SCHOOL OF ECONOMICS AND MANAGEMENT
Lund University

The Value Premium -

Is the Failure to Explain it as a Compensation for Risk a Consequense of Mis-specified Models?

Authors:

Henrik Byfors

Carl Lantz

Supervisor:

Asgharian Hossein

Abstract

Many studies have tried to explain the stock market value premium identified by Fama and French and Rosenberg, Reid and Lanstein. To the proponents of conventional asset pricing theory the value premium, measured by HmL (high book-to-market minus low book-to-market), is a bit of a dilemma. This is due to that the value of growth stocks depend more on business cycles than on value stocks, whose values are less dependent on economic circumstances. Accordingly growth stocks are expected to have higher returns and betas but empirical evidence confirms the contrary.

The purpose of this study is to examine the value premium on the Swedish stock market by applying the Sharpe Lintner CAPM as well as two additional models, LCAPM and HCPAM. The models are empirically tested in an unconditional and conditional manner where the latter uses changes in industrial production and the implied volatility as conditional variables. These two variables could be seen as proxies for the state of business cycle as well as the investors' uncertainty regarding the future.

The empirical results show that all the unconditional versions of CAPM show a significant valuepremium, which is consistent with other studies. This is also true for all the conditional versions of HCPAM, but not for LCAPM, where the intercept no longer significant. This implies that both the states of business cycle as well as the future uncertainty have explanatory power when it comes to the investors' preferences regarding the relationship between risk and return. These results show that the failure of explaining the value premium as a compensation for risk is in fact the result of mis-specified models.

1 Introduction

This chapter will serve as an introduction to the remaining parts of this study. The background, problem and purpose will be presented to the reader and will be followed by delimitations, target audience and disposal

1.1 Background

Fama and French and Rosenberg, Reid and Lanstein where the first researches to identify the stock market value premium by using a measure called HmL. HmL measures equity returns based on valuation hence defines it as the subtraction of a high book-to-market ratio portfolio from a low book-to-market ratio portfolio. The high book-to-market portfolio contains stocks whose prices are considered lower in terms of the book-to-market ratio. These stocks are also known as value stocks. Contrary to value stocks in terms of book-to-market evaluation are growth stocks. The earnings of these stocks are expected to grow at a higher rate than average. In general, these stocks are characterized by high multiples in ratios such as market to book. Accordingly, the value premium is defined as the excess return of value stocks compared to growth stocks.

Many studies have tried to explain the value premium defined by Fama and French and Rosenberg, Reid and Lanstein. However, to the proponents of conventional asset pricing theory the value premium is a dilemma. The value of growth stocks depends more on business cycles than value stocks whose values are less dependent on economic circumstances. Consequently growth stocks are expected to have higher returns and betas but empirical evidence confirms the contrary.[1] Firstly, Fama and French's HmL portfolio, high book-to-market portfolio returns minus low book-to-market portfolio returns, show a significant alpha value of 0,58% per month after the systematic risk is considered.[2] In a study by Chen, Petkova and Zhang (2006) show that the value premium has not weakened in recent times hence the anomaly persists.[3] The explanations of value premium dilemma vary among researchers. Fama and French argue that the HmL portfolio is a risk factor that stands for the financial distress of weak firms with low

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[1] Hwang, Soosung and Rubesam, Alexandre, 2006, *Is Value Really Riskier Than Growth?,* Social Science Research Network

[2] Fama, Eugene and French, Kennet 2006, *The Value Premium and the CAPM, The journal of Finance*

[3] Chen, Long, Petkova, Ralitsa and Zhang, Lu, 2007, *The Expected Value Premium,* http://papers.ssrn.com

earnings.[4] Others try to explain the dilemma in the framework of CAPM. Lewellen and Nagel show that the conditional CAPM explains the value premium nearly as poorly as the unconditional CAPM[5]. Petkova and Zhang make the same conclusion but show that time-varying risk goes in the right direction in explaining the value premium.[6] Some studies have searched for clarification of value premium by seeking answer from the inflexibility of value firms during different economic circumstances. One example is Zhang that provide an explanation in the neoclassical framework with rational expectations and competitive equilibrium. He argues that value firms are riskier because they have difficulties to adapt to new economic conditions for the reason that they are less flexible than growth firms.[7] Another example is provided by Xing and Zhang who argue that value firms in the manufacturing segment perform worse than growth firms during negative business cycles and vice versa.[8]

Despite the explanations Hwang and Rubesam (2006) claim it is still not clear why the value premium is observed in the stock market. They argue, even though some of the studies above show empirical findings that the results are not strong enough to explain the value premium. I their article *Is Value Really Riskier than Growth* they employ a regime-switching framework that allows different risk measures to vary over time. [9] This approach is in line with John C. Bogle who argues the value premium is due to period dependence and consequently claims that it does not exist. [10] Hwang and Rubesam empirical results show that the value premium disappears when allowing for different risk measures to be selected over time, thus a significant alpha of a value-minus-growth portfolio in the CAPM could be an outcome of model mis- specification. [11]

1.2 Problem discussion

Our intention with this study is to examine the value-premium on the Swedish market by employing an approach inspired by Hwang and Rubesam (2006). Since our time is limited we cannot employ the regime-switching framework and as a result not allow for different risk measures over time. However, we can employ various types of conditional models during the

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4 Fama, Eugene and French, Kennet, 1993, *Common Risk Factors in the Returns of Stocks and Bonds,* Journal of Financial Economics

5Lewellen, Jonathan and Nagel, Stefan, 2006, *The Conditional CAPM Does Not Explain Asset-Pricing Anomalies*, http://papers.ssrn.com

6 Ralitsa Petkova and Lu Zhang, 2004, Is Value Riskier Than Growth?, http://papers.ssrn.com

7 Zhang, Lu, 2005, *The Value Premium,* The Journal of Finance

8 Xing, Yuhang and Zhang, Lu, 2005, *Value versus Growth: Movements in Economic Fundamentals*, http://papers.ssrn.com

9 Hwang, Soosung and Rubesam, Alexandre, 2006, *Is Value Really Riskier Than Growth?,* Social Science Research Network

10 http://en.wikipedia.org/wiki/Value_investing, 2007-04-13

11 Hwang, Soosung and Rubesam, Alexandre, 2006, *Is Value Really Riskier Than Growth?,* Social Science Research Network

same time period, which would be an alternative approach within the framework of CAPM. This view is based on the common aspect of the studies above; they all use the same risk measure (apart from Hwang and Rubesam). Both Petkova and Zhang (2004) and Lewellen and Nagel (2006) are unsuccessful explaining the value premium only using the conditional CAPM. But Petkova and Zhang (2004) find another interesting piece of evidence; they show that time-varying risk goes in the right direction in explaining the value premium. Consequently, would the outcome of their studies be different in another version of CAPM? In other words, would the time varying risk variable make more sense in one of the models employed by Hwang and Rubesam (2006)? These models are equilibrium models hence within the rationality framework. Thus we still seek explanations on the value premium in the conventional risk-return framework by concentrating on the empirical approach of using different conditional CAPM models. This approach is similar to Hwang and Rubesam as we raise the same question; will the same risk measure hold for different time periods? In other words, the concern of ours is that human behaviour in a conventional risk-return world is not likely to be constant over time. We therefore raise the following question:

To what extent is the difficulty of explaining the value premium, as a compensation for risk, a consequence of mis-specified models?

1.3 Purpose

The purpose of this study is to examine the value premium by empirical testing of CAPM, LCAPM and HCPAM by using both conditional and unconditional models. Consequently it will be possible to analyse the value premium in perspective of different risk measures and hence if the approach in pricing risk vary through time. It will be possible to analyse if the value premium is a consequence of applying models disregarding the economic conditions. In others words, the ambition is to examine if the value premium is a consequence of mis-specified models and subsequently conclude whether value stocks really are riskier than growth stocks.

1.4 Delimitation

This study will only treat the Swedish market and companies not listed on this market will not be taken into consideration.

Due to lack of data this study will only treat the period from February 1995 to April 2007, a period that can be considered long enough to give reliable results.

The companies that will be analyzed in this study will only be those that have not been delisted during the studied time period.

1.5 Target Audience

This study is aimed for students with a solid theoretical background in finance and with an interest for the connection between risk and return. The study could also be read and used as a source of inspiration for professionals, active in the financial sector.

1.6 Disposal

In the theory chapter (2) we present various versions of CAPM models and how they will be tested empirically. The following chapter, data (3), describes the methods used to calculate various measures, how we sorted the data, which sources we used and the properties of the data. The methodology chapter (4) explain how we empirically approach the problem and which models we employ doing so. In empirical discussions (5) we discuss and analyse the results generated throughout the empirical process. In the final chapter, conclusion (6), a brief summary of the study is presented and a conclusion is drawn.

2 Theory

This chapter will give the reader the necessary knowledge regarding the models and other theory that will be used throughout the study. The different versions of the CAMP used in the text will be discussed followed by the theory behind several economic concepts

2.1 Book to Market, Value Stocks, Growth Stocks, HmL

A valuation ratio is a measure of how expensive or cheap an asset is compared to a certain measure of profit or value. The purpose of applying a valuation ratio is to compare the cost of an asset to the benefits of owning it. The measure is calculated by dividing a measure of profit by a measure of value, or vice-versa. Examples of valuation ratios are price/earnings and price/book value.[12]

The valuation ratio applied in this study is book-to-market which determine the value of a company by comparing the firm's book value to its market value. The book value stand for the firm's historical cost or accounting value, and the market value is the firm's value determined by the stock market through the firm's market capitalization.[13]

$$Book-to-market = \frac{Book\ value\ of\ the\ firm}{Market\ value\ of\ the\ firm}$$

We use the book-to-market ratio to divide the stocks included in Affärsvärldens general index into two subgroups, value stocks and growth stocks. If a stock has a high book-to-market ratio the stocks price is considered lower than stocks with a low book-to-market ratio. These stocks are called *value stocks* and accordingly considered undervalued by value investors. However, if a stock has a low book-to-market ratio the stocks price is considered higher than stocks with a high book-to-market ratio. These stocks are called *growth stocks* and are consequently considered overvalued by value investors. Investment strategies that specifically invest in value stocks are commonly known as value investing where the primary purpose is to trade stocks under their intrinsic value.[14]

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[12] http://moneyterms.co.uk, 2007-06-05
[13] http://www.investopedia.com, 2007-06-05
[14] www.entfederal.com/investing/glossary.asp, 2007-06-05

The HmL portfolio is the subtraction of a high book-to-market and a low book-to-market portfolio and subsequently the subtraction of value stocks minus growth stocks. The HmL portfolio (value premium):

HmL = High book-to-market – Low book-to-market

This premium is in a CAPM world highly significant on the Swedish market with an excess return of 1.5 percent. Consequently, since value stocks generate an excess return on the stock market a higher risk should be incorporated. However, growth stocks whose values depend more on business cycles should be riskier than value stocks. To the proponents of conventional asset pricing theory this is therefore a bit of a dilemma.

2.2 CAPM, HCAPM, LCAPM

The Capital Asset Pricing Model (CAPM) is used to determine an appropriate rate of return of an asset if that asset is to be added to an already well-diversified portfolio. This is given that asset's non-diversifiable risk. [15]In other words CAPM explains how assets are priced in relation to their risk. If the risk can be diversified through diversification, then a diversified portfolio will contain less risk than a single stock with the same expected return. Investors will try to benefit from this thus holding a well-diversified portfolio similar to the market portfolio. To be able to hold a well-diversified portfolio investors require stocks that increase the level of diversification. Consequently the prices of these stocks will rise due to the increasing demand. On the other hand, the prices of stocks that contain high level of non-diversifiable risk will decrease. The price will keep decreasing until it reaches a level where investors find it to correspond to the risk that will be added to the portfolio. Accordingly, in a CAPM world the expected return of an asset is a function of to the degree its risk is correlated with the aggregated market.[16] The theory states that the expected return of an asset equals the risk free rate plus a coefficient times the excess market return over the risk free rate. This will give us the following relationship:

$$E[R_j] = R_f + \beta_j * E[R_m - R_f]$$

[15] http://en.wikipedia.org/wiki/Capital_asset_pricing_model 2007-06-05
[16] Global Financial Markets, Giddy, Ian H, p.426-427, 1994

Where:

$$\beta_j = \frac{Cov(R_m, R_j)}{Var(R_m)}$$

If the risk free rate is subtracted on both sides we will get an expression for the excess return of an individual asset as shown below.

$$r_j = \beta_j * r_m$$

2.2.1 Lower Partial Moment CAPM (LCAPM)

In addition to the CAPM model we use two alternative equilibrium models, lower partial moment CAPM (LCAPM) and higher moment CAPM (HCAPM). LCAPM is a model which involves asymmetric reactions to market movements by separately modelling downside and upside co-movements with the market.[17] Thierry Post and Pim van Vliet (2004) argue that the mean-variance CAPM fails to describe the risk-return relation of stocks. This is due to while investors typically assign greater importance to downside volatility than upside volatility CAPM treats both types of volatility in the same manner. In order to illustrate this they set up the following example were two investment opportunities are available, x and y. Investment x is providing a return of 100 % and -100% with equal probability and y is providing a 100% and 400% with equal probability. Considering this situation most investors would prefer opportunity y since intuitive this less risky compared to x, however the variance of x is much smaller than y.[18]

Post and van Vliet believe this is a good example for replacing variance with a measure that takes downside risk into account. They therefore use mean-semivariance (MS-CAPM), developed by Hogan and Warren and Bawa and Lindenberg, as replacement for the variance:

$$\sigma^2 \equiv E(\min(R_i, 0)^2)$$

Where E is the expected value and R_i stands for the excess return over a riskfree asset for portfolio or asset *i*. Contrary to variance the semivariance does not incorporate gains (Ri > 0) in the risk, only losses are included (Ri < 0). The model does also replace the ordinary beta with a

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[17] Hwang, Soosung and Rubesam, Alexandre, 2006, *Is Value Really Riskier Than Growth*, p. 8,

[18] Post, Thierry and van Vliet, Pim, 2004, *Downside Risk and the CAPM*, ideas.repec.org

downside beta with the intention to measure co-movements with the market return in a falling market. The downside beta:

$$\beta_i^- \equiv \frac{E(\min(R_M,0)R_i)}{E(\min(R_M,0)R_M)}$$

Where β_i^- is the downside beta for asset *i,* R_M is the market return and R_i is the return for asset *i.* The MS CAPM maintains the properties of the MV CAPM and thus properties such as the efficiency of the market portfolio and the linear risk return relationship still applies. The only difference between the models is the use of risk measure, variance and regular beta versus semivariance and downside beta. This is due to the shape of the return distribution. If the return has a symmetrical distribution the regular, as well as the downside beta can be shown to be equal. On the other hand, if the distribution is asymmetrical the two models differ. Examples of effects that may cause asymmetry in stock returns are financial leverage, operational leverage and real options. When the MS CAPM is empirically tested it strongly suggests that downside beta matters. This pattern is especially clear during bad times when investment risk as well as the aversion of investors is higher than during good times.

In this study we use a similar model to the MS CAPM namely the LCAPM that is used by Hwang and Rubesam (2006). LCAPM implicitly assumes that investors react differently if the return is below or above a certain target return, which they set equal to the sample average return. Accordingly the model for determining excess return is specified the following way:

$$r_j = \beta_j^+ * r_j^+ + \beta_j^- * r_m^-$$

Where:

$$r_m^+ = r_m * I(r_m \geq \bar{r}_m)$$

$$r_m^- = r_m * I(r_m < \bar{r}_m)$$

Where $r_m^+ = r_m * I(r_m \geq \bar{r}_m)$ and $r_m^- = r_m * I(r_m < \bar{r}_m)$ are the positive and negative components of the excess market return, $\bar{r}_{mt}$ is the average return of the excess market return during the sample period, and *I* is the indicator variable.

2.2.2 Higher Moments CAPM (HCAPM)

Another alternative to the ordinary capital asset pricing model is a model with higher moments. CAPM assumes that only the systematic co-moment (CAPM β) should be priced. However, since asset returns are not always normally distributed investors are also interested in higher moments such as co-skewness and co-kurtosis.[19] The specification of the model is:

$$r_j = \beta_1 * r_m + \beta_2 * (R_m - E[R_m])^2 + \beta_3 * (R_m - E[R_m])^3$$

R denotes return and r excess return. Empirical evidence has shown that investors have preferences for the third moment, positive skewness, and aversion towards the fourth moment, kurtosis.[20]

2.3 Empirical Tests of the Capital Asset Pricing Model

In order to empirically test the different versions of the CAPM models we either use an unconditional or a conditional approach. When we employ an unconditional model to explain expected asset returns we assume that the model parameters are constant over time. This is contrary to the conditional model where we allow the parameters to vary over time. Regardless which CAPM model we test the approach of the unconditional and conditional tests is identical. We will therefore only exemplify with CAPM in the following paragraphs. When we use an unconditional model to test if the CAPM model is sufficient to explain the expected return of an asset, the first step is to define the following model:

$$R_{it} = \alpha + \beta * R_{mt} + \varepsilon_t$$

Where R is a vector of excess returns for N risky assets and α and β are the corresponding coefficients. The implication of the Sharpe-Lintner CAPM is that all of the elements in the vector α should be equal to zero. To test whether or not this is a case, we first use a single linear regression (OLS) to estimate the regressions followed by a t-test to test if the α parameters is separated from zero.

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[19] da Silva, André Carvalhal, 2005, *Modeling and Estimating a Higher Systematic Co-Moment Asset Pricing Model in the Brazilian Stock Market*

[20] http://www.capm.dk/kandidatafhandling.html, 2007-04-11

In the conditional CAPM model we use instruments that are supposed to proxy for economy-wide conditions. The instruments used in this study are industrial production and implied volatility. Previously the Sharpe-Lintner CAPM was used in the following way:

$$R_{it} = \alpha_{it} + \beta_{it} * R_{mt} + \varepsilon_t$$

However, in the conditional pricing model α and β are specified in the following way:

$$\alpha_{it} = a_{i0} + \alpha'_{i1} Z_{t-1}$$
$$\beta_{it} = \beta_{i0} + \beta'_{i1} Z_{t-1}$$

Where Z is a vector of mean zero variables known at time t-1. This leads to the following model when one of the instruments is used. The model can easily be expanded to include several instruments.

$$Rit = \alpha_{i0} + a_{i1} Z_{t-1} + \beta_{i0} R_{mt} + \beta_{i0} Z_{t-1} R_{mt} + \varepsilon_i$$

Whether or not this model explains the return in a better way than the unconditional model can be examined when testing it in the same manner as the unconditional model.

2.4 Implied Volatility, Industrial Production

In option pricing theory the historical volatility reflects the past price movements of the underlying asset and is also referred as the asset's actual or realised volatility. On the other hand, the implied volatility is a measure regarding the markets expectations of the same assets future volatility.[21]Broadly speaking the implied volatility increases when the market is bearish and decreases when the market is bullish. This is due to investors who commonly believe that bearish markets are riskier than bullish markets.[22] One example of that is the Chicago Board Options Exchange Volatility Index (VIX), which illustrates how much premium investors are willing to pay for options as insurance to hedge their equity positions.[23] A standard procedure to estimate implied volatility for an underlying asset is to use the price of an option of that asset. Imagine a call option on the underlying asset is currently in trade thus the price of the option is available. By

[21] www.iseoptions.com/volatility_calculation.pdf , 2007-06-05
[22] www.investopedia.com , 2007-06-05
[23] http://en.wikipedia.org/wiki/Implied_volatility 2007-06-05

applying a suitable option pricing formula, such as Black-Scholes, the annual volatility is computed in a backward manner. This annual volatility that would have been the input into the Black-Scholes formula to obtain the price for the option is the implied volatility. In this way investors obtain the volatility implied by the option price hence the implied volatility for the underlying asset.[24]

An economic indicator is data showing general trends in the economy. Trends can be illustrated in various perspectives and as a result the indicators applied have different characteristics. Some economic indicators have predictive values, some occur at the same time and some indicators only become apparent after the activity has occurred. Examples of economic indicators are unemployment, housing starts, Consumer Price Index and industrial production.[25]In this study we use industrial production as a business cycle indicator. According to Federal Reserve, industrial production is one of the key indicators to describe the economic development.[26]

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24 http://www.riskglossary.com 2007-06-05

25 http://www.investorwords.com 2007-06-05

26 http://www.federalreserve.gov 2007-06-05

3 Data

The chapter will treat the data that has been collected in order to be able to analyze the problem. The origin of the different data types and the different choices that has been taken will be discussed. Finally the criticism regarding the data in this study will be mentioned

3.1 Choice of Market and Market Index

The market to be studied is the Swedish market and the reason for this is twofold. First and foremost it is because of the origin of the authors, but it is also due to the fact that larger markets such as the American one have been thoroughly examined in several earlier projects and articles.

The companies analysed in this study will be selected from Affärsvärldens Generalindex (AFGX). There will be no restrictions what so ever, meaning that no matter the market value of the company, or any other factor will disqualify a company. However, this study will only include companies that have not been delisted during the chosen time period.

The market return applied in our models to analyze the data has also been taken from AFGX. The reason for the choice of this index is that it is considered to be the index that best describes the development of the Swedish stock market. This is related to the fact that, with minor adjustments, the different companies are given a weight that is proportional to their market value.[27]

3.2 Selection Criteria

Many different possibilities exist when sorting out value and growth stocks. For instance, Hwang and Rubesam (2006) selected companies based on both the book-to-market ratio as well as the Price-to-Earnings ratio. However, in this study the authors have chosen only to include one factor to base the decision on how the included companies should be sorted. The reason for this is that the task of collecting and sorting all the observation is one of the more time consuming tasks in this study.

[27] Frennberg, Per and Hansson, Björn, 1992, *Computation of a Monthly Index for Swedish Stock Returns 1919 – 1989*, Scandinavian Economic History Review

In order to select the companies to be included in this study we used the book-to-market ratio as the selection criteria. This measure is the most well known measure when studying the value premium and has for instance been used by the famous Fama and French (1993).
The authors have chosen to divide the companies included in the AFGX for each and every observation into three equally sized groups based on their book-to-market ratio. There are samples of studies where other ways of grouping the companies have been made. However, making the groups this big will ensure a sufficiently large sample even during the earlier observations when there were fewer companies available. This will give three groups of which only the ones with the highest and lowest book-to-market ratios respectively will be used. The minimum amount of companies in each of the groups was 18 (February 1995) and the maximum amount was 82 (April 2007). For notational ease, the portfolios with high or low book-to-market stocks will be noted H and L respectively. The portfolio that is created when subtracting L from H will be noted HmL.

3.3 Studied Time Period

This study will focus on the stock performance from 1995 and onwards, ignoring earlier time periods. This will mean that a sufficiently long time period will be used in order not to be too affected by singular, extreme events. Furthermore, the choice of this time period will also make sure that the conditions are up to date with the current situation in the stock market since there has been an increase in the number of high tech companies during the later decades. Furthermore, this period will include several periods with different macro economic conditions in order to give us relatively robust results.
It is worth noting that several empirical studies have shown the existence of a value premium in earlier periods as well.

3.4 Choice of Observation Frequency

The optimal in a study of this kind would be to have portfolios that are continuously rebalanced and adjusted to the current situation. However, this is not a very realistic approach and instead the authors have chosen to observe the market conditions once every month and based on that observation make the necessary adjustments to the portfolios. It would of course have been possible to have a higher frequency, but this would have given the authors too large of a workload. Furthermore, rebalancing every month is something that we also believe is a very realistic frequency for investors to rebalance their portfolios

3.5 Risk Free Rate

The risk free rate used in this study is the rate of the Swedish one month Treasury bill taken from the home page of the Swedish Central Bank. This will give us a maturity of the risk free asset coinciding with that of our investments.

3.6 Choice of Instrument

This study will employ different types of the well known CAPM model when analysing the data. However, to better adjust these models to the current conditions the authors have chosen to use conditional versions of these CAPM models. Earlier studies such as Hwang and Rubesam, (2006) have shown that taking the position in the current business cycle into consideration might explain the greater returns of the value stocks, making it natural to include a proxy for this factor as an instrument. Another factor that the authors are interested to investigate is whether or not the market uncertainty might help explain the superior return of value stocks.

3.7 Market Uncertainty

There are many different factors that could be used as a proxy for the market uncertainty. For instance it would be possible to use a backward looking measure by studying the historical volatility during a period of time and assume that this is a sufficiently good proxy for the future volatility. Another option would be to look at the implied volatility that could be read of a volatility index. This index measures the investors' beliefs regarding the future volatility and is obtained by studying the prices of market index options and then calculating the volatility needed to obtain those prices.

However, the investors that are affecting the volatility index take several factors, probably including the historical volatility, into consideration when making their opinions about the future volatility. The authors therefore believe that the implied volatility is a more accurate measure for describing the uncertainty. The authors are especially interested in investigating if the change in the opinions about the future could explain the higher returns and therefore chose to use the changes of the implied volatility index as the instrument.

The development of the implied volatility could be found by studying implied volatility indices. Unfortunately, the data for the Swedish market was not available throughout the whole chosen time period. Because of this the authors have chosen to instead look at the volatility index of the U.S. market (VIX) and use the changes in this index as the instrument. As can be seen in figure 1 these two indices are very strongly correlated and it is therefore the belief of the authors that this measure is a good proxy for the investors' beliefs of the future uncertainty of the Swedish market as well.

In this study the implied volatility will be used as a conditional variable having VIX as source. The index is calculated by employing a weighted average of implied volatility of at-the-money and near-the-money striked in options on the S&P 500 Index futures. This index is used in this study as a conditional variable.[28]

3.8 Business Cycles

The chosen measure to give us an indication of the current state of the business cycle is the industrial production. However, since this measure has more or less a constant positive trend throughout the whole period it does not give us the illustrative indication that was sought after. Instead the authors choose to use the changes in the industry production as the instrument.

One major problem with the industrial production is that it is severely affected by factors such as seasoning effects and the number of days in a given month. To account for this an index taking these factors into consideration has been used.

3.9 Criticism

The main criticism that can be made regarding the data in this study is the lack of effort made in reducing the survivorship bias of the collected data.

Survivorship bias, also known as survivor bias, is caused when only companies that have survived throughout the whole studied time period are included in the sample. The result of this will often lead to an over estimation of the returns since in many cases it is the unsuccessful companies that have left the sample and thus are excluded from the performance analysis.[29]

The authors are fully aware of the effects of the survivorship bias but have despite this chosen not to take the survivorship bias into consideration when performing the study. The task to include these non-surviving companies would have been a very time consuming one and due to the relatively short time period that was at disposal this task was not prioritised. Furthermore the results that were obtained do, to a large extent, coincide with earlier studies , convincing the authors that the survivorship bias did not have any major effects. The reason for the lack of importance for this type of bias is probably due to the fact that the two groups compared are probably affected by the survivorship bias in similar ways, eliminating the total effect.

[28] http://www.riskglossary.com 2007-06-05
[29] http://en.wikipedia.org/wiki/Survivorship_bias 2007-06-05

Furthermore, the data used in this study has been collected with the help of DataStream and is a source that can be considered as a very trustworthy one. However, since the data material is very extensive it has been impossible for the authors to exclude mistakes even if every effort has been made and the results controlled.

4 Methodology

This chapter serves as a source of information regarding the way the authors have decided to approach the problem and the different tools that have been used throughout the study. The chapter have been designed in such a way that the different steps are in chronological order, something that will make it easier to follow during the different faces

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4.1 Portfolio Construction

As mentioned earlier the companies were sorted by their book-to-market ratio and the two thirds of the companies with the highest and lowest ratios were selected. These companies were used to form the two portfolios (H and L) that were analysed. As the ratio for the different firms changed throughout the sample period the portfolios had to be rebalanced in order to fit the market characteristics of that particular month.

Once the companies that were to be studied had been selected the authors chose to construct portfolios where each and every company were assigned equal weights, not taking the size of the companies into consideration.

The authors were mostly interested in studying the difference in returns between these two types of portfolios and therefore chose to observe the difference in returns between the two portfolios by creating a new portfolio consisting of the two portfolios H and L. The portfolio, named HmL (High minus Low) was calculated by subtracting the returns of the L portfolio from the H portfolio. This strategy can be seen as having a self financing portfolio where the short selling of growth stocks is financing the purchase of value stocks. Exactly how the different models are treated in this study will be specified for this particular portfolio will be studied in greater detail further down.

4.2 Testing the Value Premium with Unconditional Models

The first step in examining the existence of a value premium was to take the conventional approach using unconditional models. Besides the very famous CAPM, other versions of the same model such as LCAPM and HCAPM were also applied, taking factors such as skewness, and kurtosis into consideration.

4.2.1 CAPM

Since it is the HmL portfolio that, first and foremost, is of interest it is on this portfolio that the different models will be applied. As described in the theoretical chapter the CAPM model for the H portfolio is described by the following formula:

$$R_{H\,it} = \alpha_H + \beta_H * R_{mt} + \varepsilon_{H\,t}$$

In the same way the data in the L portfolio will be fitted to the CAPM model with the expression:

$$R_{L\,it} = \alpha_L + \beta_L * R_{mt} + \varepsilon_{L\,t}$$

Since the HmL is formed by subtracting the L portfolio from the H portfolio this will make it possible to fit a similar model as of those described above to this portfolio. This model will have the following characteristics:

$$R_{HML\,it} = (\alpha_H + \beta_H * R_{mt} + \varepsilon_{L\,t}) - (\alpha_L + \beta_L * R_{mt} + \varepsilon_{L\,t}) = \alpha_H - \alpha_L + (\beta_H - \beta_L) * R_{mt} + \varepsilon_{H\,t} - \varepsilon_{L\,t} =$$
$$= \alpha_{HmL} + \beta_{HmL} * R_{mt} + \varepsilon_{HmL\,t}$$

As can be seen is it possible to model the returns for the HmL portfolio in the same way as for the other portfolios. As was described in the theoretical chapter α_H and α_L should be equal to zero in the ideal CAPM world. This of course gives that α_{HmL} theoretically also should be equal to zero. This means that the test of existence of a value premium will boil down to testing whether or not α_{HmL} is equal to zero, something that will be done by testing the two different hypothesis:

$$H_0: \quad \alpha_{HmL} = 0$$
$$H_1: \quad \alpha_{HmL} \neq 0$$

4.2.2 LCAPM

Specifying the model for the HmL portfolio in the LCAPM framework is done in a similar way as for the CAPM portfolio, meaning that the model described in the theoretical is directly applicable. However, a simple algorithm had to be applied in order to determine whether or not the market return in each and every observation is over or below the average return. This algorithm had the following specification:

$$
\begin{aligned}
&if \quad r_{mt} > E[r_m] \\
&\qquad\qquad r_{mt}^{+} = r_{mt} \\
&\qquad\qquad r_{mt}^{-} = 0 \\
&else \\
&\qquad\qquad r_{mt}^{+} = 0 \\
&\qquad\qquad r_{mt}^{-} = r_{mt}
\end{aligned}
$$

Once the returns were sorted into the correct columns it was once again possible to do a regression analysis with the goal to examine the coefficients and the different statistics for these coefficients in the LCAPM model specified below:

$$r_{HmL} = \alpha_{HmL} + \beta_{HmL}^{+} * r_m^{+} + \beta_{HmL}^{-} * r_m^{-}$$

As for the CAPM model, the authors were then interested in examining whether or not the null hypothesis of α_{HmL} could be rejected or not.

4.2.3 HCAPM

The reasoning concerning the existence of a value premium is very similar to that regarding that of the two prior models and would be redundant to describe it in greater detail once more. Instead the model is just stated again:

$$r_{HmL\,j} = \alpha + \beta_{HmL1} * r_m + \beta_{HmL2} * (R_m - E[R_m])^2 + \beta_{HmL3} * (R_m - E[R_m])^3$$

Once again the task is to examine the α_{HmL} to investigate if it is equal to zero.

4.3 Development of Instrument

As has been described in the earlier data chapter the authors wanted to see if the uncertainty in the market or state of business cycle had any explanatory power and thus would eliminate the value premium. However, the raw data was not applicable right away in the form that it was collected and instead had to be adjusted in order to fit the model.

4.3.1 Uncertainty

Exactly what needed to be done with the instrument data can be seen if the specification of the conditional model is examined in greater detail. To illustrate this we will specify the conditional CAPM model which is the simplest of the three models that will be used to analyse the data. With the information from the theoretical chapter we know that the specification for the conditional CAPM model will appear in the following way:

$$R_{it} = \alpha_{HmL\,i0} + a_{HmL\,i1} Z_{t-1} + \beta_{HmL\,i0} R_{mt} + \beta_{HmL\,i0} Z_{t-1} R_{mt} + \varepsilon_i$$

It can then be observed that the α in the model will vary with the value of our instrument. In order to exclude the second part of the α it will be necessary to adjust the instrument data so that it will obtain a mean of zero. In order to do that the authors choose to normalise this data by subtracting the mean from the original observations and then divide this value by the standard deviation of the data. This gives that the new Z_t that will be used throughout the rest of this study will be obtained from the following expression:

$$Z_t = \frac{Z_{t\,raw} - \overline{Z}_{raw}}{\sigma_Z}$$

4.3.2 Business Cycle

As with the data regarding the implied volatility also the industrial production data had to be adjusted in order to test whether or not the intercept in the model was equal to zero. Just as with the data for the implied volatility the necessary measure was to normalise the data in the same manner as described in the previous section.

4.4 Conditional Models

The analysis of the existence of a value premium when applying the conditional models was performed in a similar way as for the unconditional models. This means that in order for the authors not to repeat themselves to a large extent this section will not be as detailed as the previous one treating the conditional models.

In order to assure that the reader is able to follow the models that were analysed the models will be stated in full form. The conditional CAPM was already stated above and has the following specification:

$$R_t = \alpha_{0\,HmL} + a_{1\,HmL} Z_{t-1} + \beta_{0\,HmL} R_{mt} + \beta_{1\,HmL} Z_{t-1} R_{mt} + \varepsilon$$

When developing the conditional versions of LCAPM and HCAPM this is performed in the same manner as with the ordinary CAPM. This means that the two models will have the following form:

For LCAPM:

$$R_t = \alpha_{0\,HmL} + a_{1\,HmL} Z_{t-1} + \beta_{0\;HmL}^{+} R_{mt} + \beta_{1\;HmL}^{+} Z_{t-1} R_{mt} + \beta_{0\;HmL}^{-} R_{mt} + \beta_{1\;HmL}^{-} Z_{t-1} R_{mt} + \varepsilon$$

For HCAPM:

$$R_t = \alpha_{0\,HmL} + a_{1\,HmL} Z_{t-1} + \beta_{1-0\,HmL} r_{mt} + \beta_{1-1\,HmL} Z_{t-1} r_{mt} + \beta_{2-0\,HmL} (R_m - E[R_m])^2 + \beta_{2-1\,HmL} (R_m - E[R_m])^2 Z_{t-1} +$$
$$+ \beta_{3-0\,HmL} (R_m - E[R_m])^3 + \beta_{3-1\,HmL} (R_m - E[R_m])^3 Z_{t-1} + \varepsilon$$

As described earlier the data for the two instruments were normalized, meaning that it is α_0 that should be examined when analyzing the existence of a value premium. As with the unconditional models the regression analysis is performed in Excel and the results can be found in the next chapter.

5 Empirical Results

In this chapter the data will be analysed and the results will be presented and discussed. First we examine if there, in a CAPM world, exists a value premium on the Swedish stockmarket. This will be followed by a section where unconditional models will be applied in an attempt to explain this excess return and thereafter the conditional models will be applied

5.1 Difference in Returns

The findings in our study are consistent with those of most other similar studies meaning that also in this study the value stocks outperformed the growth stocks. During the examined period the portfolio of value stocks outperformed the portfolio of growth stocks by an impressing 1.5 % per month in average.

5.2 Unconditional Models

In this section the results treating the unconditional versions of CAPM, LCAPM and HCAPM that have been used in this analysis will be presented. To make it easy for the reader to follow the discussion the chapter will be divided into three subsections, one for every type of model that have been used.

5.2.1 CAPM

The first model that was used to analyse the data was the data was the ordinary CAPM. An OLS regression treating the H and L portfolio was first performed showing somewhat surprising results. As can be seen in table 1 the regression analysis showed that the β for the L portfolio was greater than that of the H portfolio. According to CAPM this would imply that growth stocks are riskier than value stocks and thus should produce higher returns, something that is not the case. Instead the H portfolio produces the higher returns of the two portfolios, giving the investor an average monthly return of 2.1 %, something that should be compared to the average return of the L portfolio which is merely 0.7 %. These findings are inconsistent with what is expected when applying the CAPM model.

The findings regarding the β:s of the two portfolios have as a consequence that the β of the HmL portfolio will be negative, giving us a fitted line that is downward sloping. This means that the average return for this portfolio will be lower than the intercept. The full results can be found in table 1, where it can be seen that the intercept for the HmL portfolio according to the OLS regression is 0.018. When testing this value against the hypothesis that the α equals zero one can see that the intercept is significantly different from zero, even on the 1 % level. These results clearly show the existence of a value premium when the situation is explained by the CAPM.

5.2.2 LCAPM

The next model that was applied to the HmL portfolio was the LCAPM whose results can be found in table 2. It can be seen that when performing an OLS regression of the HmL portfolio there in fact is a difference between the upside and the downside beta (-0,19 and -0,41 respectively). This large difference is implying that the investor behaviour in fact is asymmetric depending on the market movements. These results are for instance inconsistent with the findings in the study performed by Hwang and Rubesam (2006), this shows that either the Swedish investor behaviour are more affected by the market movements or that this phenomenon is not observable when including older time periods as in the study of Hwang and Rubesam (2006).

However, as can be seen in table 2 the intercept for the HmL portfolio is still positive with a value of 0.012. Earlier studies such as the one performed by Petkova and Zhang (2005) have shown that the α disappears when applying the LCAPM. It was argued by Hwang and Rubesam (2006) that this elimination of the α was driven by the period before 1963. Though, as has been shown in this study, even post 1995 similar results are obtained. However, the results in this study are not as strong as the ones presented by Petkova and Zhang (2005) where they came to the conclusion that the value premium disappeared. When applying LCAPM strong conclusions can be drawn in this study since α is still significant on the 10 % level. Though, as can be seen it is not nearly as significant as when applying the CAPM model, meaning that in fact the usage of the LCAPM is improving the results, something that is in line with the results found by Petkova and Zhang (2005) even if the results are not as strong.

5.2.3 HCAPM

The results when applying the HCAPM are very similar to the ones where the CAPM is used, meaning that the intercept for the HmL portfolio is highly significant even on the 1 % level. For full details the reader is advised to look at table 3 where the absolute numbers are presented. The use of the HCAPM does in fact improve the results compared to the CAPM, something that is rather expected due to the increased number of explanatory variables, but the relevance of this is not especially interesting. However, the significance level for the existence of a value premium is many times higher than in the LCAPM, implying that the LCAPM model is the most effective model of the three when it comes to explaining the returns of the HmL portfolio. This conclusion can be viewed as an important one when moving on to the next section of this chapter. The fact that LCAPM by far is the model that explains the situation the best out of these three models gives it the best starting position when it is time to use conditional versions of the same models.

5.3 Conditional Models

While the earlier chapter only treat the unconditional models used in this study this chapter is intended to focus on the results obtained when applying the conditional models presented in earlier sections of this text (reference to where).

As has been described in the data chapter the authors investigated whether or not the value premium could be explained if the CAPM, LCAPM and HCAPM where conditioned on certain macroeconomic factors (instruments) that were known at the time of making the investment in the different types of portfolios. The instruments used to condition on are the change in the Swedish industrial production as well as the changes in the implied volatility index (VIX).

5.3.1 CAPM

Implied Volatility: The results of the CAPM conditioned on the change in volatility index can be found in table 4. As can be seen there is hardly any change in absolute numbers when it comes to the significance level for the intercept, meaning that applying a conditional version of the CAPM model does not give us any relevant results. These results are not very surprising taking into consideration that the significance level of the α in the unconditional model was very high.

Industrial Production: Just as with the prior instrument the change in industrial production did not do a very good job when it comes to explaining the excess returns. The full results can be found in table 5. As can be seen the results do not differ much from the results when the change in implied volatility was used as the instrument to condition on, something that was effected by the extreme significance level of the intercept that was found when applying the unconditional model, meaning that the development of the instrument has to be very similar to that of the returns.

5.3.2 LACPM

Implied Volatility: The results of the OLS regression on the conditional LCAPM can be seen in table 6. The significance level differs from the one in the unconditional CAPM in a very interesting way. Contrary to the findings when applying the unconditional CAPM the α, and thus the value premium, is no longer significant on the 10 % level. The elimination of the value premium has been shown in other studies as well such as by Hwang and Rubesam (2006). However, instead of using conditional models they applied a regime switching model that alternated between CAPM, LCAPM and HCAPM, a model that has to be considered as a far more complicated one. The fact that the same results can be shown with a simpler model such as the conditional one is very satisfying.
A very obvious result showing that the change in volatility index and the return for the HmL portfolio are closely tied together could be found when examining if there was any kind of pattern between these two measures. The authors chose to divide the observations into two equally sized groups depending on the change in the volatility index during the prior month. The results were rather surprising as it could be seen that the group with the observations that have had the largest increases did in fact not have any positive return at all but instead a negative average return of 0.2 % per month. Of course the results were the opposite for the other group which displayed an astonishing average monthly return of 2.9 %.

Industrial Production: As with the results in the previous section the conditional LCAPM with the change in industrial production did produce relevant changes compared to the unconditional LCAPM in terms of the existence of a value premium. The full results from the regression can be found in table 7, where it can be seen that the also here the α no longer is significant on the 10 % level.

The same test as was described above, when the observations were divided into two equally sized groups based on the change in the volatility index, was performed for this instrument as well. However, the average monthly return for the two portfolios was more similar in this case and did not produce any surprising results. The group that had the largest increases in the industrial production had an average return of 1.2 % while the other one had an average return of 1.7 %. These results are more difficult to interpret, as the difference is not as significant.

The results show that the positive average returns of the HmL portfolio are driven by the superior returns from the observations where there has been a decrease in the volatility index during the prior month. The reason for this could be that the value stocks are considered riskier because of the higher returns they produce. When then the future market volatility is prognosticated to decrease the investors change to these value stocks in order to keep their portfolio risk constant.

It has also been shown that it is possible to apply models so that is no longer feasible to prove that the value premium is significant. These results could be considered rather surprising considering that the magnitude of the monthly average return from the HmL is 1.5 %.

5.3.3 HCAPM

Implied Volatility: The similarities between the unconditional CAPM and HCAPM were significant and so were the similarities between the conditional versions of the same models. This means that even though the models have the ability to decrease the significance of the intercept, it is still highly significant as can be seen in table 8. As was described in the data chapter the adjustments of the instrument data mean that the part of the intercept that should be examined is α_0.

Industrial Production: The last model to be applied in this study was the conditional version of the HCAPM with the change in the industrial production as the instrument. With the prior results in this section in mind was not a big surprise that applying this model did not mean any significant changes compared to the unconditional version. The results are presented in table 9, the t-statistic for α_0 of 3.38 is significantly different from zero even at the 1 % level.

Thus it is possible to see that what is presumed in 5.2.3 is true, that even when using conditional models the value premium is still significant. However, the reason for this might be that the original models had such poor explanatory power that the value premium would have continued to exist no matter what instruments that had been chosen, even if the instrument was a very suitable one.

6 Final Discussion

This chapter will present the conclusions that the authors have drawn from the results and analysis presented in the prior chapter. This will be followed by a section that should serve as a source of inspiration regarding areas on which continued research can be performed

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6.1 Conclusion

The fact that value stocks have outperformed growth stocks has been confirmed in several earlier empirical studies. However, one of the most important assumptions in economical theory is that the higher return is a result of a higher risk associated with that particular investment. In spite of this the value premium has been hard to empirically explain in the conventional risk return framework.

The aim of this study was to examine whether or not the failure of explaining the premium as a compensation for risk is a consequence of mis-specified models. The first conclusions the authors could draw from the results was that there in fact, also on the Swedish market, existed a value premium where value stocks outperformed growth stocks. This superior return could not be explained in terms of compensation for risk when traditional, unconditional models were applied to the data set. However, out of the three applied models (CAPM, LCAPM and HCAPM) LACPM was the one that came closest to explain that the premium as a compensation for risk, suggesting that downside risk is priced on the Swedish stock market.

The next step was to apply conditional models to the collected data. The instruments that were to be conditioned on were the change in the market's belief about future volatility, taken from the American volatility index (VIX) and the change in industry production. The results when applying either of the instruments to be conditioned on were very similar. The conditional CAPM and HCAPM were still unable to explain the superior returns. The more interesting thing was that applying the conditional LCAPM meant that it was no longer possible to reject the hypothesis that the superior came from risk compensation.

The fact that business cycles is an important factor when trying to explain the premium was argued by Hwang and Rubesam (2006), something that apparently was true also for the Swedish market. However, the fact that changes in expected volatility also have explanatory power is an interesting result.

To sum up, the aim of this study was to examine if the failure to explain the superior return as compensation for risk could be a result of mis-specified models. As the results above have shown this is the case on the Swedish market. As discussed, the results imply that this is the case on the Swedish market too, in view of the fact that the conditional version of LCAPM applied on the HmL portfolio no longer has a statistically significant intercept.

6.2 Suggestions of Further Research

Due to the relatively short time frame the authors did not examine any model where both the changes in the volatility index as well as the change in industry production were used as factors for improving the explanatory power of the model. These two factors have shown to have explanatory power and it could be interesting to see if applying both factors in the same model could improve the results further.

Hwang and Rubesam (2006) used a regime switching framework and came to the same conclusion as the authors, that the failure to explain the premium as a compensation for risk is due to mis-specified models. The same approach could be taken to examine the Swedish market to see if any improvements could be made.

Appendix

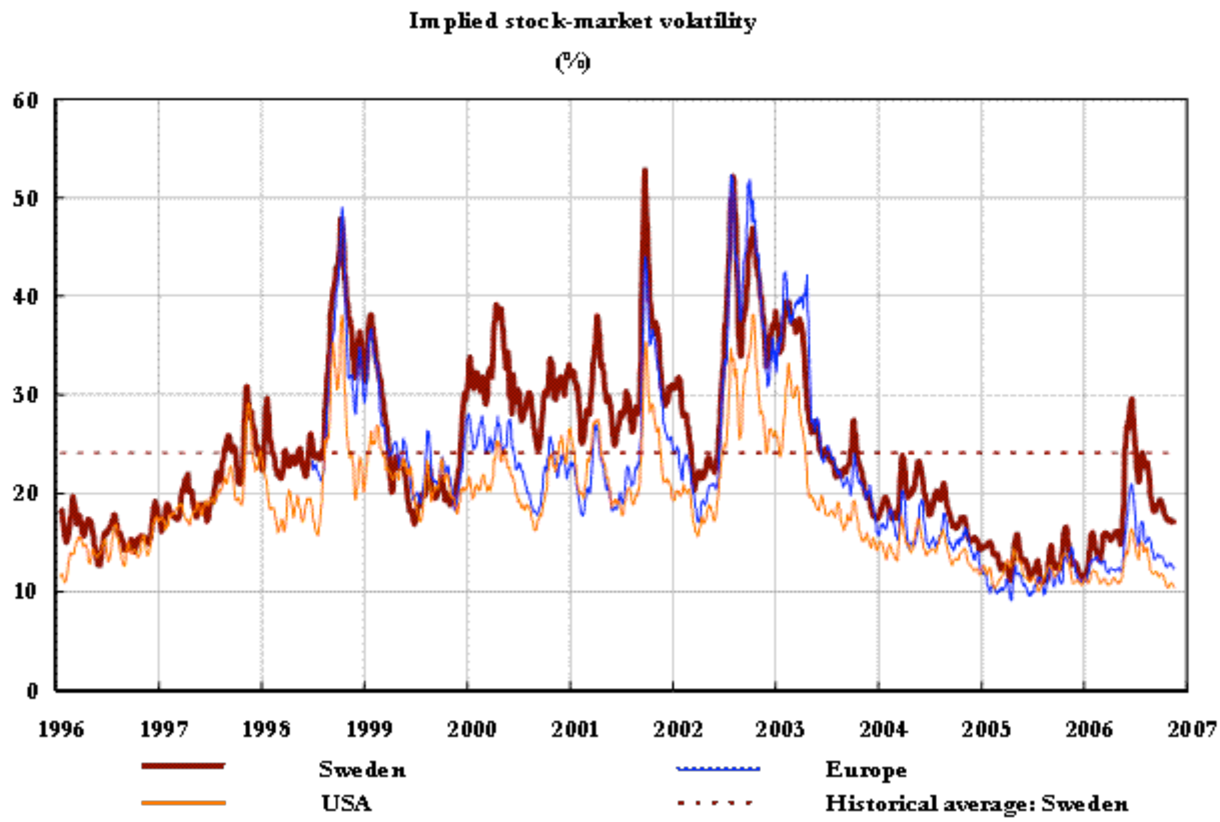

Figure 1: Implied volatility indices for different markets between 1996 and 2007

CAPM	*Coefficients*	*t Stat*	*P-value*
H Portfolio			
_	0,0150	3,84	0,000182
_	0,660	9,75	1,39E-17
L Portfolio			
_	-0,00262	-0,716	4,75E-01
_	0,969	15,3	5,86E-32
HmL Portfolio			
_	0,0176	4,30	3,13E-05
_	-0,310	-4,36	2,47E-05

Table 1: Results from the unconditional CAPM model

LCAPM	*Coefficients*	*t Stat*	*P-value*
HmL Portfolio			
_	0,0124	1,84	0,0673
_ +	-0,188	-1,29	0,199
_ -	-0,410	-3,25	0,00144

Table 2: Results from the unconditional LCAPM model

HCAPM	*Coefficients*	*t Stat*	*P-value*
HmL Portfolio			
_	0,0187	3,58	0,000465
_ 1	-0,236	-1,93	0,0558
_ 2	-1,01	-0,879	0,381
_ 3	-10,1	-0,949	0,344

Table 3: Results from the unconditional HCAPM model

Conditional CAPM Change in Volatility	*Coefficients*	*t Stat*	*P-value*
HmL Portfolio			
_ 0	0,0184	4,21	4,55E-05
_ 1	-0,00919	-2,02	0,0450
_ 0	-0,385	-4,661	7,14E-06
_ 1	0,00381	0,0717	0,943

Table 4: Results from the conditional CAPM model with the change in the volatility index as instrument

Conditional CAPM Change in Ind. Prod.	*Coefficients*	*t Stat*	*P-value*
HmL Portfolio			
$-_0$	0,0179	4,33	2,74E-05
$-_1$	-0,00688	-1,67	0,0963
$-_0$	-0,292	-4,08	7,34E-05
$-_1$	-0,0482	-0,745	0,457

Table 5: Results from the conditional CAPM model with the change in the industrial production as instrument

Conditional LCAPM Change in Volatility	*Coefficients*	*t Stat*	*P-value*
HmL Portfolio			
$-_0$	0,0104	1,52	0,131
$-_1$	0,00307	0,367	0,714
$-^+_0$	-0,230	-1,48	0,142
$-^+_1$	-0,217	-1,37	0,173
$-^-_0$	-0,707	-4,10	6,83E-05
$-^-_0$	0,233	2,17	0,0317

Table 6: Results from the conditional LCAPM model with the change in the volatility index as instrument

Conditional LCAPM Change in Ind. Prod.	*Coefficients*	*t Stat*	*P-value*
HmL Portfolio			
$-_0$	0,0100	1,48	0,142
$-_1$	0,00184	0,246	0,806
$-^+_0$	-0,223	-1,44	0,152
$-^+_1$	-0,199	-1,34	0,182
$-^-_0$	-0,711	-4,11	6,62E-05
$-^-_1$	0,222	2,16	0,0325

Table 7: Results from the conditional LCAPM model with the change in the industrial production the instrument

Conditional HCAPM Change in Volatility	*Coefficients*	*t Stat*	*P-value*
HmL Portfolio			
— 0	**0,0169**	**3,38**	**9,51E-04**
— 1	**0,00600**	**0,940**	**0,349**
— 1-0	**-0,150**	**-1,21**	**0,230**
— 1-1	**-0,114**	**-1,35**	**0,180**
— 2-0	**-1,030**	**-0,812**	**0,418**
— 2-1	**-3,68**	**-3,65**	**3,69E-04**
— 3-0	**-51,1**	**-3,48**	**6,73E-04**
— 3-1	**-17,0**	**-2,49**	**0,0140**

Table 8: Results from the conditional HCAPM model with the change in the volatility index as instrument

Conditional HCAPM Change in Ind. Prod.	*Coefficients*	*t Stat*	*P-value*
HmL Portfolio			
— 0	**0,0184**	**3,51**	**6,01E-04**
— 1	**-0,00340**	**-0,609**	**0,544**
— 1-0	**-0,218**	**-1,73**	**0,086**
— 1-1	**-0,093**	**-1,06**	**0,291**
— 2-0	**-0,642**	**-0,539**	**0,591**
— 2-1	**-0,995**	**-0,963**	**0,337**
— 3-0	**-8,42**	**-0,721**	**0,472**
— 3-1	**-3,50**	**-0,569**	**0,570**

Table 9: Results from the conditional HCAPM model with the change in the industrial production as instrument

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