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Is it really worth it?

A case study of the cyclicality premium on the Swedish stock market and the stock market of other developed countries.

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Abstract

Previous research shows that there exists a procyclicality premium in some large economies like the U.S. However, this study investigates if a procyclicality premium is present in a small open economy like Sweden as well as in some developed countries around the world due to the size of the Swedish economy. The study investigates the monthly excess return of a portfolio based on Sweden and on a portfolio based on developed countries during a 10-year period, between the 1st of January 2010 and 1st of January 2020. Following the methodology of previous scholars to answer the purpose of the presence of a procyclicality premium the Fama and Macbeth 2-stage regression is implemented for each portfolio. The result of the paper indicates that there is no significant procyclicality premium in the Swedish market, even though the business cycle factor is created from Swedish stocks. However, the Swedish business cycle factor is statistically significant for the portfolio based on developed countries using both Fama and French 3 and 5 risk factors, respectively. This present evidence proves that the business cycle in Sweden is correlated with the business cycles of other developed countries.

Keywords: Procyclicality premium, Industrial production, Fama & Macbeth 2-stage regression, Fama & French risk factors, IPI.

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1 Introduction

In this chapter the reader is introduced to the main topic of the thesis. Furthermore, a problem discussion as well as the purpose is introduced. Lastly a short outline of the remaining part of the thesis is presented.

1.1 Background

Every day, investors are deciding which type of assets they should buy or sell. These decisions are based on different occurrences that affect the stock price for example, if a recession is approaching or if the economy seems to be entering a booming stage. During a recession, stock prices tend to decrease while the volatility increases. Investors react to changes in the stock prices differently but more often than not, they tend to move onto a safer option because of the risk adverse nature of investors. When the economy starts to shift downwards, investors tend to withdraw their capital from the stock market in order to prevent a potential larger financial loss (Jennings, 2020). Furthermore, recessions increase the risk of unemployment which, in turn, will make the investors more conscious about their spending patterns, one of which would be their investments in the stock market. Changes in the economy will affect both the decisions that investors make as well as how they are balancing their portfolios in terms of risk versus reward.

The current ever-changing period presented in the stock market provides evidence that the economy of the world is very fragile and that unexpected problems can cause severe damage to the global economy as well as for individual investors. The volatility of the economy drives financial researchers to examine the effects of changes in the economic situation on the stock markets. The idea was to include economic risk factors into asset pricing models used in the estimation of asset returns. The assumption behind most economic models is based on investors being risk averse. Some investors do not have the time nor the resources to research and evaluate every single company to find a good mix of procyclical and countercyclical stocks that will balance the risk of a portfolio and its return. When the economy fluctuates the riskiness inherent in the assets tend to increase because of an increase in the systematic risk. In this situation, an investor will tend to decrease the amount of assets deemed as risky within their portfolio and increase the amount of stable assets which, as a result, will decrease the overall risk of the portfolio even though this would be at the expense of a lower expected return.

From the discussion above, two important questions arise. Firstly, how to measure the riskiness inherent in the different assets. Secondly, how an investor can earn a higher expected return when the business cycles are suddenly shifting. Researchers often try to answer these questions by considering various risk factors, and their ability to price various assets. Different perspectives on which risk factors can best capture the variation in returns, has led to the development of different asset pricing models such as CAPM established by Sharpe (1964), Lintner (1965) & Mossin (1966), and the factor models by Fama and French (1993 & 2014).

The main idea of our study is to discover which type of stocks earn a higher expected return by implementing an estimation method established by Fama and Macbeth (1973). The findings in our paper suggests that there is no cyclicality premium present in the Swedish stock market. However, there is an indication of a cyclicality premium in other developed countries when the countries' stock markets are combined into portfolios. Our results further indicate that the movement of the business cycles in Sweden are correlated with the movement of the business cycle in the developed countries, as indicated by the significant Swedish business cycle factor.

At this point in time, and to the best of our knowledge, no research has been conducted to prove whether or not a cyclicality premium in the Swedish market exists. Thus, our main contribution to the financial theory is to provide suggestions as to why small countries seem to be excluded from this type of research. The conclusions of our paper can be used by both scholars as well as professionals seeking to understand the relationship between returns and shifts in the economy while also extending on the limited empirical work that is undertaken on small economies.

1.2 Problem discussion

Differences exist amongst researchers regarding which models to choose in order to explain most of the variation in the excess return of a portfolio and which risk factors to include as explanatory variables, as well as how these are defined. Nevertheless, previous research shows the importance of risk factors, as they can explain a significant portion of the variation in portfolio returns compared to a one-factor model like CAPM. When one thinks about risk and return, one instantly thinks of the CAPM framework. The model is based on the systematic and unsystematic risk, where the investor only gets compensated for the systematic risk, which is defined as the asset's exposure relative to the market portfolio. Despite this simplistic view of risk and return, it is still widely used by practitioners. A study by Brounen, De Jong & Koedijk (2014) concludes that approximately 45% out of their 314 investigated European firms, relied on the CAPM framework in order to estimate the required return. Fama and French (1993) expand the CAPM model and add two more factors; size and value. Their 3-factor model is able to explain more than 90% of the return in a diversified portfolio sorted on size and value. In 2014 Fama and French expand their 3-factor model by adding an investment and a profitability factor, which have a significant effect on pricing US stock portfolios.

This thesis aims to investigate if there exists a procyclicality premium in the Swedish stock market. Furthermore, the study intends to examine if the business cycle factor can be used in addition to the risk factors proposed by Fama and French in order to explain the excess return of a portfolio consisting of developed countries. According to Cochrane (1999) procyclical assets should yield a higher excess return because they provide less diversification in the case of an economic downturn, thus investors demand a higher return to compensate for the additional risk. Goetzmann, Watanabe and Watanabe (2012) aim to investigate Cochrane's idea, if one gets compensated by investing in procyclical stocks, using expected GDP as a proxy for business cycles. They both utilize the framework of Fama and Macbeth (1973) and prove that there exists a risk premium for holding procyclical stocks in the American stock market. Due to the scarce research undertaken on small and open economies like Sweden as well as other countries excluding the U.S, we deem it is necessary to investigate how a business cycle factor proxied by Industrial Production Index (IPI) and the risk factors used by Fama and French affect these markets.

It is obvious that the economy moves in different directions and these changes in the business cycle can be affected by different variables such as trade wars, pandemics etc. Understanding the relationship between the excess return of assets and business cycles is crucial for any investor because it is evident that business cycles will continue to change through time. Thus, there is a need to investigate if procyclical assets really do compensate for the additional risk that an investor undertakes. Furthermore, it is inherent to add a risk factor which reflects the business cycles in the economy. In this thesis the IPI factor is used and is added to the already well-known fundamental factors established by Fama and French. This thesis builds on the inference made by scholars like Goetzmann, Watanabe and Watanabe (2012). However, most of the previous research is limited to the American market and thus so far, there has not been any research done to determine whether a procyclicality premium in the Swedish market is present. Therefore, we aim to investigate if the result from other markets like the U.S can hold for a small economy like Sweden. Due to the size of the Swedish market we further expand the scope of the thesis to investigate whether the Swedish IPI factor can explain the variation in excess return of 25 portfolios constructed based on developed countries, including Sweden. This is something that the authors of the thesis suspect, since Sweden is a small and open economy that follows the movement of other larger economies. With this paper the authors strive to expand on the empirical research conducted on other markets which leads us to the question, does a procyclicality premium exist in Sweden and in other developed countries?

1.3 Purpose

Do procyclical stocks in Sweden earn a higher excess return? Can the Swedish cyclicality factor explain the excess return of portfolios based on developed countries?

1.4 Outline of the thesis

The remaining part of the thesis is structured as follows. In chapter 2 the previous literature which is conducted within this research area is discussed. In the third chapter, the most prominent theories related to understanding the effect that different risk factors have on the excess portfolio returns are presented. Chapter 4 presents the data that is obtained as well as declaring the motivation behind the exclusion of data in the paper. In chapter 5, the methodology that is chosen to answer the purpose of this thesis is presented in detail, while in chapter 6 we will explore the result of the thesis which will be reached by implementing the methodology in the previous chapter. Moving on to chapter 7, we will discuss and analyze the results of this paper as well as their implications within the research area. Finally, in chapter 8 we will summarize the paper and some concluding remarks will be made. Furthermore, we will present ideas on future research that would need to be undertaken within the area of procyclicality premiums.

2 Previous research

In this section, previous studies that are undertaken within this research area are investigated and their conclusions are reported and constitute the foundation in the analysis.

The focus of our paper refers to stock performances with respect to their correlation with the business cycle. Following this aspect, our thesis is related to the publications of scholars which investigated the effects of macroeconomic developments on the stock market, and its performance at different cycles of the economy.

The core of the thesis has its origin in the paper by Goetzman, Watanabe and Watanabe (2012). In their research, the authors believe that prominent economists' expectations about the state of the economy have the power to affect the stock market. By this way, economic states affect the stock market through economists or investor expectations. To uncover the relationship between the economic states and the stock market, the authors conduct an analysis of the expectations and test if the return on assets imitate the expectations of the economical state. The authors' expectation is that due to the less protective power of procyclical stocks in times of economic downturns, they need to generate a higher average return to be in equilibrium, which follows the intuition behind the Merton's (1973) ICAPM model. To use the expectations of the investors, the authors use half a century of data obtained from The Livingston Survey to form an expected GDP variable. The authors use the expected GDP as one of the conditioning variables in the cross-sectional regression following the methodology used by Campbell and Diebold (2009). For using expected GDP as a state variable in Merton's (1973) ICAPM model, they use the semiannually lagged expected GDP growth. In order to test the significance of the GDP factor, the authors apply the Fama and MacBeth's (1973) two stage regression as benchmark model. Application is conducted on 25 arranged portfolios according to their book-to-market and size ratios which are dependent variables and the excess market return and lagged GDP growth are the independent factors in the regression. They reached the conclusion that the risk premium of the lagged GDP growth is indeed significant and positive, indicating that procyclical stocks generates a higher average return, which is in line with the paper's hypothesis. By using the Carhart four factor model and increasing the number of portfolios to

30 (10 portfolios arranged according to size, book-to-market, and momentum respectively), the model can explain the variation in excess return of the portfolios to a greater extent. The investigated sample period starts in the second half of 1951 and ends at the end of 2008. However, the sorting of the portfolios starts in June 1963 and ends in December 2008, while the returns begin July 1963 and ends at the same date as the sorting. The sorting of the portfolios is based on the beta values from the first stage regression where the factors are the lagged GDP growth expectations and the excess market return. The obtained beta from the lagged GDP growth is used for sorting assets into portfolios. The authors follow the methodology from Fama and French (1993) to form size and book-to-market sorted portfolios based on predetermined breakpoints of the New York Stock Exchange. Each sorting creates a new sample of portfolios, and the model is applied on each sample of created portfolios. The conclusion is that procyclical stocks indeed generate a higher return compared to countercyclical, and that the spread of procyclicality is higher for larger value firms. Lastly, the authors find that past returns for counter cyclical stocks are lower than for procyclical stocks.

Similarly, Chen, Roll and Ross (1986) base their paper on the same intuition as Goetzman, Watanabe and Watanabe (2012). In their paper, the authors investigate if macroeconomic innovations affect the US stock market. The authors perceive macroeconomic innovations as risks which should be compensated by higher returns. Furthermore, they investigate which macroeconomic variables have a significant effect on stock prices. They focus on certain macroeconomic variables as suggested by financial theory, namely the spread between high- and low-grade bonds, industrial production, the spread between long- and short-term interest rates, as well as expected and unexpected inflation rates. The following variables are included to derive the risk factors used in the paper: the inflation rate, the long term government bonds, the treasury bill rate, low-grade bonds, industrial production, oil prices, consumption, value weighted equities as well as equally weighted equities. They use a sample period which begins in January 1953 and ends in November 1983. After obtaining the necessary factors, the authors apply the methodology introduced by Fama and MacBeth (1973), to find out which macroeconomic variables influence stock prices. The authors conclude that several macroeconomic variables, which are the sources of risk, are significant and thus priced in the market. Furthermore, they noted that the most significant variables which influence stock prices are industrial production, twists in the yield curve, inflation factors, as well as changes in the risk premium. Additionally, they find that the market portfolio and aggregate consumption are not priced separately. However, it is proved that even though the market index significantly explains the volatility in the time series, it is not significant in the pricing of assets.

Hamilton and Lin (1996) on the other hand investigate whether business cycles, proxied by the industrial production index, can explain the variation in excess returns. The authors examine the co-movement of stock returns and the growth of industrial production. They combine the framework implemented by Hamilton and Susmel (1994) which is used for explaining the changes in an ARCH process with the recession model by Hamilton (1989). Additionally, they base their hypothesis on their suspicions that there exists a variable, *i.e.* the economical state variable, which can be used to determine the degree of volatility in U.S stock returns as well as the mean of growth in the industrial production. In their paper, the authors accept that an underlying variable can take on any finite value. The intuition for using this type of variable instead of a dummy variable, like Schwert (1989a), is because the latter would return an incorrect estimation of the volatility forecast; since the starting point and end date of a recession or a boom is not known until after the event has occurred, hence a dummy is not optimal for forecasting purposes. The authors use monthly data of the industrial production index starting in January 1965 and ending in June 1993. To find out the changes in growth, they use the logarithmic change in the monthly index value multiplied by 100. The data for stock returns are obtained from the S&P 500 index and the return calculation includes taking the logarithmic difference between the monthly indexes, adding the dividend yield from the index, in excess of the yield of a 3 month treasury bill multiplied by 100. Next, a maximum likelihood function is used for estimating the parameters of the model. They conclude that recessions can explain more than 60% of the volatility in stock returns, which is in line with Schwert's (1969a – 1989b) findings. Lastly, the authors state that their model is sufficient for determining future stock market volatility, as well as future breakpoints in the economy.

As previously mentioned, Goetzman, Watanabe and Watanabe (2012) believe that expectations of well renowned economists influence the stock market. Chavuet (2001) has an analogous idea following the same perception and explains it such that the movement of the stock market reflects the market members' behavior according to their thoughts about the current economic state. In her research, Chauvet (2001) investigates active association between business cycles and the movement of the stock market on a monthly basis. The author tests if it is possible to use existing financial variables for forecasting changes in the business cycle. Chauvet defines business cycles and market variations as non-linear dynamic factors on monthly intervals following Markov's switching dynamic factors. The business cycle factor sums up harmonious actions of economic elements which reflects the economical state. Factors for the stock market represent the existing financial state and are constructed from financial variables. These factors are calculated as the continuously compounded value weighted CRSP index in excess of the 3-month treasury bill rate, the difference in the 3-month treasury bill rate as well as the difference in the P/E ratio of the S&P 500 and finally the logarithmic changes in the dividend yield of the S&P 500 index. Factors for business cycles consist of trade sales and manufacturing, difference between personal income and transfer payments, industrial production and non-agricultural civilian employment. In her paper the author uses a sample period starting in February 1954 and ending in December 1994. Chauvet uses the likelihood ratio test, which consists in maximizing the conditional logarithmic likelihood function, to determine the best specifications of the different factors in the model. The author concludes that the stock market is appropriate for forecasting business cycles and compares the result with the Composite Leading Indicator (CLI) model. The author's model is less noisy compared to an ordinary CLI, meaning that it is easier to implement for predicting breakpoints. In her implemented model the calculation of the indicator occurs in the end of every month, which makes the model able to include the information for any given month, unlike the CLI model which only contains data from the previous month. Lastly, the author states that the stock market factor may be the most efficient in terms of forecasting business cycles, suggesting that there is a relationship between the two.

Nyberg (2012) focuses on testing if high-risk stocks yields a higher return. In his paper, the tradeoff between risk and return is investigated by applying a GARCH in mean process. The rationality underlying the process is that the coefficient of conditional volatility included in the model can be used for gauging the extent of risk aversion. The main contributions of the research in the financial literature are the inclusion of economical states in the tradeoff theory and accepting the effect economical states have on the tradeoff between risk and return. The result of the thesis is in line with the result of the conditional ICAPM of Merton (1973) which accepts that macroeconomic states affects asset pricing. The author uses a GARCH in mean process with incorporating the state of the business cycle, to test if there is a significant relationship between risk and excess stock returns. The data used includes only U.S. data and the indicator data for the business cycles is obtained from the National Bureau of Economic Research (NBER). The sample period for the monthly excess stock returns starts in January 1960 and ends in March 2009. Excess stock returns are calculated for U.S. stocks by subtracting the 1-month treasury bill rate. The model used by the author to investigate the relationship, while taking the state of the economy into consideration, is a new form of a regime switching GARCH in mean process. That the author defines as a QR-GARCH-M model. In the model, binary business cycle variables are modelled with excess stock returns. Empirical findings of the paper suggest that there is a significant regime-switching attitude of the excess return of U.S. stocks over business cycles.

There is an ambiguity in the previous literature regarding how the relationship between business cycles and the stock market is defined. The paper by Goetzman, Watanabe and Watanabe (2012), as well as the paper by Chauvet (2001) states that the expectations of well renowned market participants will influence the stock market. On the other hand, Adams and Merkel (2019) explain the effect of a boom of stock prices in an industry by using the expectations of market participants in the following process. Technological booms in the industry causes capital gains for the company, the investors are deceived by these increases in capital gains which creates a positive expectation about the stock of the company, which in turns further fuels the stock price. This induces the company to invest more for an increase in capital gains. Thus, there appears to be a positive relationship between an increase in asset prices and a surge in investments, but eventually the rise in the stock price ceases, and starts to decline. The authors give the example of the 1990s U.S. technology stock boom, and the housing boom in the U.S. at the beginning of 2000s to clarify the situation. Adams and Merkel (2019) apply a simple model in their paper to examine the relationship between stock prices and the business cycles in the U.S. They combine the standard model of business cycles with stock market beliefs according to emerging innovations in the industry. The authors demonstrate that declines (which occur after booms) causes economic growth to decrease from its average level, meaning that the beliefs based on an increase in stock prices may cause economic fluctuations in a future period. The sample period of the research consists of data which begins in the first quarter of 1955 and ends at the last quarter of 2014. Adams and Merkel conclude that their combined model can forecast the volatility in stock prices and dynamics of business cycles in line with reality. Their model generates 4 different results compared to a traditional Rational Expectations model. They obtain the following results. First, there are a large amount of inefficiencies in volatilities in the investment variable, the stock price variable and the variable for the number of hours worked. These inefficiencies occur due to beliefs based on busts and booms. Second, positive technology innovations cause booms in stock prices as well as output, and it is more likely for this effect to occur when the risk-free rate is low. Furthermore, they discover that the boom and bust cycles have a propensity to appear in clusters. Lastly, booms can cause economic recessions in a future time period, which occurs due to hoarding of capital during booms.

3 Theory

This chapter introduces the reader to the most prominent theories relevant to the subject of cyclicality, which are necessary for a basic understanding of the topic. Furthermore, the risk factors used as a complement to the IPI factor are presented in detail.

3.1 Procyclical and countercyclical stocks

In a broad context, stocks can be classified into two categories according to their correlation with economic cycles, countercyclical and procyclical stocks. A simple definition of countercyclical stocks are the ones that have returns which are negatively correlated with the business cycle. Due to that characteristic, countercyclical stocks are often used for mitigating the riskiness of the portfolio, in the sense that they work as a hedge in a portfolio. Countercyclical stocks usually excel during economic recessions.

Procyclical stocks can be defined as stocks which are positively correlated with the business cycle hence, these types of firms will outperform the market during economic booms but underperform during busts. This indicates that procyclical firms are more sensitive to changes in the economy in comparison to countercyclical firms. According to financial theory, these types of stocks should have a higher expected return that would compensate for the inherent risk. This means that procyclical stocks have a higher systematic risk as measured by its beta value. However, the cyclical characteristics of the stocks is not entirely captured by the market and that is why the industrial production index is used because it has been proven to mimic the cycles of the economy. This theory is proved by Goetzman, Watanabe and Watanabe (2012) amongst others, who find significant evidence that American procyclical stocks, indeed, have a higher excess return compared to countercyclical.

3.2 CAPM

The Capital Asset Pricing Model (CAPM) was devised by Sharpe (1964), Lintner (1965a, b) and Mossin (1966). According to the model, the riskiness of a portfolio should be reflected in the β variable, where a higher value indicates a higher risk and thus should yield a higher return which corresponds to the level of risk. The market portfolio consists of all assets in the market, with a β value always equal to 1. Furthermore, the model does not price all types of risk; the unsystematic risk can easily be diversified away and is therefore not priced. The systematic risk, which is the type of risk that is priced in the CAPM framework, affects the whole market and cannot be diversified away. The measure of the systematic risk, *i.e.* the β value, is defined as the covariance amongst the return of an asset and the return of the market, divided by the variance of the market return, as shown below

$$\beta_i = \frac{Cov(R_i, R_M)}{Var(R_M)} \tag{1}$$

The CAPM is an equilibrium model, meaning that the demand and supply of stocks are assumed to be equal. In their book, Danthine and Donaldson (2014) states several assumptions which are accepted in the traditional approach of the CAPM framework. They are homogeneous expectations of the investors which means all investors share the same beliefs about existing stocks as well as their future returns and the existence of a risk-free asset which all investors can buy or sell unlimitedly. The equation of the CAPM is also called the Security Market Line, denoted as:

$$E(R_i) = R_f + \beta_i[E(R_M) - R_f] \tag{2}$$

Where,

$E(R_i)$ is the expected return of asset i.

R_f is the risk-free rate.

$E(R_M)$ is the expected return on market portfolio.

And β_i is the systematic risk measure of asset i.

3.3 FAMA French 3 factors

According to Fama and French (1996) the 3-factor model, established in 1993, come to dominate both in the area of empirical research as well as amongst professionals. The model is based on the CAPM framework with the addition of a size (SMB) and value (HML) factor, used to capture the systematic risk of a portfolio. A reason as to why Fama and French (1993) choose a value and size factor is because of empirical research showing that firms with high book-to-market ratios (*i.e*. value firms) and stocks stem from small firms historically yield a higher return compared to what the Security Market Line (SML) from CAPM could predict. They argue that this is because small firms are more likely to be affected by a change in the business climate and that firms have a higher risk of being in financial distress if they have a high book-market ratio. In their paper, Fama and French (1993) describe how SMB and HML are defined and how to construct these risk factors. The SMB factor is an abbreviation of "Small minus Big" and the factor is constructed by subtracting the return of a portfolio of firms with a high market capitalization ("Big") from the return of a portfolio which constitutes of firms with a low market capitalization ("Small"). The HML factor on the other hand stands for "High minus Low" which is constructed in a similar manner, that is the return of a portfolio containing firms with a Low book-to market ratio (Growth stocks) is subtracted from the return of a portfolio composed of firms with a High book-to-market ratio (Value stocks). The intercept of the Fama-French 3-factor model should be equal to zero if the estimated risk factors fully explain the portfolio returns.

$$R_{p,t} - R_{f,t} = \alpha_i + b_i * \left(R_{M,t} - R_f\right) + s_i * SMB_t + h_i * HML_t + \varepsilon_{i,t} \quad (3)$$

Where,

$R_{p,t}$ is the return of portfolio p, sorted on size and book-to-market, for each time period, t.

$R_M - R_f$ is defined as the return of the included countries value weighted market portfolio in excess of an American T-bill with a duration of 1 month, for each time period, t.

SMB_t is the return of the size factor for each time period, t.

HML_t is the return of the value factor for each time period, t.

b_i, s_i and h_i are the factor loadings from the respective risk factor.

3.4 FAMA French 5 factors

In 2014, Fama and French add 2 new variables of profitability (RMW), and investment (CMA) to their 3-factor model and the Fama and French 5-factor model is created. The RMW factor is the spread of the returns of the most profitable companies and the least profitable companies, while the CMA factor is the spread of the returns of companies which are investing conservatively and companies which are investing aggressively.

The dividend discount model (DDM) is used as a basis when the authors expand on their previous model by adding profitability and investment factors. According to the DDM, a firm's value is determined by its future dividends, which can be related to the profitability of a firm and its current investment ventures. A drawback of the 3-factor model is that it ignores the variation in the average return of assets related to these firm characteristics.

In a more recent paper, Fama and French (2016) consider underlying anomalies which are not targeted specifically in the 5-factor model. These create problems when the 3-factor model is applied: the authors classify net share issues, accruals, momentum, and volatility as distinguished anomalies. Conclusions of their research show that the 5-factor model improves the explanation of the deviations in average returns of their sorted portfolios. At the anomaly side, Fama and French (2016) state that the 5-factor model enhances the explaining power of the average returns for all anomalies except for accruals.

The model is a time-series regression with portfolios sorted according to market capitalization (size), consolidation of profitability, investment, and the book-to-market ratio as dependent variables, with the 5 factors as explanatory variables. The time series regression of the 5-factor model is the following.

$$R_{p,t} - R_{f,t} = \alpha_i + b_i * \left(R_{M,t} - R_f\right) + s_i * SMB_t + h_i * HML_t + r_i * RMW_t + c_i * CMA_t + \varepsilon_{i,t} \quad (4)$$

Where,
$R_{p,t}$ is the return of portfolio p, sorted on size and book-to-market, for each time period, t.
$R_M - R_f$ is defined as the return of the included countries value weighted market portfolio in excess of an American T-bill with a duration of 1 month, for each time period, t.
SMB_t is the return of the size factor for each time period, t.
HML_t is the return of the value factor for each time period, t.
RMW_t is the return of the profitability factor for each time period, t.
CMA_t is the return of the investment factor for each time period, t.
b_i, s_i, h_i, r_i and c_i are the factor loadings of each respective risk factor.

4 Data

This chapter presents the data used in order to answer the purpose of the thesis, the justification behind the selected data and the motivation for excluding some potential candidates which can be used in the paper.

4.1 Swedish stock data

Following the recommendation by Koller, Goedhart and Wessels (2015) we used monthly data throughout the thesis, instead of daily or weekly. This is because, according to them, it could present problems if some of the included stocks are illiquid. If we had used shorter dated returns there is a risk for a potential downward bias within the sample, thus by choosing monthly returns it is possible to mitigate this effect. Another valid reason for using the IPI and not another macroeconomic variable like the GDP is because it is available on a monthly basis hence, no transformation of the data is necessary which limits the potential loss of data that is associated with interpolation. The monthly stock prices of all 368 stocks listed on the Nasdaq OMX Nordic Exchange Stockholm, was obtained from Bloomberg for the studied period of 10 years, ranging from the 1st of January 2010 until the 1st of January 2020. The motivation for including all stocks that constitutes the OMXSPI index is because we want to make sure that the chosen stocks reflects the entire Swedish market, and to mitigate the risk of selection bias. The amount of stocks is restricted to only include assets traded on the Nasdaq OMX Nordic Exchange Stockholm, hence the decision was made to exclude stocks traded on smaller exchanges like Firth North Stockholm and the Spotlight Stock Market (formerly known as Aktietorget). This decision was based on the non-trading, illiquidity, and extreme volatility some of these stocks exhibits. After sorting the sample for stocks being traded throughout the investigated 10-year period the sample decreased to 229 stocks. There exists a trade-off between setting the length of the time frame and the amount of stocks. Thus, the reason for not choosing a longer period in the study is because of the relatively small size of the Swedish stock market, which means that if we go back further in time the amount of stocks available would decrease. Furthermore, we decide not to choose a shorter period because that would imply fewer available monthly observations, which would increase the risk for insignificance in the sample.

4.2 Risk Free rate in Sweden

As a proxy for the risk-free rate in Sweden the authors decide to use the Stockholm Interbank Offered Rate (STIBOR) with a duration of 3 months, a time frame commonly used in an academic context. The rate is expressed on a monthly basis and is calculated based on the average of the interest rate the Stiborbanks[1] are willing to lend to each other, after excluding the highest and the lowest rates (Sveriges Riksbank, n.d). The T-bill from the European Union can be used as a proxy but because of the inability to increase the amount of cash in the economy by European governments we deem this not being a fully risk-free alternative.

4.3 Proxy for the Swedish market

The OMXSPI is used as a proxy for the Swedish market portfolio, and it is obtained from Bloomberg under the ticker name SAX, expressed on a monthly basis. The index is capital weighted and is comprised of all stocks currently trading on the Stockholm stock exchange, which at the time of writing is 368 stocks.

4.4 Industrial Production Index (IPI)

The data for the Industrial Production Index (IPI) is obtained from Bloomberg. IPI measures the change in volume of the output in the following industries: public sector, manufacturing, mining, and quarrying. As stated earlier, this thesis aims to investigate whether procyclical stocks earn a higher return or not. According to the World Bank (2020), the IPI is universally used to study and evaluate the movement of the economy, *i.e.* business cycles. The reason for why we chose this variable instead of the expected GDP used by Goetzman, Watanabe and Watanabe (2012), is because the IPI is measured on a monthly basis, making it easier to identify turning points in the economy. Due to the scale of the Swedish stock market, the sample of stocks would have been too small to form our test portfolios if we had used expected GDP as a measure of business cycles since it either has a semi-annual and annual frequency.

[1] *Nordea, SBAB Bank, Länsförsäkringar Bank, SEB, Swedbank, Danske Bank, Handelsbanken*

4.5 Fama French developed countries portfolio and corresponding factors.

The data for the portfolios sorted on size and book-to-market are collected from the Kenneth French website. The 25 sorted portfolios are derived from different developed countries[2], which includes Sweden. Furthermore, the 3 and 5 Fama and French risk factors are obtained from the same website. Due to the limitation of the size of the Swedish stock market to create a reasonable number of portfolios in the cross section, the decision is made to expand the paper and obtain the data for an additional 25 portfolios. This is done to get more nuanced results and to further investigate whether the IPI factor based on Swedish stocks can help explain the variation in excess returns of portfolios based on different developed countries.

4.6 Reflections of the sources used to obtain data

The main source for collection of the necessary data is Bloomberg which is well renowned and commonly used for obtaining large amounts of equity data both for academic and professional purposes. We decide to use Thomson Reuters when collecting the 3-month STIBOR interest rate, due to the limitations that the Bloomberg license Lund School of Economics and Management has, which implies that the data for the necessary 10 year period was not available through Bloomberg. However, this does not affect the credibility of the obtained data since Thomson Reuters is ranked as the second-best provider of financial data (Fortune 2016).

4.7 Limitations of the data

There exists an underlying possibility of survivorship bias within the sample, which is because some stocks might have defaulted during the investigated period and thus fall out of the sample. Furthermore, IPOs that occur during the study period is also examples of stocks that fall out of sample since they lack publicly available stock prices for the whole time period. This implies that there might be some skewness within the final sample. However, due to the time constraint of the thesis and the difficulty of accessing the data of formerly privately held companies, we deem this exclusion as reasonable.

[2] *See Appendix 10.4 for a list of developed countries according to Kenneth French*

5 Methodology

In this part the chosen methodology used for creating the business cycle factor as well as the Fama and Macbeth 2 stage methodology implemented to answer our purpose are well depicted. Lastly some concluding remarks regarding the limitations of the thesis are presented to the reader.

5.1 Data processing

All the methods which are used in this study requires the obtained data to be processed to be able to calculate the necessary variables such as the excess returns of the assets, the market, IPI, etc. Following this logic, the first step of the methodology is applying certain formulas to the raw data and obtaining the processed data which will be used in the asset pricing model.

Monthly asset returns are then calculated by applying the logarithmic return formula to the observations of asset prices from the 1st of January 2010 (t=1) until 1st of January 2020 (t=120).

$$R_{i,t} = lnP_{i,t} - lnP_{i,t-1} \quad (5)$$

Where,

$R_{i,t}$ is the logarithmic return of the asset i at month t.

$lnP_{i,t}$ and $lnP_{i,t-1}$ are the logarithmic prices of asset i at time t and t-1.

The monthly excess returns are then calculated using STIBOR with a duration of 3 months, as a proxy of the risk-free rate for the Swedish portfolio. The excess returns are calculated as follows

$$Z_{i,t} = R_{i,t} - RF_t \quad (6)$$

Where,

$Z_{i,t}$ is the monthly excess return on asset i at time t

R_{it} is the logarithmic return of asset i at time

RF_t is the risk-free rate at time

For the estimation of the Fama Macbeth 2-stage regression on the Swedish market the OMXSPI is deemed to work as a proxy for the market factor. The monthly prices of the index are transformed following formula 5 and the excess market return is then obtained by applying formula 6. Ultimately R_{mt}^{S} is defined as the monthly excess market return at time t.

The IPI return is calculated following the same methodology as above and will be used as the independent variable when we estimate the beta coefficients of the Industrial Production Index to reveal the co-movement of excess asset return with the business cycles. The estimation process for creating the IPI factor based on the Swedish stock market is described in detail in the following section.

5.2 Creating the factor for business cycles

The IPI is not a traded factor and to circumvent this issue, we follow the method established by Fama and French (1993) in order to create a traded IPI factor, which is considered a measurement of the economy's business cycles. Following the procedure in most of the previous literature (see for example Asgharian and Hansson (2000)) we estimate the beta coefficients by using a yearly rolling window OLS regression to account for time varying betas. The method which is applied to the estimation of yearly betas through the time period resulted in 10 yearly betas for each portfolio in the sample. At the start of each of the 10 years in the estimation window all the obtained Swedish stocks are regressed on the IPI, according to formula 7 below:

$$Z_{it} = \beta_{i,IPI} * R_{IPI,t} + \varepsilon_{i,t} \tag{7}$$

The beta coefficients are calculated using a 1-year rolling window and is assumed to be constant throughout the year. The assets are sorted into equally weighted portfolios each month, based on their factor loading (sensitivity) relative to the Industrial Production Index. The rolling beta calculations are done in Excel, using the slope function, while the sorting procedure is undertaken in Matlab. Due to the scale of the Swedish stock market, the decision is made to sort the stocks into roughly five equally weighted portfolios. This is done to keep a reasonable amount of stocks in each portfolio. The amount of stocks in portfolio one to four contained 46 while the last portfolio has 45 assets. Each portfolio is kept until the following month, and the result is a quintile of equally weighted portfolios containing 119 monthly observations each. Portfolio one is defined as the portfolio with the lowest beta coefficient and the fifth as the portfolio with the highest beta coefficient within the sample. The excess returns of the five portfolios constitute the average excess return of the stocks sorted in each portfolio, according to formula 8 listed below.

$$Z_{i,t}^{p} = \frac{1}{N} * \sum Z_{i,t} \qquad (8)$$

The IPI factor is created like how Fama and French (1993) create their SMB and HML factors. We obtain the return spread which is defined as the difference in excess return between the portfolio with the highest factor loading (portfolio 5) and the portfolio with the lowest factor loading (portfolio 1), as illustrated in the formula below:

$$IPI_t = Z_{i,t}^{5} - Z_{i,t}^{1} \qquad (9)$$

To make sure that the created IPI factor is priced in the market, a two-sided t-test is used to determine whether the IPI factor is significantly different from zero. The test is conducted on the average of the estimated factor and is defined as follows:

$$\overline{IPI} = \frac{1}{T} * \sum IPI_{i,t} \qquad (10)$$

Furthermore, we follow Campbell, Lo and MacKinlay (1997) and assume that the underlying distribution of the factor has T-1 degrees of freedom, (i.e. 118). If the return spread between the portfolio with the largest factor loading and the portfolio with smallest factor loading is statistically significant, there is an indication that the factor is priced and that a premium exists. The test statistics of a Student's t-test is depicted below:

$$t(\overline{IPI}) = \frac{\overline{IPI}}{\sigma_k / \sqrt{T}} \qquad (11)$$

Where σ_k is defined as:

$$\sigma_k = \sqrt{\frac{1}{(T-1)} * \sum_{t=1}^{T}(IPI_t - \overline{IPI}_t)} \quad (12)$$

A drawback of the method used in the thesis and in the paper by Fama and French (1993) for creating a factor is explained in the working paper Portfolio Sorts and Tests of Cross-Sectional Patterns in Expected Returns by Patton and Timmermann (2008). They claim that estimating a factor using this method is not adequate because it disregards the relationship between the IPI factor and excess returns of the remaining three portfolios. Said differently, there is the possibility that the portfolios in the middle might earn a higher return than the portfolios with the lowest factor loading. If this is the case, then we cannot make the inference that a lower beta coefficient implies a higher return. However, it is still possible that the factor is significant and thus priced in the market.

5.3 Fama-Macbeth 2-stage regression

The CAPM model implemented by Sharpe (1964) and Lintner (1965) is an equilibrium model. This means that the model does not hold for every asset at every time period t. According to Pasquariello (1999) the methodology implemented by Fama and Macbeth (1973) is proved to be a standardized method of testing and evaluating different multifactor models as well as the one factor model CAPM across time periods. Their model is proved to work especially well for multifactor models, the estimation of the factor loadings and their corresponding risk premia. Our paper aims to investigate the extent of how certain risk factors can help explain the variation in the excess return of different sorted portfolios. Due to its popularity amongst scholars and the limitations that the Sharpe-Lintner CAPM model possesses, the decision is made to implement their methodology on the Swedish market.

The idea of using portfolios instead of individual assets is proposed by Fama and Macbeth (1973). By mitigating the errors-in-variables problem that occurs in the cross-sectional regression, the method improves on the calculated beta coefficients. Furthermore, this implies that if the issue is not addressed, it could seriously impact the legitimacy of the conclusions based on the estimates from the model. This correction is further validated by Fama and French (1992) as well as Ang, Liu and Schwartz (2018). However, grouping the individual assets into portfolios is not a flawless method. As briefly touched upon in section 5.2., Mouselli, Michou and Stark (2008) state that to mitigate the information loss that occurs when the stocks are organized into portfolios, one should conduct the sorting based on the stock's sensitivity to the risk factor, (in this case the IPI). After following these recommendations, the methodology of the Fama and Macbeth regressions are implemented as described in detail below.

The method implemented by Fama and Macbeth (1973) is a two-stage regression used to determine the premium associated with certain risk factors. The first stage is a time series regression used to estimate the factor loadings of the independent variables (i.e. the risk factors). This is done by running a simple OLS regression on the excess return of the test portfolios defined as $Z_{p,t}$ on J factors, defined as $F_{1,t}$, $F_{2,t}$, …, $F_{J,t}$. A general version of the implemented time series regression is estimated for each portfolio p=1, 2, …, N, and is depicted below:

$$Z_{p,t} = \alpha_p + \beta_{p,F_1} * F_{1,t} + \beta_{pF_2} * F_{2,t} + \ldots + \beta_{p,F_J} * F_{J,t} + \varepsilon_{p,t} \qquad (13)$$

In the regression above, α_p is the intercept term for each portfolio, $\varepsilon_{p,t}$ is defined as the error term and is assumed to be IID following the empirical research by Fama and Macbeth (1973). The $\beta_{p,t}$ are the factor loadings of the independent variables in the time series regression. The subscripts J and t refer to the number of factors and to the amount of observations in the time series, respectively.

The factor loadings, i.e. the beta estimates of the first stage regression, are obtained and are denoted as $\hat{\beta}_{p,t}$ which is done to avoid confusion that the estimated values might not be equal to the true beta coefficients. The reason for why they might differ is because the true factor loadings cannot be directly observed. Thus, the independent variables in the second stage regression might be influenced by errors in the estimation of factor loadings. The remedy for these issues is addressed earlier in this section. In the second stage regression the estimated factor loadings are used as explanatory variables in a cross-sectional regression with the test portfolios as the dependent variable for every time period in the sample. The cross-sectional regression, shown beneath, give us the risk premium associated with each factor.

$$Z_{p,t} = \gamma_{0,t} + \hat{\beta}_{p,F_1} * \gamma_{1,t} + \hat{\beta}_{p,F_2} * \gamma_{2,t} + \ldots + \hat{\beta}_{p,F_J} * \gamma_{J,t} + \varepsilon_{p,t} \qquad (14)$$

Where $\gamma_{0,t}$ is the intercept term for the second stage regression and $\gamma_{1,t}$, $\gamma_{2,t}$,…, $\gamma_{J,t}$ are the risk premiums associated with each factor. Following the notation from the first stage regression, the estimated risk premiums are denoted as $\hat{\gamma}_{J,t}$. Firstly, the average of each risk premium is calculated using the following formula:

$$\hat{\gamma}_J = \frac{1}{T} * \sum_{t=1}^{T} \hat{\gamma}_{J,t} \qquad (15)$$

Following the procedure by Fama and Macbeth (1973), a two-sided t-test is conducted for each risk premium, which investigates whether the risk premiums are statistically significant or not. Following on the work by Campbell, Lo and MacKinlay (1997) we further assume that the test statistic follows a Student-t distribution with T-1 degrees of freedom. The test statistic according to Fama and Macbeth (1973) is defined as follows:

$$t(\bar{\hat{\gamma}}_J) = \frac{\bar{\hat{\gamma}}_t}{\sigma_{k,\gamma} / \sqrt{T}} \qquad (16)$$

And $\sigma_{k,\gamma}$ is defined as:

$$\sigma_{k,\gamma} = \sqrt{\frac{1}{(T-1)} * \sum_{t=1}^{T} (\hat{\gamma}_{J,t} - \overline{\hat{\gamma}_{J,t}})} \qquad (17)$$

The Fama Macbeth methodology is first applied to the Swedish sorted portfolios regressed on a Swedish market factor and the created IPI factor, the proxy for business cycles. Secondly, the FM regression is applied on 25 sorted portfolios based on developed countries, including Sweden as the dependent variables and the Fama and French 3 factors as well as the Swedish IPI factor as independent variables. Additionally, a FM regression is conducted on the same independent variables as the second regression but regressed on the Fama and French 5 factors in addition to the Swedish IPI factor. The reason for conducting a final regression including the 5 Fama and French risk factors is to investigate a potential omitted variable bias problem that might occur in the 3-factor regression. Lastly, we investigated the presence of multicollinearity by forming a correlation matrix for each respective model. As indicated by tables 6,7, and 8 in the Appendix, there is no severe multicollinearity problem in neither of our models. Therefore, following these results, we can form non-biased estimations from the regressions.

5.3.1 Fama-Macbeth with Swedish portfolios and 2 factors

The application of the Fama and MacBeth method is done by using the excess portfolio returns as dependent variable in regression (18). The dependent variable in this section, is created by sorting only Swedish stocks into quintile portfolios according to their sensitivity to the IPI. In this stage excess market returns and IPI returns are used as independent variables in the first stage regression. Application of the first stage regression is defined as:

$$Z_{p,t}^{S} = \alpha_p + \beta_{p,MKT} * MKT_t + \beta_{p,IPI} * IPI_t + \varepsilon_{p,t} \qquad t= 1, \ldots, T \qquad (18)$$

Where

The superscript S is used as an indicator for the Swedish portfolio.

$Z_{p,t}^{S}$ is the excess return of a Swedish portfolio p, at time t.

α_p is the intercept of the time series regression for portfolio p.

MKT_t is the excess market return at time t.

IPI_t is the IPI factor at time t.

After the application of the first stage regression, the estimated beta coefficients i.e. the factors loadings are obtained. Then, the second stage cross sectional regression is applied on the beta values, obtained from the first stage regression in order to get the estimated risk premiums of the two factors:

$$Z_{p,t}^{S} = \gamma_{0,t} + \gamma_{1,t} * \hat{\beta}_{p,MKT} + \gamma_{2,t} * \hat{\beta}_{p,IPI} + \varepsilon_{p,t} \qquad p = 1, \ldots, N \qquad (19)$$

Where,

$\hat{\beta}_{p,MKT}$ and $\hat{\beta}_{p,IPI}$ are the factor loadings

$\gamma_{1,t}$ and $\gamma_{2,t}$ are the risk premiums of the two factors.

To further confirm the estimated risk premiums obtained from the second stage regression we calculate the p-values as well as the t-statistics for the risk premiums of the factors. As a final step we validate if the risk premiums are significant or not, according to their p-values and their t-statistic as a second check.

5.3.2 Fama-Macbeth with 4 factors and 25 portfolios for developed countries

Fama MacBeth regressions are also applied to 25 portfolios based on developed countries, obtained from Kenneth French website. The reason for using portfolios from the Kenneth French website is due to the minor size of the Swedish economy, which limits this study to only forming five portfolios.

Following the procedure from the previous subsection, the first stage time series regression is applied on the excess returns of 25 sorted portfolios based on a number of developed countries, with the market factor, size factor, value factor and the Swedish IPI factor as independent variables. The formula for the time series regression is:

$$Z_{p,t}^{D} = \alpha_p + \beta_{p,MKT} * MKT_t + \beta_{p,SMB} * SMB_t + \beta_{p,HML} * HML_t + \beta_{p,IPI} * IPI_t + \varepsilon_{p,t}$$

t = 1,…, T (20)

Where,

The superscript D is used to denote the application of a portfolio of developed countries

$Z_{p,t}^{D}$ is the excess return of portfolio p, at time t.

α_p is the intercept of the time series regression for portfolio p.

MKT_t is the excess market return at time t.

SMB_t is the SMB factor at time t

HML_t is the HML factor at time t

IPI_t is the IPI factor at time t.

The factors are obtained from the Kenneth French website, except for the created IPI factor. After obtaining the estimated beta values from the first stage regression, the estimations are used in the cross sectional second stage regression to estimate risk premium of the specific factors. The formula for the second stage cross sectional regression is defined as:

$$Z_{p,t}^{D} = \gamma_{0,t} + \gamma_{1,t} * \hat{\beta}_{p,MKT} + \gamma_{2,t} * \hat{\beta}_{p,SMB} + \gamma_{3,t} * \hat{\beta}_{p,HML} + \gamma_{4,t} * \hat{\beta}_{p,IPI} + \varepsilon_{p,t} \quad p = 1,\dots, N$$

(21)

Where,

$\hat{\beta}_{p,MKT}$, $\hat{\beta}_{p,SMB}$, $\hat{\beta}_{p,HML}$ and $\hat{\beta}_{p,IPI}$ are the estimated factor loadings.

$\gamma_{1,t}$, $\gamma_{2,t}$, $\gamma_{3,t}$ and $\gamma_{4,t}$ are the factor risk premiums.

After running the regression and collecting the risk premiums of the estimated factors as well as their corresponding p-values and t-statistics, a two sided significance test is applied to each risk premium to determine if they are significantly different from the zero.

5.3.3 Fama-Macbeth with 6 factors and 25 portfolios for developed countries

In order to increase the scope of the study and to prevent an omitted variables bias problem, it is decided to run the test again with the Fama-French 5 factor model and IPI factor on the same 25 portfolios. The 5 factors, of excess market return, SMB, HML, profitability factor (RMW), and investment factor (CMA) are obtained from the Kenneth French's website and based on their categorization of developed countries. Following the procedure of the previous regressions the first stage regression is defined as:

$$Z^{D}_{p,t} = \alpha_p + \beta_{p,MKT} * MKT_t + \beta_{p,SMB} * SMB_t + \beta_{p,HML} * HML_t + \beta_{p,RMW} * RMW_t + \beta_{p,CMA} * CMA_t + \beta_{p,IPI} * IPI_t + \varepsilon_{p,t} \quad t = 1,\dots, T \qquad (22)$$

Where,

$Z^{D}_{p,t}$ is the excess return of portfolio p, at time t.

α_p is the intercept of the time series regression for portfolio p.

MKT_t is the excess market return at time t.

SMB_t is the SMB factor at time t.

HML_t is the HML factor at time t.

RMW_t is the RMW factor at time t.

CMA_t is the CMA factor at time t.

IPI_t is the IPI factor at time t.

Similarly, a second cross sectional regression is conducted by using the factor loadings as independent variables and portfolio returns as the dependent variables. The second stage regression is given below:

$$Z_{p,t}^{D} = \gamma_{0,t} + \gamma_{1,t} * \hat{\beta}_{p,MKT} + \gamma_{2,t} * \hat{\beta}_{p,SMB} + \gamma_{3,t} * \hat{\beta}_{p,HML} + \gamma_{4,t} * \hat{\beta}_{p,RMW} + \gamma_{5,t} * \hat{\beta}_{p,CMA} + \gamma_{6,t} * \hat{\beta}_{p,IPI} + \varepsilon_{p,t} \qquad p = 1,\ldots, N \tag{23}$$

Where,

$\hat{\beta}_{p,MKT}, \ldots, \hat{\beta}_{p,IPI}$ are the estimated factor loadings of excess market return, SMB, HML, RMW, CMA and IPI, respectively.

$\gamma_{1,t}$ to $\gamma_{6,t}$ are the risk premiums associated with the factors above

Following the procedure of the previous regressions we also validate the risk factors level of significance in order to determine their impact of the excess portfolio returns.

5.4 Thesis limitations

The time frame of the study is 10 years, starting on the 1st of January 2010 and finishing on the 1st of January 2020. The intuition for using a time frame of 10 years is that at the time of the selection process a trade-off occurs between using a large time period and using a large sample size; as previously stated, if a greater time period were to be chosen, too many stocks would fall out of the sample. Initially, the scope of the thesis is to include all 368 stocks currently being traded on the Large, Mid and Small cap of Nasdaq Stockholm, but after considering the trade off and excluding the non-traded assets in the study's time frame expressed on a monthly basis, the final number of assets is decreased to 229 stocks. We have not been able to find any articles that investigates if there is a procyclical premium in the Swedish market. This can partly be explained by the fact that a lot of previous research is conducted on larger economies like the U.S. Thus, our thesis aims to close in on the research gap for small and open economies, like Sweden.

6 Results

This chapter presents the results obtained from the creation of the business cycle factor as well as the second stage regression of the Fama and Macbeth methodology together with some remarks to what the results are indicating.

6.1 Portfolio sorting and creation of the IPI factor

Rank	1	2	3	4	5	IPI factor (5-1)
$\overline{\hat{\beta}_{IPI}}$	-1.080	-0.327	0.059	0.467	1.421	
$\overline{Z_{p,IPI}}$ (%)	0.409	0.808	0.588	0.584	0.195	-0.214
$\sigma_{p,IPI}$	0.0478	0.0383	0.0396	0.0413	0.0580	0.0614
t-stat	10,14	24,99	17,60	16,75	3.98	-4.133
P-value	0.0000	0.0000	0.0000	0.0000	0.00012	0.0000673
N	46	46	46	46	45	

Table 1: 5 Output of the Swedish portfolios sorted on IPI

$\overline{\hat{\beta}_{IPI}}$ represents the beta values of the portfolios according to IPI factor, $Z_{p,IPI}$ represents the average excess return of the portfolios as well as the IPI factor, $\sigma_{p,IPI}$ represents the standard deviations of the portfolios. Furthermore, the t-stat represents the t statistics of the created portfolios, the P-value represents the p-value of the portfolios, N represents the number of stocks each portfolio consists of.

In table 1 the results obtained from the portfolio sorting of the Swedish stocks are presented. The portfolio indicated with 1 is the portfolio with the lowest IPI-beta stocks while the 5th portfolio contains the highest IPI-beta stocks. For all sorted Swedish portfolios, the following statistics are obtained: the average beta value, the average monthly excess return, the t-statistics, a two-sided p-value and the number of stocks which constitutes each portfolio. The two-tailed critical t-value (which is valid throughout the analysis) is 1.9803, based on 118 degrees of freedom. The $\overline{\beta_{IPI}}$ distribution is quite evenly balanced with an $\overline{\beta_{IPI}}$ of -1.080 in the lowest quintile portfolio and 1.421 in the highest quintile. As shown in table 1, the average excess returns of each portfolio are more spread out and do not seem to follow any specific pattern, as the second portfolio earns the highest return and the last quintile portfolio yields the lowest excess return. However, as table 1 portrays, the constructed IPI factor is negative (-0.214%) and statically significant at the 1% level (***) for the investigated sample. This indicates that our factor is priced in the market. However, since the factor is portraying a negative sign there is an indication that holding procyclical stocks would yield a lower average excess return of 0.214% per month in the chosen sample.

6.2 Fama Macbeth

6.2.1 Swedish portfolios and the two-factor model

	C	MKT	IPI
$\bar{\hat{\gamma}}_J$	0.0518	-0.0537	-0.0027
$t(\bar{\hat{\gamma}}_J)$	3.2619	-2.7942	-0.4853
P-value	0.0014	0.0061	0.6284
$\overline{R^2}$		0.7180	
$\overline{R^2_{ADJ}}$		0.4361	

Table 2: 5 Results of the cross-sectional regression of the Swedish portfolios

C represents the constant term in the regression, $\bar{\hat{\gamma}}_J$ represents the coefficients of the factors, $t(\bar{\hat{\gamma}}_J)$ represents the test statistics for each specific factor coefficient, P-value shows the p-values for the specific factor coefficients, R^2 and R^2_{ADJ} represent the value of R square and adjusted R square respectively.

The results in table 2 portrays the average risk premium of the factors, obtained from the second stage regression of the Fama and MacBeth methodology which is implemented on the excess return of the 5 Swedish portfolios. In the table, the average risk premium of the factors ,*i.e.* the market and business cycle factor (IPI), are reported alongside their corresponding t-statistics and p-values. The reported R^2 and R^2_{Adj} are the average values corresponding to the second stage cross-sectional regression in the Fama and Macbeth methodology. According to table 2, the market risk premium is negative and statistically significant at the 1% level (***), implying that the market factor can significantly explain the cross-sectional variation of the portfolio's excess return. Furthermore, the IPI risk premium in the Swedish market is proved to be negative and not statistically significant with a p-value of 0.6284, implying that the IPI factor cannot significantly explain the cross-sectional variation in the portfolio excess returns of the selected sample. As portrayed in the table, the current model can explain roughly 44% of the variation in the Swedish portfolios.

6.2.2 4-factor model with 25 Portfolios of developed countries

	C	MKT	SMB	HML	IPI
$\overline{\hat{\gamma}_J}$	1.1938	-0.2875	-0.1028	-0.2047	0.0436
$t(\overline{\hat{\gamma}_J})$	2.8620	-0.5306	-0.8530	-1.2672	2.0097
P-value	0.0050	0.5967	0.3954	0.2076	0.0467
$\overline{R^2}$			0.6118		
$\overline{R^2_{ADJ}}$			0.5342		

Table 3: Output of the second stage regression of 25 portfolios and 4 risk factors

C represents the constant term in the regression, $\overline{\hat{\gamma}_J}$ represents the coefficients of the factors, $t(\overline{\hat{\gamma}_J})$ represents the test statistics for specific factor coefficient, P-value shows the p-values for specific factor coefficients, R^2 and R^2_{ADJ} represent the value of R square and adjusted R square respectively.

The results of the Fama and Macbeth cross-sectional regression of the 25 portfolios based on developed countries are presented in table 3, along with the $\overline{R^2}$ and $\overline{R^2_{AdJ}}$. According to the obtained results of the second stage regression, the Fama and French 3 factors, *i.e.* the market factor, size factor and the value factor, are all negative and not statistically significant, suggesting that these cannot significantly explain the variation in the excess return of the sample's portfolios. The IPI factor, on the other hand, is positive (0.0436) and statistically significant at the 5% level (**), suggesting that by investing in procyclical stocks, one would obtain a higher monthly excess return in these developed countries. The mean of the reported R^2 and R^2_{Adj} are increased compared to the cross-sectional regression based on Swedish portfolios. This indicates that this model can better capture the variation in the excess return of the portfolios based on developed countries in this sample.

6.2.3 6-factor model with 25 Portfolios of developed countries

	C	MKT	SMB	HML	RMW	CMA	IPI
$\overline{\overline{\gamma}_J}$	0.8765	0.0111	-0.0605	-0.2192	0.3156	-0.5187	0.0344
$t(\overline{\gamma}_J)$	1.6916	0.0177	-0.5077	-1.3596	2.0665	-2.5948	1.9925
P-value	0.0934	0.9859	0.6126	0.1765	0.0410	0.0107	0.0486
$\overline{R^2}$				0.6998			
$\overline{R^2_{ADJ}}$				0.5998			

Table 4: Results from the cross-sectional regression of 25 portfolios and 6 risk factors

C represents the constant term in the regression, $\overline{\gamma}_J$ represents the coefficients of the factors, $t(\overline{\gamma}_J)$ represents the test statistics for specific factor coefficient, P-value shows the p-values for specific factor coefficients, R^2 and R^2_{ADJ} represent the value of R square and adjusted R square respectively.

The results in table 4 depict the average risk premiums of the specific factors obtained from the application of the second stage regression of the Fama and MacBeth methodology based on the excess return of 25 portfolio of developed countries. Furthermore, in table 4 the t-statistics and the p-values corresponding to the specific risk premiums are displayed together with the measurement of the goodness of fit, *i.e.* R^2 and R^2_{Adj}. Following the results displayed in the table, the average risk premium of the market factor is positive and insignificant according to the 5% significance level (**). The average risk premiums for the size (SMB) and value (HML) factors are both negative and insignificant (with p-values of 0.6126 and 0.1765 respectively). However, the average risk premiums of the profitability (RMW) and the business cycle (IPI) factors are both positive and statistically significant at the 5% level (**). The fact that the IPI factor is positive and statistically significant is an indication that there exists a procyclicality premium in the developed countries included in this paper. Lastly, the average risk premium of the investment (CMA) factor is negative and statistically significant at the 5% level (**). Since the RMW, CMA and the IPI factors are statistically significant, the results imply that they have significant explanatory power of the variation of the cross-sectional portfolio excess returns. On the other hand, the MKT, SMB and the HML factors are statistically insignificant which imply that they cannot explain the variation in the excess portfolio returns. Both the R^2 and R^2_{Adj} are increased compared to the 3-factor model including the IPI factor. It is to be expected that R^2 will increase by adding more variables, but since the R^2_{Adj} also increases, there is an indication that this model better captures the variation in the 25 portfolios based on developed countries.

6.2.4 Summary of the results

Model	C	MKT	IPI	SMB	HML	RMW	CMA
5.3.1	+***	-***	-				
5.3.2	+***	-	+**	-	-		
5.3.3	+*	+	+**	-	-	+**	-**

Table 5: Summary of the results obtained from the cross-sectional regression of the 3 models.

”+” / “-” represents the sign of the coefficient for specific factor, whereas “,**,***” represents the significance level of 10,5 and 1% respectively.*

In table 5 we present a brief overview of the output from the second stage regressions of the 3 different models implemented in the thesis. In the table, the signs of the factor risk premiums are presented as well as their significance levels. The indication of significance follows the definition in most of the existing literature where ***, ** and * indicates significance at the 1%, 5% and 10% levels, respectively. The overall results portray evidence that there exists a procyclicality premium in the stock market of developed countries. However, there is no indication of a procyclicality premium present in the Swedish stock market.

7 Analysis and Discussion

This part begins with an analysis of the created business cycle factor and continue with the analysis of the 3 portfolios with their respective risk factor. Furthermore, the obtained results are compared with what previously has been found and the differences and similarities are further analyzed and discussed.

7.1 Analysis of the creation of the business cycle factor

The result of our paper indicates that the constructed business cycle factor based on the Swedish Industrial Production Index (IPI) is proved to be statistically significant at the 1% level, which implies that our factor is, indeed, priced in the market and thus, reliable inferences can be made. However, the concern stated by Patton and Timmermann (2008) regarding the method of creating a factor in the way that Fama and French (1993) did as well as how we created the IPI factor, is proved to be justified in our sample. Patton and Timmermann's concern are depict in table 1 where the second portfolio earns the highest average monthly excess return while the 5th portfolio yields the lowest average excess return. As portrayed by our sample, the created factor oversees the fact that the middle portfolios exhibit a higher average excess return. These characteristics of the quintile portfolios in our sample suggests that we cannot make the inference that investing in a procyclical stock automatically implies a higher excess return.

The results in table 1 depict that the monthly average excess return spread between the highest and lowest beta portfolios is -0.214, suggesting that procyclical stocks would, on average, yield a lower excess return. However, these results are contradictory to what Goetzman, Watanabe and Watanabe (2012) find in their paper. Their findings state that the procyclicality factor is measured as the spread between the monthly excess return of the highest LEGDP beta sorted portfolio and the lowest being 0.43 which they have proven to be statistically significant. This further indicates that there is a premium associated with investing in procyclical stocks on the American stock market. On the other hand, it is worth noting that Goetzman et al (2012) base their paper on a different market during a different time period while also using another proxy for business cycles which can to some extent, explain the difference in signs. Furthermore, we believe that the small size of the Swedish stock market can be appointed as another reason in terms of the construction of the portfolios which essentially means that the amount of stocks is too few. This can potentially help explain why studies regarding the relationship between Industrial Production Index as a proxy for the business cycle and excess portfolio return are almost exclusively conducted on large economies which have access to a significant number of stocks (see for example Chen, Roll and Ross (1986), Hamilton and Lin (1996)).

7.2 Fama and Macbeth regressions

7.2.1 Analysis based on 5 Swedish portfolios

The estimated market factor risk premium is negative however, it is statistically significant at the 1% level. This result suggests that the market beta has an explanatory power of the excess portfolio returns however, the negative sign implies that holding the market portfolio would yield the investors a negative return. The significance of the market risk premium is not in line with the research of Fama and French (1992 and 1993). In their paper, they obtain the result of an insignificant market risk premium and their results provide proof that the CAPM framework breakdowns if the assets are not sorted according to the market factor. However, the result of a negative and significant market risk premium is observed by Nyberg and Vilhelmsson (2010). In their paper, they explain this phenomenon as a natural result derived from the specification of the portfolio sorting. They claim that if the portfolios are sorted based on the beta values of assets, the result of a negative risk premium of the market factor is not uncommon to obtain. In this aspect, the behavior of the market factor is in line with the findings by Nyberg and Vilhelmsson (2010).

The risk premium of the IPI factor has a negative sign and it is statistically insignificant with a p-value of 0.6284. This result implies that the IPI factor does not have explanatory power of the excess Swedish portfolio returns. The obtained result contradicts our expectations. Those being that the business cycle factor should be positive and statistically significant due to the result of most preliminary studies which obtain a significant cyclicality premium. The inference that can be made from this result is that there does not exist a procyclicality premium on the Swedish stock market. This suggest that the business cycles do not have any effect on the pricing of the stocks in our sample. Our results contradict the paper by Chen, Roll and Ross (1986) as well as the paper by Hamilton and Lin (1996). Each of these papers observe a statistically significant business cycle factor proxied by the industrial production index in the

US. Furthermore, in the study of Chen, Roll and Ross (1986), they claim that the industrial production factor is one of the most significant factors which affects the pricing of stocks in the U.S market. However, the inconsistency in our result could be due to the differences in the researched market and the time frame between our thesis and the papers published by previous scholars. The main focus of our paper is the Swedish stock market whereas both the paper by Chen, Roll and Ross (1986) as well as the paper by Hamilton and Lin (1996) analyzes the U.S. stock market. The reason for why small economies have not previously been thoroughly investigated by scholars might be due to their marginal impact on the world economy, which is illustrated in an article by Jonsson (2020) where he states that the Swedish stock market only constitutes for roughly 1% of the global stock market in comparison to the U.S. stock market, which constitutes 54.5% of the global stock market (Credit Suisse, 2020). Sweden's marginal impact of the world economy can, henceforth, help explain the difference between the result of our paper and that of others. The differing results might also be due to different time periods as well as the use of different sample sizes. One discrepancy is that our study focuses on the last decade which consists of 10 years of data while Chen, Roll and Ross (1986) focused on the period beginning 1953 and ending 30 years later. By having access to a larger time frame, it is possible to observe more fluctuations within the economy while also making it possible due to the scale of the U.S. stock market.

The explanatory power of the market factor and the IPI factor is approximately 44% in the Swedish 2-factor model. The result of the R^2_{Adj} is relatively low compared to the other applications of the methodology in our paper suggesting that this model cannot capture as much of the variation in the cross-sectional regression compared to the other two models. The poor fit of the model could be because the market and business cycle factor capture similar proportions of the variations in the portfolios excess return. The measure of goodness of fit is in line with what Goetzman, Watanabe and Watanabe (2012) find when they run a similar 2-factor model, including the market factor as well as a business cycle factor which result in a R^2_{Adj} of 43%. Even though our factors and portfolios differ, a similar value on the R^2_{Adj} is obtained which suggests that approximately, the same amount of variations in the data sets is captured by each individual model. However Goetzman, Watanabe and Watanabe (2012) find their business cycle factor to be statistically significant while ours is not thus, we cannot make the same inferences with regards to the effect our business cycle factor has on the excess returns of the Swedish portfolios.

7.2.2 Analysis of the 4-factor model with 25 portfolios based on developed countries

When the Fama and MacBeth methodology is applied to 25 portfolios based on developed countries with the 3 Fama French factors as well as a business cycle factor, our results indicate that the market risk premium, is once again, negative. However, compared to the Swedish 2-factor model, it is statistically insignificant, with a p-value of 0.5967. The result of insignificance and the negative sign suggest that the CAPM framework breaks down and that the market factor has no explanatory power over the 25 portfolios extracted from developed countries. This result is in line with the preliminary research of Chauvet (2001) who also finds a negative relationship between the market risk factor and the returns during recessions by using an economical factor as a dummy variable. Furthermore Chen, Roll and Ross (1986) reach the same conclusion in their paper while using a different sample period as well as various risk factors. These two papers reach the same conclusions even though they used different variables, which further provides proof of the limitations with the CAPM framework.

The risk premium of the size and value factors are proved to be negative and insignificant in our sample. In the application of a similar 3 factor regression Goetzman, Watanabe and Watanabe (2012) find the size factor to be insignificant and positive while their value factor is positive but significant, implying that value stocks in their sample yield a higher average return which is previously proved by Fama and French (1993). However, due to the lack of significance in our sample, no such inferences can be made regarding the size nor the value factor.

The risk premium of the IPI factor based on Swedish stocks is positive and statistically significant at the 5% level. The inference that can be made from this result is that the business cycles in Sweden is correlated with business cycles in other developed countries. This implies that the Swedish cyclicality factor can, indeed explain the excess return of portfolios based on developed countries as well as provide an indication that procyclical stocks earn a higher excess return compared to countercyclical stocks in our sample of developed countries.

The result of our paper confirms the existence of a business cycle effect on asset pricing in developed countries, which is in line with the paper by Adam and Merkel (2019) who finds that positive business cycle movements cause an increase in the production and thus in the stock prices. The paper by Hamilton and Lin (1996) also concludes that there is a positive relationship between the industrial production and business cycles and additionally proved that the industrial production factor is significant. Moreover, the created IPI factor in our thesis shares the aspect regarding the sign and level of significance. Following the results of these papers, there is an indication that the IPI factor should be a valid proxy for business cycles.

According to the R^2_{Adj} of our 3-factor model in addition to the business cycle factor, it is proven that it can be used to explain approximately 53% out of the variations in the excess return of the investigated portfolios based on developed countries. Goetzman, Watanabe and Watanabe (2012) run a similar regression on the Fama and French 3 factors while including their business cycle factor resulting in an R^2_{Adj} of 46%. However, as opposed to the Swedish model, our business cycle factor is significant in the 3-factor model which, in contrast to what Goetzman, Watanabe and Watanabe (2012) obtained, using an similar model with the exception of applying another business cycle proxy as well as differences in terms of investigated countries. According to the difference in R^2_{Adj} there is an indication that our model is better at explaining the variations in the excess return of the portfolios.

7.2.3 Analysis of the 6-factor model with 25 portfolios based on developed countries

In the last part of the analysis, the authors of this paper apply the same methodology as before with 25 portfolios based on developed countries as the dependent variable and the 5 Fama French risk factors in addition to the IPI factor as independent variables. The obtained results prove the market factor to be positive and insignificant, which is similar to the result obtained in the 3-factor model, which once again, implies a breakdown of the CAPM framework. A similar result is also obtained by Goetzman, Watanabe and Watanabe (2012). In their paper, they also implement the Fama and MacBeth methodology on 30 sorted portfolios with a momentum factor and a lagged return factor in addition to the other 3 Fama and French factors. Following the same methodology as before, the authors obtain a positive and insignificant market risk premium, just like the results obtained in our 5-factor model. Similar conclusions were made by Chen, Roll and Ross (1986) regarding the market factor in most of the investigated periods in their paper.

The results of the risk premiums of the size and value factors are in accordance with what was found in the 3-factor model above namely, that these factors are both insignificant and negative. This result is partially in line with what Goetzman, Watanabe and Watanabe (2012) find in their application of the Fama Macbeth methodology which was implemented on 30 portfolios and resulted in positive and insignificant SMB and HML risk premiums. The difference in signs could be narrowed down to the usage of different data as well as the length of the studied period. Even though, from what we have found, the signs of the size and value risk factors differ in their paper, the statistical insignificance in both models implies that neither we nor they can make any reliable inferences based on these factors.

The risk premium of the IPI factor is still positive and significant at the 5% level even after including both the investment and the profitability factor. The significant result implies that the Swedish cyclicality factor can explain the variations in the excess return of 25 portfolios based on developed countries. Following the inference made in the previous section, the conclusion of the Swedish business cycle being in correlation with the cycles of other developed countries is still valid and thus, our assumptions made earlier in the thesis are proven to hold for both for the 3-factor model as well as the 5-factor model.

Furthermore, since the sign is positive, there is an indication that procyclical stocks earn a higher excess return in comparison to countercyclical stocks. This result is in line with the result of Nyberg (2012), who applies a different methodology created by himself and his results indicates that the business cycle indicator is statistically significant for explaining the excess return of U.S stocks. However, our results and the results obtained by Nyberg (2012) contradict the results obtained by Goetzman, Watanabe and Watanabe (2012) in their 5-factor model with 30 portfolios, which reaches the conclusion of an insignificant procyclicality premium. The reason for the discrepancy could be due to the usage of another proxy for business cycles, which implies that inference from our thesis can remain valid. Nyberg (2012) explains the relationship between business cycles and excess returns such that during recessions, stock returns tend to be negative, which is in line with what Hamilton and Lin (1996) find. Different scholars, using different methods as well as time periods all reach the same conclusion. Namely, that there is an indication that a procyclicality factor does exist in large economies.

Both the profitability (RMW) factor and the investment (CMA) factor are found to be statistically significant and thus, reliable inferences can be made regarding the effect these factors have on the excess return of the portfolios in our sample. The positive and significant profitability factor implies that firms with a prosperous profitability earn a higher return compared to firms with a souring profitability, which is what one could suspected. On the other hand, the negative and significant investment factor provides an indication that firms with a more conservative investment policy yield a lower excess return compared to firms that undertake investments to a greater extent i.e. a more aggressive approach which ties in with the results by Adams and Merkel (2009).

In the thesis, it is previously stated that we have considered the possibility that an omitted variable bias problem is present in the 3-factor model which is why the thesis has been extended to also include a 5-factor model. This proves to be a valid concern because the mean of the R^2_{Adj} of the cross-sectional regression was increased to 59.98% for the 5-factor model compared to the 3 factor-model which could explain 53.42% of the variation in the excess return of the 25 portfolios. This indicates that the inclusion of the profitability and investment factor into the model is justified since there is an increase in the $\overline{R^2_{AdJ}}$. Furthermore, we can conclude that our 5-factor model to be the "best" model based on the amount of variation the model can explain. Similar results are derived by Goetzman, Watanabe and Watanabe (2012), who prove that their model with a business cycle factor and 5 other factors can explain most of the variation within their portfolios, approximately 59%. This is an indication that our model can account for slightly more of the variation in comparison to the model used by Goetzman, Watanabe and Watanabe (2012), even though they use different risk factors and different assets within another time period in their paper.

To conclude the analysis the following inferences can be made in our thesis: No procyclicality premium can be found in the Swedish stock market given the sample at hand. However, it has been proved that the Swedish cyclicality factor can, in fact, significantly explain the cross-sectional variation in the excess return of 25 portfolio based on developed countries. These results prove our intuition that the business cycle in a small open economy like Sweden follows the movement of the business cycles of other developed countries, indicated by the Swedish IPI factor being significant in both the 3-factor model as well as the 5-factor model in which the latter can explain the most of the variation in the second stage cross-sectional regression.

8 Conclusion and further research

In the last section a summary of the obtained results of the thesis alongside with some concluding remarks regarding the results are made. Lastly, the authors present some potential ideas on future research topics.

8.1 Conclusion

This paper's focus is to investigate whether procyclical stocks earn a higher excess return compared to countercyclical stocks in Sweden. To further expand this paper's scope, it is investigated whether the Swedish cyclicality factor can explain the variations in excess stock return of portfolios based on developed countries. In this thesis, the IPI factor is used as a proxy for the business cycles in the economy and its cross-sectional variations are interpreted as the cyclicality premium in the Swedish stock market as well as the stock market of some developed countries. The reason for using the IPI and not another macroeconomic variable like GDP is partly because it is available on a monthly basis and thus no transformation of the data is necessary. This limits the potential loss of data that is associated with interpolation, as well since it is a variable that previously been used by scholars like Chen, Roll and Ross (1986) as well as Hamilton and Lin (1996). The Swedish portfolios constitute 229 stocks, all listed on the Nasdaq OMX Nordic Exchange Stockholm. The stock price data are obtained on a monthly basis and cover the entire period between 1st of January 2010 and 1st of January 2020. In order to investigate the cyclicality premium, we construct a business cycle factor which is based on portfolios sorted on β_{IPI}, which results in a quintile of portfolios. Following the methodology by Fama and French (1993) the IPI factor is defined as the spread between the high IPI beta portfolio and the low IPI beta portfolio.

An application of the Fama and Macbeth (1973) two stage regression on the excess return of the 5 Swedish portfolios indicates that there is no statistically significant cyclicality factor present in the studied data set. Considering that Sweden is a small economy relative to the global market, the insignificance might be due to the size of the stock market, due to the size of the Swedish stock market the scope of the thesis is expanded to include more countries.

Thus, to get access to more data and more nuanced results, the Fama and MacBeth (1973) methodology is applied on the excess returns of 25 portfolios based on developed countries and they are obtained from Kenneth French's website. The result of the second stage regression with the Swedish IPI factor and the 3 Fama and French factors, indicates that there is a cyclicality premium in the stock markets of the investigated countries, implying that procyclical stocks earn higher excess returns compared to countercyclical ones. Furthermore, this suggests that the Swedish cyclicality factor can explain the excess return of portfolios based on other developed countries. To mitigate the risks of omitted variable bias problem in the 3-factor model application of the Fama and Macbeth (1973) methodology, the Fama and French 5-factor model is also used. The result of the cross-sectional second stage regression portrays a positive and significant cyclicality premium. Since the Swedish cyclicality factor is statistically significant in both of the applications of the Fama and Macbeth methodology (the Fama and French 3 factors as well as the 5 factors) there is an indication that the business cycles in Sweden are correlated with those of other developed countries. Furthermore the 5-factor model increased the $\overline{R_{AdJ}^2}$, implying that these two additional factors capture some of the cross-sectional variations in the excess portfolio returns which the 3-factor model cannot capture, hence justifying their presence in the model.

The result of the developed countries follows what has previously been proved by scholars, namely that there exists a procyclicality premium in large economies. However, the results for the Swedish stock market contradict what others find, which might be because of a potential size effect associated with the Swedish market. It is argued in this work that a potential reason as to why small economies like Sweden have not been studied in the academia has to do with small market size, complicating the possibility of making interesting inferences. A possible remedy for overcoming this size effect can be to increase the sample size as well as the sample period. In our paper, both remedies are considered, with a tradeoff materializing in the selection of the two. Thus, using a greater number of countries instead of just Sweden might solve both aspects of the size effect, as indicated by our results in the developed countries.

8.2 Further research

Which type of stocks that one should invest in has been discussed extensively through times and especially when the economic business cycles are shifting. This topic is likely to continue being relevant because the economy will keep being subject to changes in the cycles. Therefore, we believe that further research within this area needs to be undertaken. At the moment, the majority of the research focuses on large economies, leaving a gap for studies looking into procyclicality premiums in small and open economies, like the Nordic countries. To further get access to more stocks one could consider expanding sample size to include the Baltic countries. By doing so, the researcher could obtain enough stocks to get the opportunity to expand on the time frame to capture more fluctuations in the economy in terms of booms and recessions. Moreover, by having a greater time frame, one could investigate whether procyclical stocks yields a higher return in times of crisis, which is another interesting, more aggressive form of economic downturns which we believe to be worth considering, especially in small and open economies.

Furthermore, we believe that it might be interesting to see if the results are valid when using another asset pricing model such as the Arbitrage Pricing Method, because there is no consensus amongst previous scholars with regards to which model to use. We believe that by using another pricing model one could compare the different models with each other and maybe determine which one works best for this type of research questions.

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10 Appendix

10.1 Correlation matrix for the independent variables in the Swedish 2-factor model

	MKT-RF	IPI
MKT-RF	1	
IPI	0,060881	1

Table 6: Correlation matrix for Swedish portfolios with excess market return factor and the IPI factor

10.2 Correlation matrix of the independent variables in the 4-factor model

	MKT-RF	SMB	HML	IPI
MKT-RF	1			
SMB	0,006584	1		
HML	0,120784	0,065599	1	
IPI	0,093624	0,265477	0,13261	1

Table 7: Correlation matrix for 25 developed countries portfolios with 3 FF factors and the IPI factor

10.3 Correlation matrix of the independent variables in the 6-factor model

	MKT-RF	SMB	HML	RMW	CMA	IPI
Mkt-RF	1					
SMB	0,006584	1				
HML	0,120784	0,065599	1			
RMW	-0,39378	-0,32934	-0,52825	1		
CMA	-0,11149	-0,03791	,0635841	-0,20708	1	
IPI	0,093624	0,265477	0,103261	-0,18694	0,022484	1

Table 8: Correlation matrix for 25 developed countries portfolios with 5 FF factors and IPI factor

10.4 The 23 developed countries included in the paper

Australia	France	Italy	Singapore
Austria	Germany	Japan	Spain
Belgium	Great Britain	Netherlands	Sweden
Canada	Greece	New Zeeland	Switzerland
Denmark	Hong Kong	Norway	United States
Finland	Ireland	Portugal	

Table 9: The 23 developed countries which are included in the construction of the 25 portfolios