R_F = \alpha_i + \alpha_{Bi} \cdot \delta_B + \beta_i (R_{Mt} - R_F) + \beta_{Bi} \cdot \delta_B (R_{Mt} - R_F) + \varepsilon_t \quad (2.2)$$

where $R_{it} - R_F$ is the excess return on portfolio, $R_{Mt} - R_F$ is excess return on market portfolio, α_i is the intercept, β_i the portfolio's sensitivity to market index, α_{Bi} is the additional intercept for bear months, δ_B is the dummy variable that equals one for bear months and zero for bull months, β_{Bi} is additional value of the slope for the bear months, ε_t counts for the firm-specific risk.

The dummy variable value assignment begins with the calculation of the arithmetic mean of market return. If the actual market return in particular month is higher than its mean value, the dummy variable equals to zero and this month is considered as bull month. If the actual market return in particular month is lower than its mean value, the dummy variable equals to one and this month is considered as bear month.

⁴⁵ Bhardwaj, R., Brooks, L. (1993). Dual Betas from Bull and Bear Markets: Reversal of the Size Effect, *Journal of Financial Economics*.

2.3 Dual beta market model accounting for the economic cycle

The unique model for analyzing the effect of the economical cycles was constructed again based originally on Bhardaj and Brooks⁴⁶ (1993) followed by the study of Kim and Burnie (2002) which was focused on effect of the economic cycle on the firm size effect. Specifically, they proved that small firm effect is manifest in the expansion phase of the economic cycle but not in the contraction phase. In addition, they concluded that risk-adjusted returns are larger for small firms than for large firms, known as size effect which was found as reversal in study of Bhardaj and Brooks⁴⁷ (1993).

For purpose of the master thesis the Bhardaj and Brooks (1993) dual beta market model followed by the Kim and Burnie⁴⁸ (2002) dual beta market model was adjusted to reflect the effect of the economic cycle on the value premium. The model equation is

$$R_{it} - R_F = \alpha_i + \alpha_{Ci} \cdot \delta_C + \beta_i (R_{Mt} - R_F) + \beta_{Ci} \cdot \delta_C (R_{Mt} - R_F) + \varepsilon_t \quad (2.3)$$

where $R_{it} - R_F$ is the excess return on portfolio, $R_{Mt} - R_F$ is excess return on market portfolio, α_i is the intercept, β_i the portfolio's sensitivity to market index, α_{Ci} is the additional intercept for the expansion period, δ_C is the dummy variable that equals one for the expansion and zero for the contraction period, β_{Ci} is additional value of the slope for the expansion period, ε_t reflects the firm-specific risk.

The values of the dummy variables for economic cycle are assigned based on the data listed in the NBER⁴⁹ database, where are identified the expansions and contractions periods.

⁴⁸ Kim, M. K., Burnie, D. A. (2002). The Firm Size Effect and the Economic Cycle, *The Journal of Financial Research*, 15(1), 111-124.

⁴⁹ *US Business Cycle Expansions and Contractions*. (2011). Downloaded 25 January 2011, from <http://www.nber.org/cycles/cyclesmain.html>

2.4 Regression analysis with the dummy variables

The regression analysis with the dummy variables is used as the measurement technique in the analytical part of the master thesis, specially used for construction of the dual beta models to reflect the time varying value premium. Generally, **the simple or bivariate linear regression** is used as technique for the measuring the linear relationship between the dependent variable and one independent variable. The simple regression equation to predict the dependent variable from the specific values of independent variables plot as the straight line relationship is

$$\hat{y} = \hat{\alpha} + \hat{\beta} x \quad (2.4)$$

where \hat{y} is the estimated dependent variable, x is the independent variable, $\hat{\alpha}$ is the estimated constant which is actually the intercept of the regression line, and $\hat{\beta}$ is the estimated regression coefficient which is actually the slope of linear regression line.

The multiple regression is used for measuring the relationship between the dependent variable and two or more independent variables. The multiple regression equation looks like following

$$\hat{y} = \hat{\alpha} + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + \dots + \hat{\beta}_k x_k \quad (2.5)$$

where \hat{y} is the dependent variable, x_1, x_2, \dots, x_k are the independent variables, $\hat{\alpha}$ is the estimated constant, and $\hat{\beta}_1, \hat{\beta}_2 \dots \hat{\beta}_k$ are the estimated regression coefficients.

The dummy variable is the variable which can get two possible values, a zero or a one. The value determination depends on whether there is presence or absence of some effect that may influence the expected value of the dependent variable. There can be used several dummy variables in regression equation, the more dummy variables are included the better is the model fit nonetheless in the expense of the less model generality.

2.5 Statistical testing

2.5.1 Coefficient of determination

The coefficient of determination (R^2) measures the proportion of explained variance in the regression compare to the total variance⁵⁰ (Zikmund et al, 2010). The purpose of the coefficient of determination is to measure the how well the regression model explains the relationship between dependent variable and independent variable(s).

$$R^2 = \frac{\text{Explained variance}}{\text{Total variance}} = \frac{\text{Explained sum of squares}}{\text{Total sum of squares}} = \frac{SSR}{SST} = \frac{\sum_i \hat{y}_i - \bar{y}}{\sum_i y_i - \bar{y}} = 1 - \frac{SSE}{SST} = 1 - \frac{\sum_i y_i - \hat{y}_i}{\sum_i y_i - \bar{y}} \quad (2.6)$$

The adjusted coefficient of determination is modification of R^2 adjusted for the number of independent variables. Unlike the R^2 , the adjusted R^2 increases only if the added independent variable(s) improve(s) the explanatory power of the model. Adjusted R^2 will equal the R^2 in maximum, otherwise it will equal less than R^2 . The value of the adjusted R^2 can be negative as well.

The adjusted R^2 is calculated as (Zikmund et al, 2010)

$$\text{Adjusted } R^2 = 1 - (1 - R^2) \frac{n-1}{n-k-1} \quad (2.7)$$

where n is number of observation, and k is number of independent variables.

2.5.2 t-statistic

The t-statistic is based on the assumption that returns are normally distributed. In general, if we standardize the estimate of a normally distributed variable by computing its difference from a hypothesized value and dividing by the standard error of the estimate, the resulting variable will

⁵⁰ Zikmund, W. G., Babin, B. J., Carr, J. C., and Griffin, M. (2010) *Business Research Methods* (8th edition). Canada: South-Western, Cengage Learning.

have a t-distribution. The larger will be the sample size, the more the bell-shaped t-distribution will approach the normal distribution (Bodie, 2008).

Generally, the t-statistic is the ratio of the regression parameter to its standard error. Since the t-statistic actually equals the number of standard errors by which the estimated value exceeds zero, it can be used to assess the likelihood that the true but unobserved value might actually equal zero rather than the estimated value derived from the analyzed data. If the true value was zero, we would be unlikely to observe estimated value far away from zero due to the many standard errors. Overall, the large t-statistic implies the low probability that the true value is zero. (Bodie, 2008).

2.5.3 p-value

In the statistical testing of the model and its parameters, the p-value stands for the probability value, or the observed or computed significance level (Zikmund et al, 2010). The null hypothesis is often rejected when the p-value is lower than 0.05. If the null hypothesis is rejected, then the result is considered to be statistically significant.

2.5.4 F-test

In the multiple regression model, we might further investigate whether two or more explanatory variables are jointly important to the model. Namely, the F-test allows us to test the joint hypotheses. F-test is based on comparison of the sum of the squared errors from an unrestricted model, also called a “full”, or an “original” model, to the sum of squared errors from a restricted model. A large difference would imply that the restricted model has lower explanatory power⁵¹ (Ogunc and Hill, 2008). The F-statistic is calculated as

$$F = \frac{\frac{SSE_R - SSE_U}{K_U - K_R}}{\frac{SSE_U}{N - K_U}} \quad (2.8)$$

⁵¹ Ogunc, A. K., Hill, R. C. (2008). *Using Excel For Principles of Economics* (3rd edition). New York: John Wiley & Sons.

where SSE_R is the sum of squared errors of the restricted model, SSE_U is the sum of squared errors of the unrestricted model, K_R is the number of variables in the restricted model, K_U is the number of variables in the unrestricted model, and N is number of observations.

The null hypothesis is rejected if the calculated F-statistic is greater than the critical value of the F distribution with some significance level, e.g. 0.05. The significance of the F-statistic can be also verified by the p-value.

2.5.5 Robustness test

Robustness testing for testing the portfolio returns refers to model verification, particularly, whether the results obtained from analysing the model with the data spanning the full time period are also relevant in other periods, or in shorter periods within the total period. The simple way is to divide the total period into two equal time periods, to test the model in those periods and compare the results.

3 Data

For the purpose of data analysis were used data from Kenneth R. French data library⁵², particularly, the monthly value weighted returns on ten portfolios formed on book-to-market equity ratio;⁵³ other data used from the same data source were market excess return and risk free return⁵⁴.

U.S. business cycles data were obtained from the National Bureau of Economic Research⁵⁵ (NBER) with the clear specification of expansion and contraction periods covering the total time period identical with the data from Kenneth R. French data library.

The total analysed time period begins in July 1926 and ends in December 2010, which counts for 1114 monthly observations. Due to the Robustness testing the total time period was divided into two equal subperiods. To be specific the equal number of monthly observations was 507 in each subperiod. The first part of the total time period started from July 1926 and ended in September 1968. The second part, the remaining time period, started from October 1968 and ended in December 2010.

The Microsoft Office Excel 2007 was used as a software program for data analysis. The publication "Using Excel for Principles of Economics"⁵⁶ was used to perform multiple regression with dummy variables in this software.

⁵² *Kenneth French Data Library. (2011)*. Downloaded 25 January 2011, from http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

⁵³ This data was created by CMPT_BEME_RETS using the 201012 CRSP database. The portfolios are constructed at the end of June. BE/ME is book equity at the last fiscal year end of the prior calendar year divided by ME at the end of December of the prior year. The portfolios use Compustat firms plus the firms hand-collected from the Moody's Industrial, Utilities, Transportation, and Financial Manuals.

⁵⁴ This data was created by CMPT_ME_BEME_RETS using the 201012 CRSP database. The 1-month Treasury Bill return comes from Ibbotson and Associates, Inc.

⁵⁵ *US Business Cycle Expansions and Contractions. (2011)*. Downloaded 25 January 2011, from <http://www.nber.org/cycles/cyclesmain.html>

⁵⁶ Ogunc, A. K., Hill, R. C. (2008). *Using Excel For Principles of Economics* (3rd edition). New York: John Wiley & Sons

4 Empirical part

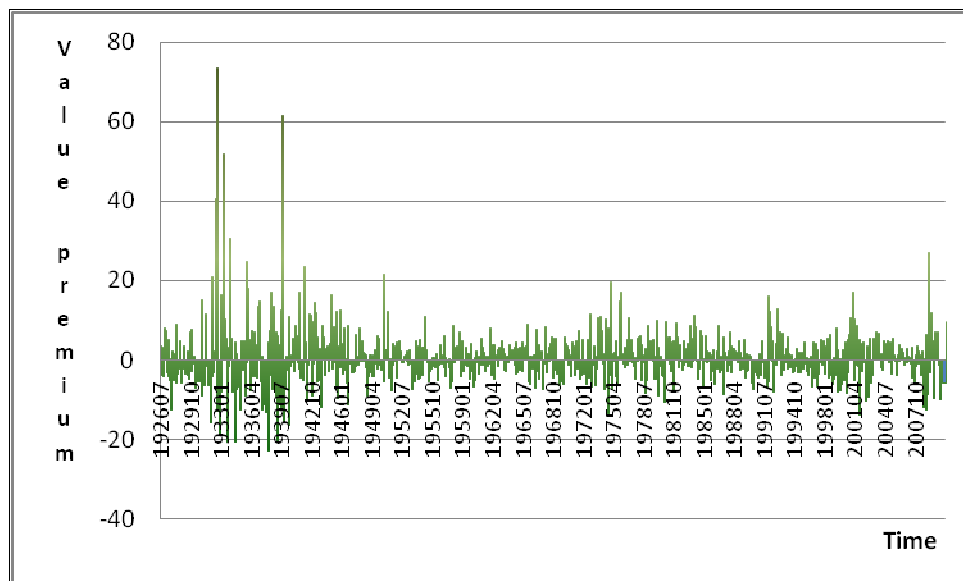
The empirical part stands on the three regression models, the first the single index model as the benchmark model as well as the constant risk model, the second and third model as the multiple regression models with dummy variables as the time-varying modes, the second model accommodating the effect of bull or bear markets, the third model accommodating the effect of economic cycle.

Primarily, the regression models are tested during the total time period. Afterwards, the models are tested in two equal subperiods to accomplish the Robustness testing of the regression models and to assess their reliability and to draw further implications.

4.1 Value premium over the time

The value premium during the total analysed time period was calculated as a difference between the portfolio return with highest book-to-market equity ratio and the portfolio return with the lowest book-to-market equity ratio for every month of total time period. The results of the value premium are depicted in the following figure.

Figure 4.1 Development of the value premium over total period



On the previous figure we can notice quite substantial oscillations of the value premium during the Great Depression. Except this period, the value premium oscillated positively or negatively in almost the same extend, although we could presuppose that the positive values were more outstanding and prevailed more often during the total period.

4.2 Testing the simple index model

The simple index model was chosen to perform the empirical testing of the CAPM as a benchmark model for the data analysis. This model offers the easiest approach to promptly check whether the CAPM succeeds or fail to explain the excess portfolio return with the market beta. The simple linear regression was run based on the equation 2.1 of the simple index model.

4.2.1 Literature suggestions for the expected results

As it was mentioned earlier in the section 1.1.4, the CAPM model has for long time influenced the way how academics and practitioners have thought about the average return and risk.

Later, Black, Jensen, and Scholes (1972)⁵⁷ and Fama and MacBeth (1973)⁵⁸ found that, as predicted by the CAPM model, there is a positive simple relation between average return and market beta during the early period from 1926-1968. However during the more recent period from 1963 to 1990 this simple relation between market beta and average returns disappears as Lakonishok and Shapiro⁵⁹ (1986) and Fama and French (1993) concluded.

The Fama and French (1993 and 1996) was revolutionary in the way that their three-factor model captures better the variations in average stock returns than the CAPM for the 1963-1990 period, which had further implications on the value premium. Specifically, Fama and French (2006) found that the CAPM can explain the strong value premiums from 1926 to 1963, but not value premiums

⁵⁷ Black, F., Jensen, M. C., Scholes, M. (1972). The capital asset pricing model: Some empirical tests. *Studies in the theory of capital markets*, ed. Michael Jensen. New York: Praeger, 79–121.

⁵⁸ Fama, E. F., MacBeth, J. D. (1973). Risk, Return and Equilibrium: Empirical Tests. *Journal of Political Economy*, 81, 607–636.

⁵⁹ Lakonishok, J., Shapiro, A.C. (1986). Systematic Risk, Total Risk and Size as Determinants of Stock Market Returns. *Journal of Banking and Finance*, 10, 115-13.

from 1963 to 2004. More in detail, growth stocks tend to have larger market betas than value stocks in the later period, which is in reversal with CAPM's requirement to explain value premium. Thus, Fama and French (2006) rejected a CAPM explanation of the value premiums from 1963 to 2004, whether the time variation in market beta is allowed or not. During earlier period from 1926 to 1963 period, value stocks have larger betas than growth stocks, thus Fama and French (2006) like Ang and Chen (2005), approved that the CAPM captures the value premiums in this period near perfectly.

However, Fama and French (2006), overall concluded that the CAPM creates more problems compare to its success with the value premiums of 1926 to 1963.⁶⁰ Based on the results, Fama and French (2006) concluded that the CAPM has fatal problems throughout the whole period from 1926 to 2004. Specifically, "size and book-to-market equity or risks related to these factors are important in expected returns, whether or not they relate to beta in a way that would support the CAPM. The market beta has little or no independent role. It seems to predict, however, that challenges are forthcoming."

4.2.2 Presentation of the results

The results obtained from the simple linear regression following the equation 2.1 of simple index model are listed in the table 4.1. Data covers the total analysed period. Data are organized in the table for 10 portfolios based on the book-to-market equity ratio in order from low to high, and for following categories: the coefficient of determination, the adjusted coefficient of determination, the estimates of regression coefficients according to the equation 2.1, and the p-values of regression coefficients. The same presentation of the results is kept in subperiods.

Based on the results from the table 4.1, particularly focusing on the p-value of the alpha, the CAPM model was rejected twice out of ten portfolio deciles. Therefore we conjecture that the CAPM is overall valid over the total analysed period from 1926 to 2010. However, in consideration that the

⁶⁰ According to the CAPM, all differences in beta are compensated in the same way in expected returns. But in Fama and French three-factor model when the portfolios are formed based on size, book-to-market ratio, and beta, the variation in beta related to size and book-to-market equity ratio was compensated in average returns for 1928 to 1963, but variation in beta unrelated to size and book-to-market ratio went unrewarded during 1928 to 1963. As a result, Fama and French (2006) reject CAPM pricing for portfolios formed on size, book-to-market equity ratio, and beta, for 1928 to 1963 as well as for 1963 to 2004. This rejection of the CAPM is as strong for large stocks as for small stocks.

value premium is time varying, the results highly depend on the chosen period. Thus, it is essential to run the linear regression for two subperiods as well.

Table 4.1 The results of the simple linear regression for the single index model during the total period

Portfolio	Coefficient of Determination		Regression coefficient		P value of the coefficient	
	R ²	Adjusted R ²	α	β	α	β
P1	0,95	0,90	-0,1	1,0	0,22	0
P2	0,96	0,93	0,0	1,0	0,38	0
P3	0,96	0,91	0,1	0,9	0,16	0
P4	0,95	0,90	0,0	1,1	0,61	0
P5	0,94	0,88	0,1	1,0	0,12	0
P6	0,94	0,88	0,1	1,1	0,25	0
P7	0,91	0,83	0,1	1,1	0,52	0
P8	0,90	0,81	0,2	1,2	0,05	0
P9	0,89	0,79	0,2	1,2	0,08	0
P10	0,84	0,71	0,2	1,5	0,28	3E-273

The table 4.2 shows the results for the first subperiod from July 1926 to September 1968. The results imply the CAPM validity in this time period due to the low significance of the alpha coefficient for nearly every portfolio based on book-to-market equity ratio which comply with the results of the studies of Black, Jensen, and Scholes (1972)⁶¹, and Fama and MacBeth (1973)⁶² that there is positive simple relation between average return and market beta within the same analysed period; and further the results comply with the studies focused on value premium of Ang and Chen (2005)⁶³, and Fama and French (2006) where is stated that the CAPM explains the value premium nearly perfectly.⁶⁴

⁶¹ Black, F., Jensen, M. C., Scholes, M. (1972). The capital asset pricing model: Some empirical tests. *Studies in the theory of capital markets*, ed. Michael Jensen. New York: Praeger, 79–121.

⁶² Fama, E. F., MacBeth, J. D. (1973). Risk, Return and Equilibrium: Empirical Tests. *Journal of Political Economy*, 81, 607–636.

⁶³ Ang, A., Chen, J. (2005). The CAPM over the long run: 1926–2001, Working paper, Columbia University.

⁶⁴ However, the CAPM is finally rejected in the study Fama and French (2006) in period 1926-1963 for the reasons described in footnote no. ().

**Table 4.2 The results from the simple linear regression
for the single index model during the first subperiod**

Portfolio	Coefficient of Determination		Regression coefficient		P value of the coefficient	
	R ²	Adjusted R ²	α	β	α	β
IP1	0,96	0,93	0,0	1,0	0,91	2E-292
IP2	0,97	0,94	0,0	1,0	0,50	3E-302
IP3	0,96	0,93	0,0	0,9	0,59	1E-286
IP4	0,96	0,92	-0,2	1,1	0,06	9E-283
IP5	0,95	0,91	0,1	1,0	0,38	4E-265
IP6	0,95	0,90	0,0	1,1	0,87	1E-252
IP7	0,94	0,89	-0,1	1,3	0,36	1E-242
IP8	0,93	0,86	0,1	1,3	0,37	5E-219
IP9	0,92	0,85	0,1	1,4	0,76	6E-208
IP10	0,87	0,76	-0,1	1,7	0,75	5E-159

The results for the second subperiod from October 1968 to December 2010 are listed in table 4.3. Looking on the p-values of the alpha coefficient, we can observe high significance of this coefficient especially for the portfolios with higher book-to-market equity ratios that contained mostly the “value stocks.” In detail, these portfolios are the four portfolios with highest book-to-market equity ratio at the significance level of 5%. See the table 4.3. Hence we can claim that the CAPM fails to explain the excess returns on portfolio especially for the portfolios with the value stocks. Moreover, there is rising trend in the alpha coefficient values, from lowest value for portfolio with lowest book-to-market equity ratio to the highest value for the portfolio with highest book-to-market equity ratio.

Table 4.3 The results from the simple linear regression for the single index model during the second subperiod

Portfolio	Coefficient of Determination		Regression coefficient		P value of the coefficient	
	R ²	Adjusted R ²	α	β	α	β
IIP1	0,93	0,86	-0,1	1,1	0,10	3E-219
IIP2	0,96	0,92	0,0	1,0	0,54	8E-276
IIP3	0,95	0,90	0,1	1,0	0,14	8E-251
IIP4	0,93	0,87	0,1	1,0	0,22	1E-224
IIP5	0,91	0,84	0,1	0,9	0,19	1E-200
IIP6	0,92	0,85	0,1	0,9	0,10	2E-212
IIP7	0,88	0,77	0,2	0,9	0,04	5E-164
IIP8	0,87	0,76	0,2	0,9	0,03	1E-158
IIP9	0,87	0,75	0,3	0,9	0,00	4E-155
IIP10	0,81	0,66	0,4	1,1	0,01	5E-121

The results reflecting the failure of the CAPM in the second subperiod of 1968 to 2010 comply with the studies of Lakonishok and Shapiro⁶⁵ (1986) and Fama and French (1993) who concluded that the simple relation between market beta and average returns disappears during the period from 1963 to 1990. With respect to the value premium, Fama and French (2006) found that the CAPM fails to explain the value premiums from 1963 to 2004.

⁶⁵ Lakonishok, J., Shapiro, A.C. (1986). Systematic Risk, Total Risk and Size as Determinants of Stock Market Returns. *Journal of Banking and Finance*, 10, 115-13.

4.2.3 Conclusion from simple index model analysis

The simple index model in total period as well as in both subperiods has high explanatory power with regards to the values of coefficients of determinations (R^2) and adjusted coefficient of determination (adjusted R^2) above 0.8. The linear regression line of the simple index model explains well the relationship between the portfolio excess return and market excess return. The main intention for running linear regression was to reveal the validity of the CAPM in total period and due to result dependence on the time period to test the validity in two equal subperiods. During the total period was CAPM found mostly valid. However, Robustness testing revealed the strong validity of the model only in the first subperiod and the substantial failure of the CAPM in the second analysed period especially for the portfolios with higher book-to-market equity ratio. These results were in compliance with the previous studies, namely Fama and French (1993 and 2006), but also with other studies mentioned earlier.

In the next step, there will be presented the results from the multiple regression models to find what cause the time-varying nature of the value premium, particularly the question is directed to the effect of bull and bear markets, or economic cycle.

4.3 Testing the dual beta model reflecting the effect of bull-bear market

The dual beta model for analysing the effect of bull-bear market has a form of the multiple regression model with dummy for the bull-bear markets, zero for the bull market, and one for the bear market. The determination of bull and bear markets was described in methodological section 2.2. The multiple regression with dummy variable follows the equation 2.5. The results will be presented for total period as well as for two equal subperiods. The tables with reported results will have structure of ten portfolios formed on book-to-market equity ratio from low to high; with categories for coefficient of determination, adjusted coefficient of determination, and the values of regression coefficients according to regression equation 2.2, the p-values of regression coefficients. In addition, the results of the F test will be presented to compare two models (the dual beta model accounting for bull and bear markets, and the single index model. Namely, the F-statistic and p-value of the F-statistic will be reported.

4.3.1 Literature suggestions for the expected results

According to Petkova and Zhang (2005) the risk of value-minus-growth strategies is high in “bad times” when the expected premium for risk is high and is low in “good times” when the expected premium for risk is low. Our aim is to find whether the value stock tend to do better during the bear markets that are more clear proxy of “bad times,” and the glamour stocks tend to do better during the bull markets that are more clear proxy of “good times.”

4.3.2 Presentation of the results

The table 4.4 shows the results for the total period of performed multiple regression analysis with dummy, and F-test. Since the dummy variable for the bull and bear markets is inserted in this model, the interpretation of the model can be taken from two different points of view. Concretely, the first alpha coefficient present in the bull market situation since the second alpha will be annulled due to the dummy for bull market which will be zero in this situation. Against the another point of view, in the bear market situation there will be the present two alpha coefficients, the common intercept represented by the first alpha coefficient, and the second alpha coefficient accounting for the bear. Looking on the results, we can see overall significance of all regression coefficients. Moreover, the values of coefficients of determination and adjusted coefficients of determination are high as well. The results of the F-test lead to rejection of the CAPM in favour of this model. From detailed

observation, value of common alpha coefficient is decreasing over the portfolios from low book-to-market equity ratio to high book-to-market ratio. However, the second coefficient alpha reflecting the bear market situation is characterized by the rising tendency over the portfolios with low book-to-market equity ratio to high book-to-market ratio. Therefore, the results are in accordance with the study of Petkova and Zhang (2005) that value stocks are doing well in loosely defined “bad times.” Moreover, looking on both beta coefficients, we can conjuncture that the portfolio returns are very volatile during the bull markets and less volatile during the bear markets.

Table 4.4 The results of the dual beta model reflecting the bull-bear markets during the total time period

Portfolio	Coefficient of Determination		Regression coefficient				P value of the coefficient				F test	
	R ²	Adjusted R ²	α	α_{β}	β	β_{β}	α	α_{β}	β	β_{β}	F stat.	p value
B1	0,95	0,90	0,28	-0,59	0,95	0,03	0,02	0,00	0,00	0,36	6,8	0,00
B2	0,96	0,93	0,34	-0,43	0,93	0,04	0,00	0,00	0,00	0,08	6,5	0,00
B3	0,96	0,91	0,39	-0,35	0,88	0,07	0,00	0,01	0,00	0,00	6,8	0,00
B4	0,95	0,91	-0,85	0,90	1,21	-0,19	0,00	0,00	0,00	0,00	32,9	0,00
B5	0,94	0,89	-0,54	0,69	1,09	-0,15	0,00	0,00	0,00	0,00	18,8	0,00
B6	0,94	0,88	-0,70	1,05	1,20	-0,13	0,00	0,00	0,00	0,00	20,9	0,00
B7	0,92	0,85	-1,48	1,69	1,40	-0,35	0,00	0,00	0,00	0,00	58,7	0,00
B8	0,91	0,83	-1,48	1,77	1,47	-0,41	0,00	0,00	0,00	0,00	57,1	0,00
B9	0,90	0,81	-1,18	1,61	1,49	-0,29	0,00	0,00	0,00	0,00	26,9	0,00
B10	0,85	0,73	-2,15	2,58	1,88	-0,53	0,00	0,00	0,00	0,00	36,9	0,00

The results of the multiple regression and F-test for the first subperiod are listed in table 4.5. Based on the highly significant results of all model parameters, we conclude the significant validity of this model in the first subperiod as in the total period. The behaviour of double alpha coefficients has the same character as in the total period; therefore the further implication will be the same as in interpretation of the results in total period.

Table 4.5 The results of the dual beta model reflecting the bull-bear markets during the first subperiod

Portfolio	Coefficient of Determination		Regression coefficient				P value of the coefficient				F test	
	R ²	Adjusted R ²	α	α_{β}	β	β_{β}	α	α_{β}	β	β_{β}	F stat.	p value
IB1	0,97	0,93	0,48	-0,60	0,89	0,08	0,00	0,00	0,00	0,01	8,1	0,00
IB2	0,97	0,94	0,36	-0,32	0,90	0,07	0,01	0,08	0,00	0,02	4,3	0,01
IB3	0,96	0,93	0,30	-0,17	0,86	0,09	0,03	0,36	0,00	0,01	4,2	0,01
IB4	0,97	0,93	-1,39	1,40	1,29	-0,25	0,00	0,00	0,00	0,00	44,5	0,00
IB5	0,96	0,92	-0,80	0,99	1,15	-0,19	0,00	0,00	0,00	0,00	21,4	0,00
IB6	0,95	0,90	-0,82	1,15	1,27	-0,13	0,00	0,00	0,00	0,01	12,0	0,00
IB7	0,95	0,90	-1,75	1,81	1,53	-0,36	0,00	0,00	0,00	0,00	40,5	0,00
IB8	0,94	0,88	-1,61	1,49	1,62	-0,48	0,00	0,00	0,00	0,00	40,9	0,00
IB9	0,93	0,86	-1,35	1,38	1,67	-0,34	0,00	0,00	0,00	0,00	16,2	0,00
IB10	0,88	0,78	-2,61	2,39	2,11	-0,65	0,00	0,00	0,00	0,00	23,2	0,00

The results of the multiple regression and F-test for the second subperiod are listed in table 4.6. As you can observe, there arose quite serious problem with the model validity. The values of the regression coefficients do not have clear pattern in their tendency across portfolios based on the book-to-market equity ratio. Moreover, the significance according to p-value is mostly not satisfactory. The value premium practically disappears. Compare with the results of single index model for the same period listed in table 4.3. Comprehensive evaluation of the multifactor model compare to the single index model in form of the F-test revealed low level of superiority of the multiple regression model with dummy for the bull and bear markets over the simple index model. The possible source of problems could be possible caused by so called the “nifty-fifty” mania.

The “nifty-fifty” refers to the fifty premier growing stocks on the New York Stock Exchange in the 1960s and 1970s. They were considered as the stocks to buy and hold. Among these stocks were included for example the stocks of companies like Xerox, IBM, Polaroid, Coca-Cola, Eastman Kodak, and Avon. All these stocks grew enormously; the dividends were continuously increased and these stocks were connected with high market capitalization (Siegel, 2002).⁶⁶

⁶⁶ Siegel, J. J. (2002). *Stock for the long run* (3rd edition). New York: McGraw-Hill/Irwin

The bubble formed due to madness of the crowd claiming that the “nifty-fifty stocks can never go down, simply busted. The “nifty-fifty” period for our analytical purposes begins in January 1969 and ends in December 1974.

Table 4.6 The results of the dual beta model reflecting the bull-bear markets during the second subperiod

Portfolio	Coefficient of Determination		Regression coefficient				P value of the coefficient				F test	
	R ²	Adjusted R ²	α	α_{β}	β	β_{β}	α	α_{β}	β	β_{β}	F stat.	p value
IIB1	0,93	0,86	-0,35	-0,15	1,13	-0,15	0,10	0,59	0,00	0,01	3,8	0,02
IIB2	0,96	0,92	0,12	-0,34	1,01	-0,05	0,44	0,09	0,00	0,23	2,6	0,07
IIB3	0,95	0,90	0,28	-0,31	0,95	0,01	0,09	0,16	0,00	0,78	1,0	0,38
IIB4	0,93	0,87	0,16	-0,14	0,99	0,00	0,41	0,59	0,00	0,94	0,2	0,85
IIB5	0,91	0,84	0,11	-0,06	0,92	-0,02	0,58	0,82	0,00	0,77	0,1	0,92
IIB6	0,92	0,85	0,01	0,14	0,96	-0,03	0,96	0,58	0,00	0,61	0,2	0,79
IIB7	0,88	0,77	-0,10	0,07	0,94	-0,15	0,67	0,81	0,00	0,03	2,5	0,08
IIB8	0,87	0,76	0,02	0,43	0,91	0,00	0,94	0,19	0,00	0,98	0,9	0,41
IIB9	0,87	0,75	0,56	-0,13	0,85	0,10	0,04	0,71	0,00	0,19	0,9	0,43
IIB10	0,81	0,66	0,28	0,42	1,06	0,05	0,46	0,41	0,00	0,65	0,5	0,59

The results of the multiple regression with dummy variable performed exclusively for period of the nifty-fifty mania are reported in the table 4.7. As it was assumed, the results have low significance of all the parameters in multiple regression and the results of F-test not satisfactory as well. Moreover, the pattern of tendency of both beta coefficients was exactly opposite over the portfolios based on book-to-market equity ratio. This confirms the extraordinary behaviour of the “nifty-fifty” stocks during this period.

Table 4.7 The results of the dual beta model reflecting the bull-bear markets during the “nifty fifty” mania

Portfolio	Coefficient of Determination		Regression coefficient				P value of the coefficient				F test	
	R ²	Adjusted R ²	α	α_{β}	β	β_{β}	α	α_{β}	β	β_{β}	F stat.	p value
N6974B1	0,92	0,84	-0,81	1,55	1,19	-0,05	0,32	0,11	0,00	0,79	1,33	0,27
N6974B2	0,97	0,94	0,23	-0,29	1,13	-0,07	0,64	0,62	0,00	0,52	0,50	0,61
N6974B3	0,97	0,94	0,09	-0,29	1,11	-0,14	0,85	0,61	0,00	0,21	1,32	0,27
N6974B4	0,94	0,89	0,61	-1,01	0,78	0,19	0,31	0,16	0,00	0,18	1,44	0,24
N6974B5	0,93	0,86	0,24	-0,95	0,85	-0,09	0,70	0,20	0,00	0,55	4,42	0,02
N6974B6	0,90	0,81	1,03	-1,26	0,71	0,15	0,18	0,17	0,00	0,38	1,05	0,35
N6974B7	0,88	0,77	0,41	-0,96	0,72	0,01	0,60	0,30	0,00	0,94	0,60	0,55
N6974B8	0,91	0,83	1,36	-1,48	0,65	0,17	0,05	0,07	0,00	0,29	1,75	0,18
N6974B9	0,89	0,80	3,05	-3,78	0,45	0,42	0,00	0,00	0,01	0,04	6,95	0,00
N6974B10	0,85	0,73	2,50	-3,58	0,64	0,15	0,03	0,01	0,00	0,54	3,82	0,03

As a next step, the multiple regression with dummy variable was performed for the second period, but excluding the period of “nifty-fifty” mania. That was done with the expectation that the results will be more satisfactory. The results are reported in table 4.8. The results are quite satisfactory. However, this model improved only slightly in its validity. Importantly, the F-test revealed that the model in this period is mostly not superior to the single index model.

Table 4.8 The results of the dual beta model reflecting the bull-bear markets during the second subperiod without the period of “nifty fifty” mania

Portfolio	Coefficient of Determination		Regression coefficient				P value of the coefficient				F test	
	R ²	Adjusted R ²	α	α_{β}	β	β_{β}	α	α_{β}	β	β_{β}	F stat.	p value
N75IIB1	0,93	0,87	-0,31	-0,42	1,13	-0,17	0,16	0,15	0,00	0,01	5,57	0,00
N75IIB2	0,96	0,91	0,14	-0,40	0,99	-0,05	0,39	0,07	0,00	0,25	2,74	0,07
N75IIB3	0,94	0,89	0,33	-0,34	0,93	0,03	0,06	0,17	0,00	0,52	1,06	0,35
N75IIB4	0,93	0,86	0,08	0,04	1,02	-0,04	0,70	0,90	0,00	0,52	0,21	0,81
N75IIB5	0,91	0,83	0,09	0,10	0,93	0,00	0,69	0,73	0,00	0,98	0,06	0,94
N75IIB6	0,93	0,86	-0,12	0,34	0,99	-0,05	0,54	0,20	0,00	0,37	1,08	0,34
N75IIB7	0,88	0,77	-0,19	0,26	0,98	-0,17	0,44	0,43	0,00	0,02	3,01	0,05
N75IIB8	0,87	0,75	-0,14	0,68	0,94	-0,02	0,61	0,06	0,00	0,80	1,78	0,17
N75IIB9	0,86	0,75	0,28	0,40	0,90	0,06	0,30	0,27	0,00	0,43	1,06	0,35
N75IIB10	0,81	0,66	0,03	1,03	1,12	0,05	0,95	0,06	0,00	0,65	2,09	0,13

4.3.3 Total conclusion of dual beta model reflecting the bull-bear markets

Based on the results of dual beta model reflecting the bull-bear market in total period and in the first subperiod, we can claim very high significance of this model as well as high superiority of this model compare to the index model in explanatory power of excess return. Moreover, it was empirically proven that the value stocks tend to do better during the bear markets Thus, the distinction between the bull and bear markets has definitely importance for analysing the value premium over the time. In addition, the period of “nifty-fifty” mania created certain problems during the second analysed subperiod. The problems were reduced after excluding this period from the second subperiod. However, the model was still not superior to the simple index model as the results of F-test revealed.

4.4 Testing the dual beta model reflecting the effect of economic cycle

The testing the impact of the economic cycle on the value premium was conducted using the dual beta model reflecting the economic cycle, particularly using multiple regression model with dummy variable counting for economic cycle according to equation 2.3 listed in the methodological part. The zero value of the dummy variable was assigned in case of the month occurred during the expansion period; the value of the dummy variable was assigned to be one in case of month occurred in recession period. The results are organized in tables in the same manner as it was presented in section presenting the results of the testing of the dual beta model reflecting the bull and bear markets. Concretely, the results are presented for total period as well as for two equal subperiods. The tables with the results are assigned for of ten portfolios formed on book-to-market equity ratio from low to high; with categories for coefficient of determination, adjusted coefficient of determination, the values of regression coefficients according to regression equation 2.3, the p-values of regression coefficients: In addition, the results of the F test are presented in order to compare two models (the dual beta model accounting economic cycle, and the single index model). Namely, the F-statistic and p-value of the F-statistic are presented.

4.4.1 Literature suggestions for the expected results

The paper of Gulen, Xing, and Zhang (2008 and 2010) as a quite comprehensive studies of time varying value premium, presents the presumption applied for our expected results. Specifically, they claimed that the value premium occurs especially in the recession. Our task will be to present the empirical evidence to confirm, or to reject this hypothesis.

4.4.2 Presentation of the results

The results of multiple regression with dummy variable accounting for the economic cycle are listed in the table 4.9. The results were obtained for total analyses period. The important conclusion from table 4.9 is to notice that the values of the second alpha coefficient accounting for the recession months are not significant for all portfolio deciles. The common alpha coefficient is significant only in one case and its value is nearly identical with simple index model. Therefore, the recession do not influence the excess portfolio returns based on book-to-market equity ratio. In addition, the results of the F-test in three cases indicate the superiority of unrestricted model compare to restricted

model. The reason is due to the high significance of the second beta coefficient accounting for the recession. Moreover, it shows that the beta coefficient is not constant.

Table 4.9 The results of the dual beta model reflecting the economic cycle during the total time period

Portfolio	Coefficient of Determination		Regression coefficient				P value of the coefficient				F test	
	R ²	Adjusted R ²	α	α_{β}	β	β_{β}	α	α_c	β	β_c	F stat.	p value
EC1	0,95	0,90	-0,08	-0,04	1,01	-0,03	0,25	0,78	0,00	0,21	0,8	0,44
EC2	0,96	0,93	-0,01	0,17	0,99	-0,03	0,88	0,16	0,00	0,07	2,7	0,06
EC3	0,96	0,91	0,03	0,11	0,96	-0,04	0,59	0,40	0,00	0,05	2,3	0,10
EC4	0,95	0,90	0,02	-0,16	1,04	0,05	0,72	0,30	0,00	0,03	3,0	0,05
EC5	0,94	0,88	0,11	-0,04	0,97	0,01	0,12	0,79	0,00	0,64	0,1	0,86
EC6	0,94	0,88	0,12	0,03	1,02	0,11	0,12	0,85	0,00	0,00	8,6	0,00
EC7	0,91	0,84	0,10	0,01	1,07	0,11	0,30	0,96	0,00	0,00	5,4	0,00
EC8	0,90	0,82	0,25	0,15	1,08	0,18	0,02	0,53	0,00	0,00	13,3	0,00
EC9	0,89	0,79	0,20	-0,10	1,26	-0,04	0,11	0,71	0,00	0,38	0,4	0,64
EC10	0,84	0,71	0,25	-0,09	1,40	0,13	0,17	0,82	0,00	0,03	2,3	0,10

The table 4.10 reports the result of the multiple regression with dummy variable in the first period. The both alpha coefficients are not significant for all portfolio deciles. Due to the significance of the second beta coefficient for two portfolio deciles, the F-test results are in favour of the unrestricted model compare to restricted model in case of these two portfolio deciles.

Table 4.10 The results of the dual beta model reflecting the economic cycle during the first subperiod

Portfolio	Coefficient of Determination		Regression coefficient				P value of the coefficient				F test	
	R ²	Adjusted R ²	α	α_{β}	β	β_{β}	α	α_c	β	β_c	F stat.	p value
IC1	0,96	0,93	-0,01	0,06	0,97	-0,01	0,90	0,73	0,00	0,74	0,1	0,89
IC2	0,97	0,94	-0,01	0,24	0,96	0,00	0,88	0,15	0,00	0,83	1,0	0,35
IC3	0,96	0,93	-0,01	0,26	0,91	0,01	0,88	0,13	0,00	0,54	1,3	0,26
IC4	0,96	0,92	-0,12	-0,09	1,08	0,05	0,25	0,67	0,00	0,11	1,3	0,26
IC5	0,95	0,91	0,12	-0,12	1,00	0,02	0,25	0,57	0,00	0,49	0,4	0,68
IC6	0,95	0,90	0,06	0,07	1,10	0,10	0,62	0,77	0,00	0,00	4,3	0,01
IC7	0,94	0,89	-0,10	0,05	1,25	0,04	0,49	0,86	0,00	0,30	0,6	0,57
IC8	0,93	0,86	0,17	0,05	1,28	0,09	0,31	0,88	0,00	0,06	1,7	0,18
IC9	0,92	0,85	-0,02	-0,17	1,52	-0,18	0,93	0,67	0,00	0,00	5,5	0,00
IC10	0,87	0,76	-0,05	-0,27	1,71	-0,05	0,88	0,66	0,00	0,58	0,3	0,78

The presentation of the results for the second subperiod of multiple regression with dummy variable accounting for economic cycle is listed in table 4.11. The second alpha coefficient connected with dummy variable accounting for economic cycle is not significant for all portfolio deciles. The values of the common alpha coefficient are highly significant for the portfolios with higher book-to-market equity ratio. Moreover, the values of the common alpha coefficient are nearly identical with alpha coefficient in the single index model for the same analysed period. Due to the significance of the second beta coefficient, this unrestricted model is dominant to the simple index model. In addition, the beta is not constant in time.

Table 4.11 The results of the dual beta model reflecting the economic cycle during the second subperiod

Portfolio	Coefficient of Determination		Regression coefficient				P value of the coefficient				F test	
	R ²	Adjusted R ²	α	α_{β}	β	β_{β}	α	α_c	β	β_c	F stat.	p value
IIC1	0,93	0,86	-0,12	-0,18	1,07	-0,02	0,21	0,47	0,00	0,56	0,4	0,67
IIC2	0,96	0,92	0,00	0,08	1,03	-0,06	0,96	0,65	0,00	0,03	2,7	0,07
IIC3	0,95	0,90	0,08	-0,10	1,02	-0,11	0,29	0,61	0,00	0,00	6,2	0,00
IIC4	0,93	0,87	0,14	-0,24	0,99	0,01	0,11	0,28	0,00	0,79	0,7	0,52
IIC5	0,91	0,84	0,10	0,00	0,93	-0,05	0,31	0,99	0,00	0,24	0,7	0,50
IIC6	0,92	0,85	0,16	-0,12	0,92	0,03	0,07	0,60	0,00	0,48	0,4	0,65
IIC7	0,88	0,77	0,24	-0,13	0,84	0,05	0,02	0,62	0,00	0,28	0,8	0,46
IIC8	0,88	0,77	0,26	0,17	0,81	0,18	0,02	0,55	0,00	0,00	7,8	0,00
IIC9	0,87	0,75	0,33	-0,08	0,91	0,01	0,01	0,80	0,00	0,81	0,1	0,94
IIC10	0,82	0,67	0,45	0,11	0,98	0,19	0,01	0,80	0,00	0,01	3,7	0,94

4.4.3 Total conclusion of the dual beta model reflecting the economic cycle

Based on the results of multiple regressions with dummy accounting for business cycle in total period as well as for two subperiods, the dummy variable accounting for the economic cycle does not have high explanatory power to explain the excess portfolio returns. However, including more explanatory variables in this model has indeed impact on better explanatory power compare to the simple index model. This is documented by higher coefficient of determination and mainly by the results of the F-test. In contrary with the evidence presented by Gulen, Xing, and Zhang (2008 and 2010), we rejected that the value premium appears in recession. This rejection is namely due to the poor significance of the alpha coefficient accounting for business cycle. The significance of the alpha coefficient accounting for business cycle was low for every portfolio deciles and in every analysed period.

5 Total conclusion

The research problem studied in this master thesis was to find whether the bull-bear market, and the economic cycle had an impact on the value premium that varies in time. The three regression models were introduced to study the research problem. The first model, the single index mode, had a role as the benchmark model to reflect the simple relation of the CAPM. Other two models were time varying models, specifically, the multiple regression model with dummy for the bull-bear market, and the multiple regression model with dummy for the economic cycle. Their role was to reveal whether these factors help to explain the time-varying value premium. The models were tested for the total period from July 1926 to December 2010. For the purpose of Robustness testing the total period was divided into two equal subperiods, the first subperiod started in July 1926 and ended in September 1968, the second subperiod began in October 1968 and ended in December 2010. The models were tested for both subperiods as well.

The empirical results of the benchmark simple index model complied with the studies of Fama and French (1993 and 2006). Particularly, that CAPM fails to explain the value premium during the second subperiod. In previous studies it was found that the value premium is time varying. Thus, there arose motivation to study the effects of bull-bear market, and economic cycle on the time varying value premium. The results of the multiple regression model with dummy for bull-bear market revealed that the value stocks tend to do better in bear market which was in accordance with the loose definition of “bad times” by Petkova and Zhang (2005). Specifically, the alpha coefficient accounting for the bear month had a tendency to increase the excess portfolio returns for the portfolios with higher book-to-market equity ratio. In fact, it was the opposite effect of the common alpha coefficient. In contrast to findings of Fama and French (2006) presenting that there is no value premium from 1926 to 1963, we concluded that the value premium varies significantly over bull-bear market. The problematic period of the “nifty-fifty” mania probably caused certain problems with model validity in the second subperiod. When the “nifty fifty” period was excluded from the second subperiod, the significance the model slightly improved.

Based on the empirical results of the multiple regression with dummy for economic cycle, the hypothesis that value premium appears in recession stated in papers of Gulen, Xing, and Zhang (2008 and 2010) was rejected. The rejection was namely due to absence of statistical significance of the alpha coefficient connected to the dummy for recessions. In contrast, the common alpha remained statistically significant during the economic expansions. This allowed concluding that the value premium was generated during economic expansions.

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