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INVESTIGATING THE VALUE PREMIUM IN THE SWEDISH STOCK MARKET

by

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Abstract

Investigating the Swedish stock market, we find value stocks to have significantly outperformed growth stocks during the period of 1993 to 2017. As value stocks are found to be riskier during bad states of the economy, the existence of the value premium can be partly attributed to time-varying risk. Value betas are anticyclical, while growth betas exhibit a procyclical pattern. Controlling for time-varying risk slightly reduces the value premium and its significance, yet it remains positive. The search for other relevant factor using an APT model lead to the finding that a model based on the Carhart four-factor model reduces alphas to zero, with market excess returns and the momentum factor showing a negative effect on the value premium. An APT model using macroeconomic variables shows limited explanatory power with regards to the value premium.

Keywords: Value premium, time-varying risk, APT, Sweden

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1. Introduction

Through time, investors have been looking for ways of exploiting patterns in the returns of stocks. One of the most debated issues in the past several decades is the well-documented finding that value stocks yield higher average returns than growth stocks, an empirical finding that has become known as the value premium. Since the discovery of the value premium by Rosenberg et al. (1985), scholars and investment professionals have argued that the market can be outperformed by identifying value stocks that have high book-to-market ratios. Academic attention has been plentiful, mainly since the question of why value stocks have been outperforming growth stocks is controversial and yet to be resolved. According to the efficient market hypothesis[1], stocks cannot systematically outperform others without being riskier. The existence of the value premium therefore challenges the efficient market hypothesis. An important assumption of this hypothesis is that it assumes a significant part of the market participants to be rational. However, De Bondt and Thaler (1987) and Lakonishok et al. (1994) have argued that investors are irrational, overreacting to recent news causing stock prices to temporarily depart from their fundamental values. In other words, the value premium can be attributed to expectational errors made by investors. Academics like Fama and French (1992), Liew and Vassalou (2000) and Petkova and Zhang (2005) have on the other hand argued that the value premium is due to unidentified risk and that the higher returns are simply a compensation for this risk.

The strategy of identifying value stocks and investing in those is known as the contrarian strategy. Value stocks tend to be stocks which have performed poorly in the past and are expected to continue to do so. Growth stocks on the other hand are typically stocks that are currently popular in the market, having high potential in terms of both revenue and cash flows. A popular way of classifying these

[1] According to the efficient market hypothesis, stock prices should reflect all available information. Fama (1965) defines an "efficient market as a market where there are large numbers of rational, profit-minimizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants."

stocks is by looking at the book-to-market (B/M) ratios (Fama and French, 1992; Lakonishok et al., 1994), which is high for value stocks and low for growth stocks. By disproportionately underinvesting in stocks that are overpriced and overinvesting in stocks that are underpriced, investors have historically been able to outperform the market.

Although the majority of the research of the value premium has been focused on the US market, other markets have been researched as well. For instance, Mouselli (2010) investigates the U.K. value premium and Fama and French (1998) provides evidence of the value premium in 12 out of 13 observed developed markets. As the behavior of stock markets may vary greatly across markets, investment strategies cannot automatically be generalized. An interesting question is therefore how a contrarian strategy performs in the Swedish market. Fama and French (1998) did find a value premium in their studies for the Swedish market, but as this study is quite dated, a new look at the Swedish market seem justified.

The first objective of this thesis is to show whether the Swedish stock market is characterized by the value premium. The value premium will be identified by using one-variable classifications of value and growth stocks. By forming portfolios and re-balancing them each year, to account for changes in classifications, we can determine the performance of the contrarian strategy. The second objective is to identify whether value stocks are fundamentally riskier than growth stocks. This is done by building on the methodology that Petkova and Zhang (2005) have laid out by looking whether "time-varying risk goes in the right direction in explaining the value premium". Thirdly, as Petkova and Zhang (2005) found that CAPM was unable to explain the full magnitude of this value premium, this paper will follow their recommendation of looking at arbitrage pricing theory (APT) as en effort to identify possible driving factors for the value premium. The research question outlined in this thesis is as follows:

"Is the Swedish stock market characterized by the value premium, and if yes, is there a risk-based explanation for this value premium?"

The answer to this question is significant to both academics and investors. If the value premium can be explained by a higher risk accompanied with value stocks, this would provide substance for the efficient market hypothesis. At the contrary, if a fundamental-based approach fails to explain the value premium, more behavioral arguments should be explored that would be contradicting the current efficient market state. The contribution of this thesis is twofold. Firstly, we fill the gap of the contemporary literature about the existence of the Swedish value premium. Secondly, we successfully find and illustrate the time-varying risk characteristics that Swedish value- and growth stocks consist of.

The delimitations of this thesis are focused on two essential points. Firstly, the data for the Swedish stock market regarding book-to-market ratios is limited before the year of 1993 which limits the number of business cycles that we may analyze. To that end, the time-varying risk analysis would be restricted to a smaller number of booms and crashes, for instance. Secondly, this research solely looks at the Swedish stock market and incorporates a more recent unexplored time period limits the ability to generalize the results to other countries.

The remainder of this thesis is organized as follows. Section II will present the literature review. Section III will outline the data collection, the construction of the portfolio and the methodology used for analyzing time-varying risk. Section IV provides the results accompanied with an analysis and is followed by a conclusion in section V.

2. Literature review

This section aims to portray the research area regarding the value premium in several remarks, as of now. A vast literature framework is developed and the prevailing ideas for the value premium are emphasized upon. However, discrepancies among the vast literature are also presented by bringing forward various academic critique against these theories. Above all, the section introduces a clear gap in the area that the research question and approach of this paper will try to fill.

2.1. The Contemporary Research

Historically, researchers have shown how value stocks tend to earn higher returns than growth stocks (Basu, 1983; Rosenberg et al., 1985; Fama and French, 1992). There are several different approaches in measuring this value returns, with respect to what sorting ratio to adopt. The most relevant ratios are the book-to-market (B/M), earnings-to-price (E/P), cash-earning-to-price (CE/P) and the dividend yield (D/Y). The E/P and CE/P ratios should proxy the expected growth of the cash flows. As Lakonishok et al. (1994) mention, holding discount rates and payout ratios constant. A high CE/P firm has a low expected growth rate of cash flow, while a low CE/P firm has a high expected growth rate of cash flow, and similarly for E/P.

Although the existence of the value premium is generally agreed upon, the driver behind the persistence of this arbitrage opportunity is unclear. Chan (1988) argues that the contrarian strategy should not exist in efficient markets, as any trading rule based on past prices violates the weakest form of the market efficiency hypothesis. A big reason why academic attention has exploded since the influential papers of Fama and French (1992) and Lakonishok et al. (1994), is because the value premium is so persistent. If there would not exist a fundemental-based explanation, one would expect that the value premium would soon have disappeared with more and more investors becoming aware of its existence. However, as previously mentioned, this hypothesis assumes investors to behave rationally. De Bondt and Thaler (1987) attribute the success of the contrarian strategy to the behavioral argument that people have a tendency to overweight recent information and underweight base rate data. As investors react too heavily on recent information, stock prices temporarily depart from their fundamental values. Consequently, prior "losers" are more attractive investments than prior "winners". Lakonishok et al. (1994) also explain that investors are irrational by extrapolating past earnings too far into the future, overreacting to good or bad news, or by equating a good investment with a well-run company, irrespective of price. They find that investing in value stocks is not fundamentally riskier than investing in growth stocks, meaning that the value premium cannot be explained by risk. Instead, their explanation for why value stocks have been consistently outperforming growth stocks is because investors have not yet been able to identify the success of the contrarian strategies.

Vermaelen and Verstringe (1986), who replicated the winner-loser anomaly of De Bondt and Thaler (1987) and applied this to the Belgian stock market, argued that the overreaction effect is a rational response to risk changes. Due to a decline in the stock price, a firm's debt-to-equity ratio and therefore its risk increases. Elaborating on the argument that the value premiums may be due to higher risk, Chan (1988) proposed that the risk of winner and loser stocks is not constant over time and that the risk of the contrarian strategy positively correlates with the expected market risk premium. The financial leverage of loser firms increases as the stock price falls, making the investment in a value stock riskier.

This discussion about risk is partially discussed by Lakonishok et al. (1994) and De Bondt and Thaler (1987) who argue that the value premium cannot be inherent in the risk. The authors show that value betas are higher than the betas of growth stocks during strong economic years, while they are lower during worse economic conditions. This finding directly contradicts the risk hypothesis of the value premium, since a lower beta during bad economic conditions for value stocks means that it faces smaller downside risk, which is the risk that investors are the most afraid of. In general, when the state of the economy is bad, the marginal utility of wealth is high. As a result, investors who are risk-averse are unlikely to invest in stocks with high exposure to downside risk.

In contrast to these results, Petkova and Zhang (2005) found the betas of value stocks to covary positively with the market risk premium while growth betas covary negatively, implying larger downside risk for value stocks. The authors' findings are consistent throughout different states of the economy. Their results differ from previous research, since they measure the state that the economy is currently in through an alternative method. Instead of using realized market excess returns, considered a noisy measure for economic conditions (see Stock and Watson 1999), Petkova and Zhang (2005) use the expected market risk premium. Using realized market excess returns is considered a noisy measure, as states can be misclassified due to the positive correlation of ex post and ex ante returns. As the expected market risk premium is unobservable, the authors estimate it using the default spread, dividend yields, term spread and short-term interest rates. Petkova and Zhang (2005) conclude that the time-varying risk can explain the value premium, but mention that the covariation between the value-minus-growth betas and the expected market risk premium is too small to be explained within the context of the capital asset pricing model (CAPM). Other drivers for the value premium, such as APT- or ICAPM-related risk, are still open for consideration.

Another argument for the value premium that has been popular recently is the duration-based explanation by Lettau and Wachter (2007). The idea behind this explanation is that growth stocks would have higher cash-flow growth rates than value stocks and therefore a longer duration. This could explain the lower expected returns that growth stocks have, as the term structure of equity is downward sloping. Value stocks, as short-horizon equity, vary more with fluctuations in cash flows, which is the fluctuations that investors fear most. They therefore provide a risk-based explanation for the value premium. However, Chen (2017) finds that growth stocks do not have substantially higher cash-flow growth rates than value stocks in both rebalanced and buy-and-hold portfolios. This raises the question whether the difference between the timing of growth and value stocks cash flows is sufficient in explaining the value premium.

In conclusion, vast evidence of the existence of the value premium has been built upon throughout the years. The contrarian strategy of having long positions in value stocks and short positions in growth stocks has consistently showed a positive abnormal performance. While there is consensus in the existence of a value premium, there is also a high degree of disagreement about what drives it. An effort in explaining the risk premium has been through risk. The intuition behind this is that the higher returns generated by value stocks could be weighed against the possible higher risk involved. Lakonishok et al. (1994) try to refute this argument by showing that value stocks are not fundamentally riskier than growth stocks. This finding is contradicted by the research of Petkova and Zhang (2005), claiming that the expected market risk premium is a better measure for the current state of the economy. They successfully show that time-varying risk can partly explain the value premium, but using the CAPM they show that a part of the value premium is still unexplained.

This surely motivates further studies about the composition of the value premium covering methods beyond the conditional CAPM, such as the APT.

3. Research design

Section 3.1 covers the selection of the data. The construction of the value-minus-growth portfolios is described in Section 3.2. Section 3.3 lays out the framework for studying the time-varying risk of value and growth stocks, respectively. In Section 3.4 the application of the unconditional and conditional CAPM is explained. Finally, in section 3.5, the APT approach is explained.

3.1. Data sample

The research of this paper uses data for 350 companies. The sample contains companies listed on the Swedish OMX exchange[2], excluding financial firms due to their fundamentally high B/M ratios and high leverage. Furthermore, stocks with negative book-to-market ratios are omitted, which is in line with both practitioners and academics. The study period is between 1993 and 2017 with the reasons being twofold. Firstly, the data quality on book-to-market values before the period of 1993 is flawed and lacking. Secondly, the decision of the Riksbank to leave the fixed exchange rate of the European Exchange Rate Mechanism (ERM) on the 19th of November in 1992 (Edvinsson et al., 2012), would lead to a noisy estimation of the expected market risk premium. The data includes adjusted share prices and book-to-market ratios. This data is collected from Thomson Reuter's Datastream on a monthly basis.[3] The returns for the value -minus-growth portfolios sorted on E/P, C/P and D/Y are retrieved from the Kenneth R. French library[4], which is

[2]The decision to not use the OMXS30 index is due to the empirical findings that B/M portfolios with a smaller capitalization have a higher value premium than large cap B/M portfolios. Thus, using the entire OMX allows for this analysis (Mouselli, 2010; Fama and French, 1992).

[3]Monthly returns are used as this will yield enough data points in order to identify a value premium combined it being recommended frequency needed for calculating betas (Berglund and Knif, 1999).

[4]$http : //mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html$ is the site from which data was retrieved for the returns of different portfolios.

an often-used source for value-minus-growth returns. Furthermore, as we want to estimate the expected market risk premium as defined by Petkova and Zhang (2005), the D/Y, term spread (TERM), default spread (DEF) and short-term treasury bill rate (TB) are collected. The dividend yield is defined as the sum of the dividends divided by the market index and is collected from Datastream as well. The three other variables can be retrieved from the Swedish Central Bank ("*Riksbanken*"). The short-term interest rate is proxied by the one-month Swedish Treasury bill rate. The term spread is calculated as the difference between the 10-year and 3-month Treasury securities. The default spread is the difference in yield between a American treasury bond and a debt security with the same maturity but of less quality. Market returns and the Fama French factors of SmB and momentum are provided by the research data center of the Swedish House of Finance.

3.2. Portfolio construction

In order to form portfolios, stocks are separated based on their B/M values, as favored by Fama and French (1992). Portfolios are formed based on the average ratio of the preceding three months at time t. The three preceding months are used as an assessment period to classify the stock as either a value or as a growth stock. Portfolios are formed in July at time t, and will be held till June at time $t+1$. After each year, the portfolio is reassessed, as the characteristics of the stocks might have changed during that time.

The portfolio returns are calculated using the equally-weighted approach, as the Swedish stock market is rather concentrated and large stocks would have too large of an influence. The returns are presented as normal percentage returns, as these are the most easily understood and is a method in accordance with previous research. If a company is delisted during the course of the year, the return is replaced with the average return of the corresponding size decile portfolio. As empirical studies have shown, the value premium might differ between large cap and small cap companies (Gonenc and Karan, 2003). In order to analyze this, the stocks within the portfolios are split into two groups at the median value of the market capitalizations and the same ratio assessment method is applied for the two datasets. The market capitalization split for the entire data set is made every year in July.

The Fama French factors have been constructed by the research center of the Swedish house of finance. In the case of SmB-portfolio, the firms are sorted based on their market capitalization. As small stocks have empirically shown to outperform growth stocks, portfolios are formed by investing in the 30% smallest stocks of the market, while shorting the 30% largest stocks. The same holds for the winner minus losers (momentum) portfolios. The best performing stocks of the previous 6 months are bought, while bad performing stocks are sold. This factor did not originally belong to the Fama French 3-factor model, but Carhart (1997) found that funds with high returns last year, also have higher than average expected returns the year after.

3.3. Time-varying risk

As shown by Petkova and Zhang (2005), Petkova (2006) and Li et al. (2009) the existence of the value premium may be a result of time-varying risk. As value stocks may be subject to higher risk during bad states of the economy, the value premium is attributable to the larger downside risk that these stocks face. In order to be able to conduct an analysis on potential time-varying risk in the Swedish stock market, different states of the economy need to be defined and categorized. Fama (1981) and Stock and Watson (1999) used realized market returns as a measure. However, Petkova and Zhang (2005) found that the combination of variables for modeling the expected market risk premium, provides a more precise measure for the state of the economy. This will also be the measure that we will use. The state of the economy will be divided into four stages: *peak*, *expansion*, *recession* and *trough*. The lowest 10 percent of the observations are defined as the state "peak"; the remaining months with the premium below the average is the "expansion" period; the months with the premium above the average but below the 10 percent highest is the state "recession"; and the 10 percent highest observation is the state "trough". To elaborate a bit more on the interpretation of the different states, the peak of the business cycle represents the end of economic expansion and a shift to a recession. The absolute end of the recession-cycle is classified as the state trough, before the economy starts expanding again. To estimate the expected market risk premium, the following equations are used:

$$r_{mt+1} = \delta_0 + \delta_1 DIV_t + \delta_2 DEF_t + \delta_3 TERM_t + \delta_4 TB_t + e_{mt+1} \tag{1}$$

and

$$\hat{\gamma} = \hat{\delta}_0 + \hat{\delta}_1 DIV_t + \hat{\delta}_2 DEF_t + \hat{\delta}_3 TERM_t + \hat{\delta}_4 TB_t, \tag{2}$$

With $\hat{\gamma}$ being the expected market risk premium. The conditioning variables are the dividend yield (DIV), the default spread (DEF), the term spread (TERM), and the short-term Treasury bill rate (TB). The choice for these variables corresponds to the ones used by Petkova and Zhang (2005) and is the standard from the time-series predictability literature. Once the states of the economy are defined, average conditional betas can be calculated for these different states. These betas are estimated using a 60-month rolling window by regressing excess value and growth portfolio returns on excess market returns. To complement the somewhat informal calculation of average conditional betas we will do an univariate regression of the conditional rolling betas on the expected market risk premium, in order to establish whether any significant relations are present. The following equation will be used with the beta-premium sensitivities being denoted by ϕ_i:

$$\hat{\beta}_{it} = c_i + \phi_1 \hat{\gamma}_t + \eta_{it}, \tag{3}$$

We test whether the ϕ_i is significantly different than 0. For the value portfolios we expect a positive beta-premium sensitivities. We also test whether growth portfolios have negative beta-premium sensitivities.

3.4. The Capital Asset Pricing Model (CAPM)

When using CAPM we can test whether the returns of value stocks are captured by systematic risk. In order to test this, the returns of the different portfolios are regressed on the excess market return. If there is no value premium, then the true intercepts in these regressions should be 0. The CAPM takes on the following form:

$$r_i = \alpha_i + \beta_i(R_m - R_f) + \epsilon_t \tag{4}$$

Where:

$R_i =$ the value premium for period t;

$R_m =$ the market return for period t;

$R_f =$ the risk-free rate for period t;

$\alpha_i =$ the intercept term;

$\beta_i =$ sensitivity to the market risk; and

$\epsilon_t =$ the error term for period t;

The risk-free rate is proxied by using the Swedish 3-month t-bill. If there would be a value premium in the Swedish stock returns, the intercept should be significantly different from zero for the value-minus growth portfolios.

3.4.1. Conditional CAPM

Would the value and growth portfolio be subject to time-varying risk, conditional market regressions will be applied, which allow the betas to vary over time. The conditional variables will be the ones that we used to estimate the expected market risk premium; *DIV*, *DEF*, *TERM*, and the *TB*. They are lagged by one month as they should have predictive power for the returns. This results in the following formula:

$$r_{it+1} = \alpha_i + (\beta_{i0} + \beta_{i1}DIV_t + \beta_{i2}DEF_t + \beta_{i3}TERM_t + \beta_{i4}TB_t)r_{mt+1} + e_{it+1} \tag{5}$$

3.5. The Arbitrage Pricing Theory (APT)

The reason why additional factors have been added to the original CAPM, is since it has shown to capture larger parts of the variance in excess returns. When Fama and French (1992) published their results on the value premium, they found that the traditional CAPM measure could not completely capture the value premium.

Looking at the Intertemporal CAPM (ICAPM) was one recommendation for future research by Petkova and Zhang (2005). This involves looking at consumer-investor behavior with an inter-temporal period of investing. As it is very similar to the CAPM and as we deem a multi-factor approach to risk more likely to lead to a success, we decide to leave out this model in the analysis.

The APT is, like the CAPM, a model for pricing securities. While CAPM is a single factor model, the APT looks at the relationship between expected returns and multiple risk factors. As the APT model has less restrictions than CAPM, it is more suitable for the empirical world with it being more flexible. The premise of the APT model is that arbitrage opportunities should not exist in efficient financial markets and that certain factors make the assets deviate from their expected values. Some examples of these risk factors are: the interest rate, industrial production and inflation rates. The factors used in the APT are likely to differ between economies and over time. The selection of risk factors is therefore complex. The Fama-French three factor model is an APT model that is essentially an extension of CAPM, adding a factor for the returns of SmB portfolios and a factor for the value premium (HmL) based on the B/M ratio. The Carhart's four factor model is an extension of the Fama-French model, adding momentum (Mom) as an additional factor, as different studies showed stocks that did well over the past months continued to do well (Fama and French, 1996; Jegadeesh and Titman, 1993). As it would be insensible to regress the HmL factor on our HmL portfolios, this factor is omitted. This results in the following formula:

$$P_t = \alpha_i + \beta_i(R_m - R_f) + \beta_i(SmB) + \beta_i(Mom) + \epsilon_t \tag{6}$$

Where:

$P_t =$ the value premium for period t;

$SmB =$ the size factor for period t;

$Mom =$ the momentum factor for period t;

The decision behind the SmB factor comes from the argument that smaller stocks are more sensitive to changes in business conditions and therefore provide higher historical returns than the CAPM would predict. Furthermore, the price momentum of stock returns has been identified to exist (Jegadeesh and Titman, 1993; Chan et al., 1996). Stocks that have been identified as winners in the past six months are found to generate short-term abnormal returns.

However, the robustness of the Fama-French factors has been criticized as they are not non-orthogonal. Which is due covariance between market returns, the SmB factor and the momentum factor. In order to overcome this issue, we first perform single regressions of the SmB and momentum returns on the market returns and save the residuals. These residuals are then used in the multivariate regression on our portfolio returns. Although this method is not very academic, it is used by practitioners to purely identify sources of exposure.

Another form of APT is the original one proposed by Roll and Ross (1980) and consists of four factors, namely the (1) change in inflation, (2) change in the level of industrial production,[5] (3) shifts in risk premiums, and the (4) change in the shape of the term structure of interest rates. According to Roll and Ross (1980), if no unexpected changes happen in these variables, the actual returns should equal the expected returns. As a result, no value premium should exist if these macroeconomic variables are correctly able to predict returns. The selected variables are suitable as their impact on asset prices is unpredictable, the factors cannot be diversified, accurate information is available on them and there is a theoretical and economical justification for using them.

4. Results and Analysis

This section presents and analyzes the results retrieved from the research and compares them to previous research. In subsection 4.1 we identify the value premium for the Swedish stock market and discuss the optimal sorting ratios. Subsection 4.2 expands upon this finding through incorporating a risk perspective for value and

[5]The industrial production index (IPI) is a monthly economic indicator measuring real output in the manufacturing, mining, electric and gas industries, relative to a base year.

growth stocks via beta regressions. Subsection 4.3 shows the results for the value premium persistence after applying the CAPM. Finally, subsection 4.4 presents the results of an APT model as an attempt to explain the remaining part of the value premium.

4.1. The Swedish Value Premium

Table 1 displays descriptive statistics for the different value premium portfolios on a monthly basis. As can be seen in the table, there are remarkably high peaks and troughs in the portfolio returns. This is mainly attributable to the dot-com bubble in 1999-2000 and its subsequent crash in the following years. Combined with the results that we show in Table 2, the highest recorded value premium was for the 10th percentile of larger stocks with a monthly premium of 2.25 percent.

Furthermore, a subdivision into two periods was conducted, constituting of pre- and post-recession samples. This yielded severely different degrees of the value premium, as seen in Table 2. It would suggest that the relationship as of late does not seem as strong, while the value premium for the time period up until 2007 is in line with the portrayed image by previous researchers. That is, a strong and significant value premium. The subsequent period on the other hand, shows a severely weaker positive monthly difference between value and growth stocks. It would rather seem as if the value premium for the Swedish stock market has been extracted throughout the years.

Consistent with the average returns of the value premium are the unconditional alphas that we find when regressing the value premium on excess market returns. In Table 3, the unconditional alphas and betas are shown for the different portfolios. It can be seen that abnormal returns which are not captured by systematic risk are solely present in the pre-recession period. After the recession, no significant unconditional alpha values are found, suggesting that the value premium has indeed disappeared in recent years. Furthermore, the beta values are mostly significant and negative.

Table 1: Descriptive statistics for the value premium portfolios for the entire sample ranging from 1993-2017, including the added sorting dimensions such as earnings-to-price (E/P), dividend-yield (D/Y) and cash-flow-to-price (C/P). The mean, median, maximum and minimum are denoted in absolute percentages, respectively.

Descriptive	B/M		B/Ms		E/P	D/Y	C/P
	0.1	0.3	0.1	0.3	0.3	0.3	0.3
Mean	2.25	0.94	0.32	0.55	0.98	1.54	0.99
Median	1.97	0.47	0.12	0.04	0.34	1.08	0.74
Maximum	52.50	25.82	39.59	31.14	39.06	34.15	43.42
Minimum	(56.09)	(32.74)	(59.44)	(37.03)	(31.67)	(37.89)	(35.61)
Std. Dev.	0.12	0.07	0.11	0.09	0.08	0.09	0.09
Obs.	293	293	293	293	293	293	293

4.2. Optimal Ratio and Size

For the different sorting ratios, several researchers have documented that an E/P strategy yields a much higher value premium than the traditional B/M approach (Jaffe et al., 1989; Davis, 1994; Athanassakos and Chair, 2010). However, the work of these authors mainly focused on the U.S., which could possibly explain different optimal approaches when looking for a value premium. The results of this paper are more aligned with the work of other value premium investigations that have focused on non-U.S. stock markets, such as the work of Fama and French (1992) and Dhatt et al. (1999). The results of these studies found that both the B/M and E/P construction shows the same level of the value premium, however the E/P would slightly outperform its counterpart. As can be seen in Table 2, comparing the B/M and E/P under the same percentile, the difference is indistinguishable. However, this study did find a remarkably high significance for the D/Y portfolio. The D/Y seems to be outperforming all of the different portfolio constructions under the same percentile.

In addition, dividing the data with respect to market capitalization in an effort to identify possible differences between value premiums for larger and smaller stocks yielded surprising results. The value premium for small market-capitalization stocks is insignificant, which is in contrast to the findings of Fama and French (1992) and Mouselli (2010). They find that the value premium is mainly driven by small market-

Table 2: Monthly average value premium for different HmL portfolios, reported in percentages. B/M and B/Ms are portfolios formed following a double-sorting mechanism. This involves a split at the median market-capitalization and thereafter sorting into different percentiles based on B/M ratios. The size breakpoint for year t is at the median Swedish OMX market equity at the beginning of July each year. The B/M breakpoints are at the 10th and 90th (0.1) as well as the 30th and 70th (0.3) percentile. The three remaining portfolios are sorted in a similar fashion, however using different sorting ratios as earnings-price (E/P), Dividend yield (D/Y) and cash earnings to price (C/P) without a size split. These portfolios consist of the highest and lowest 30 percent, respectively. We compute the monthly return formation for three different time periods: the full sample from 1993 to 2017; the post recession sample from 2008 to 2017 and the pre-recession sample from 1993 to 2007.

Sample	B/M		B/Ms		E/P	D/Y	C/P
	0.1	0.3	0.1	0.3	0.3	0.3	0.3
July 1993-	2.25**	0.94*	0.32	0.55	0.98*	1.54**	0.99
June 2017	(0.12)	(0.07)	(0.11)	(0.09)	(0.08)	(0.09)	(0.09)
July 1993-	2.54**	0.99	1.28	1.61*	1.15	2.27**	1.06
June 2007	(0.13)	(0.09)	(0.13)	(0.10)	(0.10)	(0.11)	(0.11)
July 2008-	0.50	0.42	0.74	0.90	0.58	0.08	0.76
June 2017	(0.05)	(0.03)	(0.07)	(0.05)	(0.04)	(0.04)	(0.04)

whereas * and ** indicates 5% and 1% significance levels, respectively.

capitalization stocks for the United States. For our sample however, larger stocks seem to be driving the value premium for the Swedish stock market. The results are also contrary to that of Loughran (1997), who mention that the book-to-market effect is shown to be mostly a manifestation of the low returns on smaller newly-listed stocks. This reasoning clearly is not the case for the Swedish stock market. The value premium is rather amplified when solely examining larger stocks.

4.3. Cyclicality of Value and Growth Stocks

To see whether the riskiness of value and growth stocks vary over time, we estimated the expected market risk premium in order to proxy the state of the economy[6]. Table 4 shows the average rolling betas throughout the different states of the economy. Clearly, the average beta of growth stocks is higher than that of value stocks,

[6]The regression of the expected market risk premium was highly significant (1% level). The credit spread was deemed the least informative variable. Risk-free rate had a negative coefficient while term spread and dividend yield had a positive coefficient in explaining the dependent variable.

Table 3: Alphas and betas for the unconditional CAPM. The excess market return ($R_M - R_F$) is regressed on the value premium return and thus the beta coefficient is displayed for each portfolio along with the regression intercept (α). The intercept is displayed in absolute percentages. The regressions are based on three different period samples: (i) The whole sample covering the years 1993-2017, (ii) The pre-recession period covering the years 1993-2007 and (iii) The post-recession covering the years 2008-2017. Standard errors are displayed within parenthesis. The standard errors are corrected for autocorrelations and heteroscedasticity up to 60 lags.

The full sample	B/M	B/Ms	E/P	C/P	D/Y
$R_M - R_F$	-0.32**	-0.33**	-0.17**	-0.30**	-0.32**
	(0.07)	(0.07)	(0.05)	(0.06)	(0.05)
α	1.15**	0.51	0.72*	0.84*	1.14**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Pre-recession					
$R_M - R_F$	-0.60**	-0.57**	-0.34**	-0.50**	-0.46**
	(0.10)	(0.10)	(0.07)	(0.07)	(0.07)
α	1.92**	1.25*	1.09*	1.18*	1.73**
	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Post-recession					
$R_M - R_F$	0.20**	0.13	0.26**	0.19**	0.02
	(0.07)	(0.09)	(0.07)	(0.06)	(0.07)
α	0.23	-0.41	0.10	0.27	0.18
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

* and ** indicates 5% and 1% significance levels, respectively.

resulting in significant negative values for the average value-minus-growth rolling beta. This result is in line with Grinblatt and Titman (2002), who state in their corporate finance textbook that it is typically growth opportunities that are a source of systematic risk. Furthermore, the result that the rolling beta of the value premium portfolio is positive in the worst state of the economy, is aligned with the findings of Petkova and Zhang (2005). This result seems robust since similar results are shown for the different sorting methods with the exception for B/Ms. The value premium is hypothesized to be a result of higher risk during the state trough. As no significant value premium was found for the small-cap B/M portfolio, it makes sense that also no higher downside risk is found.

Examining Figure A.1 (found in the appendix), it seems that there exists certain

Table 4: Average rolling betas throughout different states of the economy. The betas for the different portfolios are estimated using a 60-month rolling window between 1993 and 2017. Portfolios included are high-minus-low portfolios using the book-to market, earnings-to-price, cashflow-to-price, dividends-to-price ratios at the 30th and 70th percentiles. B/M and B/Ms are portfolios formed following a double-sorting mechanism. This involves a split at the median market-capitalization and thereafter sorting into different percentiles based on B/M ratios. The size breakpoint for year t is at the median Swedish OMX market equity at the beginning of July each year. The B/M breakpoints are at the 10th and 90th (0.1) as well as the 30th and 70th (0.3) percentile. The size breakpoint for year t is at the median Swedish OMX market equity at the beginning of July at year t. The B/M breakpoints are at the 30th and 70th percentiles. Four different variables are used to estimate the expected risk premium. The variables used are the dividend yield, term spread, credit spread and 3-month Swedish treasury-bill rate. The four states are then sorted on the expected market risk premium. The state peak and trough are the correspond to the 10 percent lowest and 10 percent highest observations of the expected risk premium. The state expansion corresponds to the 40 percent below the average risk premium, but above the lowest 10 percent. Recession refers to the 40 percent above the average risk premium, but below the highest 10 percent. Reported are the average rolling betas in the different states. We also report the coefficient of the expected risk premium on the rolling betas of the different portfolios, denoted by ϕ. The standard errors are reported as ste(ϕ). The standard errors are corrected for autocorrelations and heteroscedasticity up to 60 lags.

	Peak	Expansion	Recession	Trough	Average
B/M	-0.56	-0.20	-0.52	0.04	-0.31**
B/Ms	-0.43	-0.18	-0.43	-0.11	-0.29**
E/P	-0.22	-0.03	-0.28	0.04	-0.12**
C/P	-0.45	-0.12	-0.41	0.07	-0.23**
DY	-0.47	-0.18	-0.41	0.02	-0.26**

Value portfolios	ϕ	σ	Growth portfolios	ϕ	σ
B/M	1.49*	0.38	B/M	-3.03*	0.36
B/Ms	2.35*	0.30	B/Ms	1.00	1.07
E/P	0.39	0.47	E/P	0.38	0.45
CE/P	0.64*	0.21	CE/P	-2.34*	0.44
D/Y	1.40*	0.18	D/Y	-1.94*	0.20

* indicates 1% significance level.

cyclicality for both value and growth betas. Value betas seem to be countercyclical, while growth betas seem to be procyclical. What this implies is that value stocks tend to be riskier during bad times, while growth stocks are riskier during good times. We therefore expect to see a positive relation between the expected market risk premium and value stocks, as the economy is classified as worse when the expected market risk premium increases. On the other hand, we expect a negative relation between the expected risk premium and growth stocks.

Regressing the value and growth betas on the expected market risk premium does indeed show significant results which are in line with these expectations. What we find, as shown in Table 4, is that for all value portfolios with the exception of the portfolio formed using E/P, the expected market risk premium has a significant positive effect on the value betas. On the other hand, the growth portfolios of B/M, C/P and D/Y seem to have a significant negative relationship with the adjusted risk premium. Although these are univariate regressions, the expected market risk premium is an estimation based on four other variables that indicate the riskiness of the market. Table 5 shows a similar regression, but then on the individual components. Most variables show great significance and are in line with previous expectations. Nearly all variables seem to have an inverse effect on value and growth stocks, respectively, with the D/Y construction as an exception. The high adjusted R^2 tells us that the variables used to estimate the expected market risk premium go a long way in explaining variations within the rolling betas of the value and growth portfolios.

Thus, examining the riskiness of value and growth portfolios through the use of rolling betas, the riskiness has been shown to vary greatly over time. The results in this paper differ from that of Lakonishok et al. (1994) where the authors reject the hypotheses of the fundamental-based view that the value premium could be explained by risk. They find the value portfolios to not be riskier than growth portfolios during bad states of the economy. Despite the fact that Lakonishok et al. (1994) examined a different stock market and time-period, the contrasting results could also be inherent to their use of excess market returns to classify the state of the economy. Our results are more in line with Petkova and Zhang (2005), who found excess market returns to be a noisy measure and instead suggested the use of the expected market risk premium. To that end, a different approach could be a source of the different results of the time-varying risk analysis.

The interpretation of why value stocks are riskier could have its explanation in the argument provided by Mouselli (2010), who also found value firms to be riskier during bad states of the economy. Mouselli argues that value firms have more unproductive capital during bad times, as they find it difficult to reduce stocks. As a result, their

Table 5: Multivariate regression of value and growth portfolio betas on different explanatory variables. CS is the credit spread, defined as Baa minus AAA bond yields from Moody's. DY is the dividend yield, defined as the sum of total dividends of the OMXS30, divided by the total price index. Term spread (TS), is the difference between the yield of 10 year government bonds and the 3-month treasury-bill. N denotes the number of observations. Further reported are the adjusted R^2 and the F-statistics. The standard errors are corrected for autocorrelations and heteroscedasticity up to 60 lags. All independent variables have been tested and rejected for having an unit root using the augmented Dickey-fuller test.

Value portfolios	CS	DY	Rf	TS	C	N	R^2	F-stat
B/M	8.63	6.84*	-5.41**	5.16	0.88**	222	0.75	158.91
	(8.73)	(3.38)	(1.59)	(3.00)	(0.16)			
B/Ms	-3.60	2.87	-3.07**	3.43	0.90**	222	0.68	113.06
	(7.32)	(2.08)	(0.94)	(1.85)	(0.10)			
E/P	41.71**	-1.77	-3.49**	2.06	0.78**	222	0.54	63.35
	(9.45)	(3.44)	(1.24)	(2.91)	(0.19)			
CE/P	32.34**	-1.30	-3.31**	3.09**	0.80**	222	0.53	62.18
	(5.18)	(1.65)	(0.34)	(1.16)	(0.07)			
D/Y	22.30**	-1.81	-2.56**	3.98**	0.86**	222	0.51	56.69
	(4.79)	(1.52)	(0.32)	(1.08)	(0.06)			
Growth portfolios								
B/M	-37.51**	-0.20	3.28**	-5.83*	1.28**	222	0.61	85.52
	(9.34)	(3.59)	(1.04)	(2.89)	(0.18)			
B/Ms	-51.48**	-0.82	3.97**	-3.18	1.27**	222	0.59	77.44
	(9.69)	(3.78)	(1.26)	(3.16)	(0.19)			
E/P	-1.04	-0.27	1.92**	-3.01*	0.93**	222	0.58	75.85
	(5.73)	(1.83)	(0.67)	(1.38)	(0.09)			
CE/P	-13.19**	-0.68	2.61**	-4.71**	1.09**	222	0.65	99.58
	(3.57)	(1.14)	(0.24)	(0.80)	(0.05)			
D/Y	-22.33**	0.06	1.72**	-3.58	1.25**	222	0.64	94.78
	(2.68)	(0.85)	(0.18)	(0.60)	(0.04)			

* and ** indicate 5% and 1% significance levels, respectively.

risk-level increases more than that of growth firms. On the other hand, growth firms face higher adjustment costs in good times, resulting in a beta that co-varies negatively with the expected market risk premium.

Another possible explanation for the larger downside risk that value stocks face could be related to the operating leverage mechanism. Carlson et al. (2004) and García-Feijóo and Jorgensen (2010) successfully couple the mechanism with the value premium. The authors show that value firms tend to have their revenues and equity values decrease more than the average firm during bad times. In other words, during bad economic states, value firms are more susceptible to downsides than their growth counterparts, which may be specifically observed through the operating leverage of these firms[7].

The finding that value stocks are more susceptible to downside risk could possibly assist in explaining the existence of the value premium. In other words, the existence of the value premium could be attributed to the argument that value stocks have a higher disaster risk. Higher returns for value stocks are simply a compensation for the potential losses during bad economic states. The finding that the value premium has decreased since the financial crisis of 2008 could be due to the decrease of the current disaster risk for the Swedish stock market, as far as equity pricing reflects.

4.4. The Conditional CAPM

Given the finding of the specific time-varying characteristics of value and growth stocks, an effort is made to capture this risk through the use of conditional market regressions. Comparing Table 3 and Table 6 with each other, we see that the alphas have generally decreased in magnitude and significance. This is in line with the results from Petkova and Zhang (2005), who also found the alphas to reduce after controlling for time-varying risk. However, still some significance can be found for the alphas in some portfolios for the full sample, which is mainly attributable to the alphas of the pre-recession period. Therefore, although accounting for time-varying risk reduces the alphas, it still does not fully capture the value premium. Lewellen and Nagel (2006) found that the conditional CAPM does not explain the value premium, as the covariances between betas and the market risk premium are not large enough to explain unconditional pricing errors. However, their conditional alphas are large and significant, while the majority of our conditional alphas are insignificant. The finding that accounting for time-varying risk reduces the magnitude of the value premium further motivates the idea of applying an APT model which is specifically aimed at capturing this.

[7] When revenues decrease, the equity value falls relative to book value, equal to the size of the capital stock. Given fixed operating costs that increase with the size of the capital stocks, the risk of the company increases due to higher operating leverage (Carlson et al., 2004).

Table 6: Alphas of conditional market regressions for different value-minus-growth portfolios. The excess market return ($R_M - R_F$) is regressed on the value premium return with the term spread, credit spread, dividend yield and the 3-month treasury bill as conditioning variables. The regressions are based on three different period samples: (i) The whole sample covering the years 1993-2017, (ii) The pre-recession period covering the years 1993-2007 and (iii) The post-recession covering the years 2008-2017. Both the alphas and standard errors are reported in percentages. Standard errors are displayed within parenthesis and are adjusted for autocorrelation and heteroscedasticity.

	B/M	B/Ms	E/P	C/P	D/Y
July 1993-	1.07**	0.44	0.64	0.73*	1.02**
June 2017	(0.4)	(0.43)	(0.33)	(0.34)	(0.33)
July 1993-	1.72**	1.10	0.91	0.97	1.54**
June 2007	(0.59)	(0.61)	(0.47)	(0.50)	(0.48)
July 2008-	0.28	-0.38	0.19	0.34	0.21
June 2017	(0.37)	(0.49)	(0.36)	(0.32)	(0.34)

* and ** indicates 5% and 1% significance levels, respectively.

4.5. Applying the APT

When choosing between possible factors for the APT, the Fama and French variables seemed to give the most significant results. As shown before, excess market returns negatively affect the value-minus-growth portfolios. Furthermore, we find the momentum factor to have a significant negative coefficient.[8] As for the economic intuition, it would seem as if growth stocks in general display a stronger momentum force than value stocks. The SmB coefficient seems to have small explanatory power over the value premium. The combination of momentum and SmB did however show to add explanatory power to the model, as indicated by the significance of the Wald-test. However, despite the observation that some variables are significant in the APT regression, the overall model has low explanatory power and is inconsistent across the different sorting methods.

The finding of the cyclicality of value and growth stocks further motivates the use of macro-economical variables. However, imposing a model introduced by Roll and Ross (1980) which involves regressing the change in inflation, industrial production,

[8] Momentum is significant for the value premium portfolios CE/P and D/Y. Despite this, the independent variable was deemed as lacking explanatory power with the reasoning that the value premium portfolio in its entirety failed to show a premium significantly different from zero.

Table 7: APT analysis of value premium portfolios. We regress the value premium portfolios on excess market returns, momentum and SmB returns. Reported as well are the number of observations, adjusted R-squared and the chi-squared values from a Wald-test. The Wald-test examines whether the coefficients momentum and SmB add explanatory power to the model. A rejection of the Wald-test-statistic would indicate that the variables add explanatory power to the model. Standard errors are displayed within parenthesis and are adjusted for autocorrelation and heteroscedasticity.

	B/M	B/Ms	E/P	C/P	D/Y
$R_M - R_F$	-0.32*	-0.32**	-0.19**	-0.26**	-0.30**
	(0.14)	(0.12)	(0.05)	(0.05)	(0.05)
Mom	-0.08	-0.10	-0.14**	-0.12*	-0.12*
	(0.07)	(0.07)	(0.05)	(0.05)	(0.05)
SmB	-0.16	-0.26**	-0.03	-0.02	0.01
	(0.12)	(0.08)	(0.07)	(0.07)	(0.07)
α	0.01*	0.00	0.00	0.00	0.00
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
N	288	288	288	288	288
Adj. R^2	0.09	0.11	0.07	0.09	0.12
F-stat	9.38	11.13	7.15	9.15	13.10
Wald X^2	0.25	0.00**	0.01**	0.049*	0.048*

* and ** indicates 5% and 1% significance levels, respectively.

shifts in risk premiums and change in the shape of the term structure of interest rates does not yield significant results. These results are therefore not reported.

5. Conclusions

5.1. Main Findings

This thesis provides a fundamental-based explanation to the value premium existence and the findings are thus focused on three essential points. Firstly, the Swedish stock market is clearly characterized by a value premium, as shown by significantly positive monthly average returns and unconditional alphas. The study finds that the B/M, E/P and D/Y are sucessful sorting mechanisms for identifying the Swedish value premium. Therefore the results are more aligned with the researchers of Fama and French (1992) and Dhatt et al. (1999), than that of Jaffe et al. (1989), Davis (1994) and Athanassakos and Chair (2010). Examining the Swedish value premium over time, the relationship has severely weakened after the financial crisis.

Secondly, the risk of both value and growth stocks vary over time. Value stocks seem to be exposed to a higher downside risk during bad states of the economy. On the other hand, growth stocks seem to contain higher risk during the other states of the economy. Value betas are therefore found to be counter-cyclical, while growth stocks display pro-cyclicality. As a result, the value premium in the Swedish market can be seen as a compensation for the higher downside risk. Under conditional market regressions, which allow the beta to vary over time, we find that this slightly reduces the magnitude of the value premium for all portfolios. However, the alphas still remain positive, and significantly higher than zero for the B/M and D/Y portfolios.

Finally, arbitrage pricing theory using the Fama-French four factor model reduces the magnitude of the alphas to zero. The momentum factor generally decreases the value premium, whereas the SmB factor is mostly insignificant. We therefore find the excess returns of small over big firms not to be a relevant factor for the value premium, although we did find that the value premium exists mostly for large cap stocks when using a double-sorting mechanism using market capitalization and book-to-market values. Surprisingly, doing an APT analysis using macroeconomic variables did not show much explanatory power.

5.2. Limitations

The limitations are the following. Firstly, limited relevant data before 1993 has prevented us from investigating the value premium over different business cycles. As we have found time-varying risk to be present in the Swedish stock market, it would have been interesting to see how consistently the betas covary with the business cycle. Secondly, as the value premium and its drivers differ between different countries, the results that we find can not be generalized to other markets. A vast majority of the contemporary literature uses the U.S. for their value premium investigation while this paper solely focuses on the Swedish OMX. Behavioral differences of these two stock markets should be anticipated. Finally, as most existing research covers obsolete time-periods, we are unable to compare our observation of a decreasing value premium in the Swedish stock market. This makes it difficult to draw any clear conclusions from this finding.

5.3. Recommendations for further research

The aim of this research has been to investigate the Swedish value premium and provide evidence of its existence. Furthermore, the research also aimed to provide a risk-based explanation for its existence. In doing so, the findings of this research clearly exhibit a significant value premium for the Swedish market. It also displays and explains the time-varying characteristics of value and growth stocks, respectively. However, recognizing our limitations throughout this paper, recommendations for further research supporting a fundamental-based explanation would be as follows: (i) examining whether a weakening value premium for an updated time horizon is also a characteristic of other stock markets, (ii) to further examine the relationship between the value premium and the operating leverage mechanism that is ongoing and finally (iii) incorporate an APT-variable that significantly acts as a proxy for the time-varying risk that value- and growth stocks show in order to capture the value premium.

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Appendices

Table A.1: The annual returns of a buy-and-hold portfolio for the different value premium portfolios for the period 1993-2017. The assessment period each year spans from July-June. B/M-total includes all of the stocks listed in the OMX while B/M and B/Ms follow a double-sorting mechanism. This sorting mechanism follows a split at the median market-capitalization. All of the returns are displayed in decimals. Negative returns are displayed within parenthesis.

Sample period	B/M-total			B/M			B/Ms			E/P	CE/P	D/Y
	0.1	0.2	0.3	0.1	0.2	0.3	0.1	0.2	0.3	0.3	0.3	0.3
1993 - 1994	0.29	0.37	0.23	0.21	0.33	0.19	(0.09)	(0.14)	0.39	0.33	0.25	0.33
1994 - 1995	(0.15)	(0.07)	0.01	(0.13)	(0.10)	0.01	(0.11)	(0.04)	(0.06)	(0.10)	(0.20)	(0.13)
1995 - 1996	0.11	(0.14)	(0.14)	0.28	(0.13)	(0.16)	(0.20)	(0.37)	(0.32)	0.13	0.01	0.11
1996 - 1997	(0.06)	0.10	0.14	0.15	0.00	0.08	0.05	0.08	0.26	(0.02)	(0.12)	(0.06)
1997 - 1998	0.04	(0.06)	(0.06)	0.07	(0.17)	(0.13)	(0.05)	(0.06)	(0.06)	(0.09)	(0.22)	(0.16)
1998 - 1999	(0.15)	(0.08)	(0.07)	(0.33)	(0.25)	(0.16)	0.10	0.19	0.10	(0.18)	(0.20)	(0.12)
1999 - 2000	(0.60)	(0.56)	(0.48)	(0.75)	(0.68)	(0.56)	(0.61)	(0.45)	(0.41)	(0.47)	(0.60)	(0.40)
2000 - 2001	1.33	1.14	1.01	1.77	1.34	0.95	1.21	1.06	1.02	1.08	1.26	1.05
2001 - 2002	0.73	0.57	0.65	0.67	0.46	0.57	0.83	0.69	0.62	0.09	1.06	0.92
2002 - 2003	0.09	0.09	0.11	0.17	0.16	0.16	(0.01)	(0.02)	0.00	0.16	0.11	(0.01)
2003 - 2004	0.61	0.36	0.23	0.57	0.31	0.16	(0.06)	(0.02)	0.00	(0.06)	0.10	0.10
2004 - 2005	0.07	0.03	0.01	0.11	0.01	(0.06)	0.11	0.09	0.07	(0.01)	(0.23)	0.08
2005 - 2006	0.26	0.02	0.10	0.18	0.07	0.06	0.23	0.12	0.18	0.18	0.27	0.29
2006 - 2007	0.06	(0.03)	0.00	0.23	0.16	0.15	(0.20)	(0.19)	(0.18)	(0.03)	0.34	0.15
2007 - 2008	(0.03)	0.02	0.01	0.12	0.03	(0.02)	(0.05)	0.01	(0.02)	(0.05)	(0.06)	0.16
2008 - 2009	(0.15)	(0.13)	(0.06)	(0.16)	(0.12)	(0.01)	(0.20)	(0.16)	(0.11)	0.02	0.11	0.19
2009 - 2010	0.06	0.07	0.02	(0.02)	0.02	0.00	(0.01)	0.03	0.09	0.15	0.17	0.02
2010 - 2011	0.32	0.18	0.14	0.16	0.07	0.11	0.29	0.23	0.16	(0.02)	0.11	(0.01)
2011 - 2012	(0.05)	(0.04)	(0.03)	(0.18)	(0.12)	(0.08)	0.01	0.03	0.01	0.12	0.07	0.08
2012 - 2013	(0.06)	(0.10)	0.11	0.16	0.16	0.09	(0.18)	(0.29)	(0.34)	0.13	0.04	(0.04)
2013 - 2014	0.18	0.05	0.06	0.23	0.14	0.11	0.11	(0.11)	0.03	0.03	0.01	0.20
2014 - 2015	(0.07)	(0.08)	(0.05)	(0.01)	0.00	0.00	(0.19)	(0.14)	(0.17)	(0.08)	(0.06)	(0.07)
2015 - 2016	0.10	(0.01)	0.00	0.00	(0.04)	(0.05)	0.10	0.03	0.00	(0.10)	(0.06)	(0.23)
2016 - 2017	(0.21)	(0.07)	(0.03)	0.10	0.03	0.03	(0.31)	(0.16)	(0.10)	0.10	0.16	0.07

Figure A.1: Graph illustrating the rolling betas for both value and growth portfolios between the year 1999-2017. The beta was estimated on a rolling window of 60 months. The lined graph illustrates the average betas of all the constructed value portfolios while the dashed line illustrates the average beta of all of the growth portfolios.