universität wien

MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

„Macroeconomic Activity and Stock Returns: Empirical Evidence from the Eurozone"

verfasst von / submitted by

Snezhana Penkova, BSc.

angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

Master of Science (MSc.)

Wien, 2017 / Vienna 2017

Studienkennzahl lt. Studienblatt / degree programme code as it appears on the student record sheet:	A 066 914
Studienrichtung lt. Studienblatt / degree programme as it appears on the student record sheet:	Masterstudium Internationale Betriebswirtschaft / Master's degree programme International Business Administration
Betreut von / Supervisor:	a. o. Univ.-Prof. Mag. Dr. Christian Keber

Statutory Declaration

I confirm that this paper is my own work except the citations and the referred literature. I confirm that I diligently quoted all authors whose articles and books I used for the purpose of this thesis. I am aware of the fact that I could be charged with an offence in case of plagiarism.

Vienna, 07.06.2017 Snezhana Penkova, BSc.

Acknowledgements

I would first like to express my sincere gratitude to a.o. Univ.-Prof. Mag. Dr. Christian Keber for supervising my Master's thesis, for providing me with scientific guidance, supporting me during the whole process and helping me achieve more on this topic. I am grateful that Prof. Keber gave me the opportunity to conduct this research and to extend my knowledge in this field. I deeply appreciate his guidance and time.

I would also like to thank Maria Chiara Iannino, PhD, who was actively involved in the validation of the empirical research for this thesis. Without her valuable suggestions, this study would have probably taken much longer.

Furthermore, I would like to acknowledge my sister, Liliya Penkova, MSc., who was by my side throughout the writing process and shared her valuable experience and knowledge. I would also like to thank her for the moral and emotional support!

With a special mention to my family who supported me spiritually during my entire studies and motivated me.

Last but not least, I extend my warmest thanks to my friends, whose time, interest and understanding I highly appreciate. Thank you very much!

Abstract

The key purpose of this study is to shed light on the linkage between the financial markets in the Euro area and the real economy. The influence of macroeconomic variables from Euro zone on the Euro Stoxx 50 Index will be evaluated for the period from 1999 to 2016. Given fluctuations during dot-com bubble in the late 1990s and the financial crisis of 2007-2008, these periods were also investigated separately. Out of a set of 36 economic indicators, the most relevant will be selected among them using two approaches: Forward selection method and Backward selection method considering also Akaike's information criterion and Bayesian information criterion. After conducting multiple linear regression analysis on these key factors, a significant relation with following factors was found: current account balance, disposable income of household, long-term savings and unemployment. The results are partly in consensus with previous studies, focused on different geographic area.

Zusammenfassung

Das Ziel dieser Studie ist, den Zusammenhang der Finanzmärkte im Euroraum und der Realwirtschaft gegenüberzustellen. Die Auswirkungen der makroökonomischen Variablen der Eurozone auf den Euro Stoxx 50 Index werden für die Periode zwischen 1999 und 2016 bewertet. Unter Berücksichtigung der Fluktuationen während der Dotcom-Blase in den späten 90er Jahren und der Finanzkrise von 2007-2008, werden diese zwei Perioden auch separat untersucht. Von 36 ökonomischen Indikatoren werden die relevantesten anhand zweier Ansätze herausgefiltert: Forward-Selektion und Backward-Selektion, wobei das Akaike's Informationskriterium (AIC) und das Bayes'sche Informationskriterium (BIC) mitberücksichtigt werden. Nach Durchführung einer multiplen linearen Regression anhand dieser Schlüsselfaktoren lässt sich ein signifikanter Zusammenhang zwischen den Aktienrenditen und folgenden Indikatoren feststellen: Leistungsbilanz, verfügbares Haushaltsgesamteinkommen, langfristige Einsparungen und Arbeitslosigkeit. Diese Ergebnisse sind teilweise mit früheren Studien, die auf verschiedenen geographischen Regionen konzentriert sind, übereinstimmend.

Table of Contents

1. Introduction

Observing and predicting stock movements are some of the most important issues which affect the economic health of a country or a whole region. Therefore, these have become one of the most discussed topics among researchers in the last three decades. Investors, directors, risk managers as well as policy makers are interested in understanding the factors that cause these movements for various reasons – to increase profits, to stabilize the market through different monetary policies, to mitigate risk, etc. As the valuation of a company directly influences the stock price, it is important to consider how this valuation could alter and under which circumstances. According to one of the most common valuation approaches – the Discounted Cash Flow method (DCF)[1], stock price depends on the future expected cash flows of the company, where the relation is directly proportional, and the future discount rate, where the relation is inversely proportional. Consequently, a possible decrease in cash flows results in lower stock price, in which case two kinds of reasons should be taken into account – internal and external ones. The first determinants are firm-specific ones such as changes in product variety, brand destruction, change in corporate governance, etc. The second group includes external factors such as stronger competition or macroeconomic factors (interest rate, inflation, money supply, exchange rate and others).

A lot of the previous literature has focused on the latter group of determinants – the macroeconomic ones, whereas during the last three decades various geographic regions and separate determinants have been investigated (Chen et al., 1986, Graham & Harvey, 2001, Bilson et al., 2001, Ibrahim, 2003, Coleman & Tettey, 2008, Ali, 2011). The factors, whose impact on stock price movements have been mostly tested and have displayed significant influence are: interest rate, money supply, inflation or Consumer Price Index as a proxy for inflation, exchange rate, oil prices, unemployment rate, real return on government bonds, industrial production, industrial and/or consumer confidence, trade balance, GDP or GDP growth, budget deficit etc.

1 Irving Fisher (1930) in "The Theory of Interest" and John Burr Williams (1938) in "The Theory of Investment Value" were the first to use the DCF method in modern economic terms.

However, previous research is mostly directed either to developing countries such as BRICs, CEE, Ghana, Pakistan, Kenya, Iran and others, or only to a limited number of developed ones (such as the US, the UK, France, Germany, Italy). Very few studies concentrate on the Eurozone. Another big issue is that most of these papers investigate only one or two variables at once, which is why there is a large gap in the literature regarding the impact of most of the above mentioned factors on stock indices particularly in the Euro area. This master's thesis aims at providing further information and filling part of this gap by considering the influence of macroeconomic determinants on the Euro Stoxx 50 Index.

The thesis is organized as follows: Section 2 presents a theoretical background and literature review of previous studies, which investigate the relation between macroeconomic variables and stock markets. Section 3 introduces the econometric methodology, as well as the hypotheses, which will be tested, and describes the variable selection process. The empirical results and details about the tests are reported in Section 4. Finally, discussion and suggestions for further research are provided in Section 5.

2. Literature Review

The investigation of factors, which affect the stock valuation and respectively account for movements in asset prices, as well as the prediction of future changes in these prices has received considerable attention in the literature. Numerous studies have been constantly conducted not only by financial experts and researchers, but also by government agencies and investors. Depending on the period and the territorial scope, different investigations give mixed results about the impact of each indicator on stock fluctuations. The reason could be that the macroeconomic variables are often endogenous or cyclical (Sims, 1980) and could hardly be predicted themselves. However, the authors are unanimous about the theoretical framework, which should be taken as a starting point. Asset pricing methods such as Capital Asset Pricing Model (CAPM), Arbitrage Pricing Theory (APT), Discounted Casf Flow (DCF), ect. are proven in the literature to be of great importance for purchase or sale decisions on the stock market (Grünewald, 1960, Stehle, 2004, Voigt et al., 2005, Kuhner & Maltry, 2006). Next subsection focuses namely on the standard valuation models.

2.1. Theoretical Framework

Before presenting the methods for stock pricing, another theory should be considered as relevant – the Efficient Market Hypothesis (EMH), developed by Fama (1970). It states that "security prices at any time "fully reflect" all available information" (Fama, 1970) and only unexpected shocks would have impact on stock prices. Consequently, some articles examine only such unanticipated movements such as the one written by Pearce and Roley (1985). Fama introduced some important terms in his paper. According to it, three forms of efficiency exist – the weak one suggests that stock prices depend only on their historical ones, semi-strong indicates that they incorporate also public news and the strong form – that also insider information is included. However, empirical studies regarding market efficiency are inconclusive, testing whether at least weak form of efficiency exists in each market. Early studies by Samuelson (1965) and Working (1960) confirmed the random walk theory, but other such as these by Claessens (1995), Poshakwale (1996) and Khababa (1998) found evidence in various markets, that stock prices do not always follow this model. Despite this, for the purpose of this study the semi-strong

hypothesis is followed. It states that the movements in macroeconomic variables should be already reflected in the price of the security and this allows empirical research about the relation between these indicators.

One of most typical asset pricing models – the Discounted Cash Flow one (DCF) - suggests that stock prices strongly depend on the discounted value of expected cash flows of the company (Boulding, 1936, Parker, 1968, Nasseh & Strauss, 2000). Boulding (1936) highlighted that the value of the company is equal to its expected net revenues, discounted with an internal rate of return. The asset price in turn is supposed to reflect the true value of the enterprise.

$$V_0 = \frac{x_1}{(1+i)} + \frac{x_2}{(1+i)^2} + \frac{x_3}{(1+i)^3} + \cdots + \frac{x_n}{(1+i)^n}$$

where V_0 = value of the company

$x_1, x_2, \ x_n$ = expected net revenues

i = internal rate of return

n = number of periods

As macroeconomic factors impact the cash flows of a firm, they could cause shocks in the prices on the stock market as well.

As already discussed, CAPM is one of the oldest and most common methods, used in valuation, as all estimation procedures of the market risk premium as well as of the return for assets are based on this principle. It is also directly connected to DCF, because CAPM delivers the discount factor used. The basic model was proposed by Sharpe (1964), Lintner (1965) und Mossin (1966), which was further developed by Brennan (1970), who included also taxes. However, for the purpose of this thesis, no in-depth recognition of the after-tax CAPM version is needed. The focus will be on the basis model, which argues that a linear relation exists between individual asset returns ($E(\tilde{R}_i)$) and systematic risk (expressed by β_i):

$$E(\tilde{R}_i) = r + \beta_i \,.\, [E(\tilde{R}_m) - r]$$

where $E(.)$ = expected value of a random variable (at the beginning of the considered period)

$\tilde{R}_i$ = return on an individual stock i during the considered period, a random variable

r = risk-free rate of return

$\tilde{R}_m$ = return on the capital market

β_i = Beta value of security i, the non-diversifiable (systematic) risk

The reason why only systematic risk is included in the model is that this one could not be reduced or eliminated by diversification, as it is caused by external factors such as macroeconomic variables, and therefore the investors care more about it (Hillier et al., 2010). Various studies showed both advantages and disadvantages of this model, where the restrictive assumptions of CAPM are under the most discussed restrictions. Some authors argue that they are inconsistent with the reality (Nölte, 2008). However, this thesis will not focus on these assumptions, which are explained in detail in the papers of Sharpe (1964), Lintner (1965) und Mossin (1966).

Another model, which expresses financial returns as a linear function of macroeconomic fundamentals, is the Arbitrage Pricing Theory (APT). Originally developed by Ross (1976) and later tested by numerous researchers, it indicates that "stock returns are exposed to systematic economic news…they are priced in accordance with their exposures" (Yilmiz, 2014). Therefore, changes in macroeconomic factors reflect changes in the environment and respectivelly in the underlying systematic risk. They are captured by betas, which represent covariances and measure the direction and the magnitude of the asset movement, and risk premiums, which are different according to the individual asset/portfolio :

$$E(\tilde{R}_i) = r + \beta_1 . RP_1 + \beta_2 . RP_2 + \cdots + \beta_n . RP_n$$

where $E(.)$ = expected value of a random variable (at the beginning of the considered period)

$\tilde{R}_i$ = return on an individual stock (or a portfolio) i during the considered period, a random variable

r = risk-free rate of return

RP_n = the risk premium associated with the particular indicator

β_n = the sensitivity of the asset's return to the particular macroeconomic variable n

This model is an extension of CAPM and consists of multiple factors. Respectively, some of the assumptions behind are the same (such as homogenous expectations of the market participants, frictionless capital markets, perfect competition). An important fact is that none of the factors

in basic APT model is known. Further evidence could be found in the paper of Chen, Roll and Ross (1986), which pointed out that variables such as interest rate and industrial production have significant linkage with US stocks (Peiró, 1996).

2.2. Previous Empirical Research

Since the 1970s the impact of the macroeconomic fundamentals on stock price has been intensively researched and the focus was on different geographic regions, financial markets as well as different set of variables. The US market is among the most popular ones considered in these studies. One of the first articles on the topic is written by Fama and Schwert (1977), who showed significant negative relation between asset returns and inflation. Some years later, Fama (1981) assumed that there is a more deep connection between the stock fluctuations and real economic activity and confirmed it in 1990 when he found a strong causality with the industrial production. In 1987, Kaul claimed that the effect of inflation is related to the monetary sector and money supply and demand. Lee (1992) reported that inflation plays no significant role in explaining stock movements, but interest rate does, and the correlation is negative. Further facts regarding this interaction came from Balduzzi (1995), who linked the strong impact of inflation on financial markets with the interest rate. He pointed out that namely the interest rate accounts for a considerable part of the negative connection between inflation and asset returns.

Hamilton (1983) and Burbidge & Harrison (1984) were among the first authors, who investigated the importance of oil as a macroeconomic factor. Chen et al. (1986) used a broader spectrum of variables such as unanticipated inflation, change in expected inflation, industrial production, change in default risk premium, long-term government bonds, oil price, real return of US Treasury Bills, return on the stock market index NYSE and growth rate in real per capita consumption, whose long-term relation with the return of single assets was examined for the period between 1958 and 1984. In this article the authors followed the APT model and also assumed the validity of Efficient Market Theory (EMH), which is used in this Master's thesis as well, as already mentioned. Chen et al. (1986) used 12 cross-sectional regressions to test their hypotheses and found out that "innovations in macroeconomic variables are risks that are rewarded in the stock market" (Chen et al., 1986, p.383). The most significant impact was of the industrial production and the NYSE Index. Wei et al. (1991) expanded the research of this

market, conducting a regression analysis for the period 1961-1985. However, because of multicollinearity in their data, the results were insignificant.

Recently some studies of the US market have been conducted as well. Bekaerta & Engstromb (2010) claimed that high expected inflation is often observed in periods of uncertain real economic growth and respectively higher risk aversion, and thus tends to increase equity yields. The article by Mensi et al. (2013) conducted a VAR-GARCH analysis and provided evidence about a "significant transmission among the S&P 500 and commodity markets". Jareño & Negrut (2016) demonstrated a strong effect of GDP, industrial production, long-term interest rate, unemployment rate and consumer price index for the period 2008-2014.

Considering the non-US markets, great attention is paid to emerging countries. Interest rate, inflation, exchange rates, gold and oil prices as well as money supply are among the indicators, causing movements in both price and volatility on the market in Ghana (Adjasi, 1999, Adam & Tweneboah, 2008). Interest rate, inflation and exchange rates are significant also for Kenya and have a negative relation with the price fluctuations on the Nairobi Securities Exchange (Kitati et al., 2015). After a co-integration analysis, money supply, GDP, exchange rate and inflation were proven to be strong indicators in Pakistan (Khan, 2014) and Taiwan (Singh et al., 2010) as well. The study of Nasiri et al. (2013) pointed out that the impact of some macroeconomic variables in Iran could be observed only after a time interval of some months, which is a strong indicator for slower reaction and, therefore, a partial economic inefficiency in the emerging markets. The articles of Bhattacharya & Mookherjee (2001) and Doong et al. (2005) examined the importance of exchange rate and other factors respectively in India and in six Asian countries through a Granger causality test.

Besides emerging markets, Japan was also observed. Kaneko & Lee (1995) as well as Humpe & Macmillan (2007) made a comparison between US and Japan and found significant positive effect of industrial production on both markets, which proved the importance of industrial development in them.

In comparison to the entire research on this topic, only a small part is focused on Europe. Asprem (1989) and Wasserfallen (1989) were among the pioneers who considered the effect of macroeconomic factors on a group of European countries. The article of Wasserfallen (1989) examined the UK, Switzerland and West Germany, while this of Asprem (1989) delivered

information about ten countries among which also the above-mentioned three. The main findings were a negative influence of inflation, unemployment, interest rate and imports and a positive one of future real activity and the US yield curve, although all the results were very weak. Furthermore, authors such as Gjerde & Sættem (1999), Bjørnland (2009) and Löflund (1992) contributed to the investigation of Scandinavian equity market. The first two focused on Norwegian economy and using the multivariate vector autoregressive (VAR) approach, they found significant interaction between asset returns and real interest rate changes, oil price changes and changes in real economic activity. Löflund (1992) studied the impact of inflation, long-term government bonds, industrial production and return on the stock market index SEK on individual asset returns in Sweden between 1977 and 1988. Unfortunately, his results seemed to be very unstable after the robustness check and their significance was questionable. Similar difficulties appeared by Martinez & Rubio (1989), who suggested no significant connection between macroeconomic variables and stock performance in Spain and by Poon & Taylor (1991), who tested the factors suggested by Chen et al. (1986) with UK data.

Central and Eastern Europe (CEE) has also got attention in the recent years, when Syllignakis & Kouretas (2009) and Mohanty et al. (2010) analyzed the influence of oil price on the financial markets in the region as well as the connection of various macroeconomic fundamentals with the correlations between the stock exchanges in CEE with these in Russia, Germany and the US.

Although, some research exists about the European financial markets and the effect of various macroeconomic variables on them, there is significant gap in the literature. In general, when observing the European countries, mostly Germany, the UK and France have been investigated till now (Peiró, 1996, Adelberger & Lockert, 1999, Morelli, 2002, Bessler & Opfler, 2005, Henry, 2009, Schmeling & Schrimpf, 2011 etc.). Some articles considering larger group of markets have been still written by Park & Ratti (2008), Arouri & Nguyen (2009), Alam & Uddin (2009), Arouri et al. (2012) and Cunado & Gracia (2014), but their disadvantage is the scope of the study. They are focused only on one variable and hence do not have high explanatory power for the overall influence of the macroeconomics on the financial markets. Other papers such as these by Nasseh & Strauss (2000), Marcellino et al. (2003) and Oberndorfer (2009) do deliver conclusions for more countries and variables, but are not recent and do not account for the effect of financial crisis from 2007-2008. A summary of the relevant literature focused on the

European area and the researched variables could be found in Table 3.1. in Section 3.2.2 ("Explanatory variables and Expectations"). The purpose of this Master's thesis is namely to fill in this gap and conduct a wide research on the whole Eurozone and to study the impact of more than 30 factors. Further details about the single factors are described in Section 3.2.2 ("Explanatory variables and Expectations").

3. Data and Methodology

This chapter introduces the econometric methodology as well as the data collection and processing. Some of the restrictions of the study regarding the data and the chosen approach will be also shortly discussed.

3.1. Research Approach

The purpose of this research is to find at least one European macroeconomic variable, whose impact on Euro Stoxx 50 movements is statistically different from zero. A multiple regression analysis is used, as it has been proven to be appropriate for this objective (Asprem, 1989). This technique describes the linear relation between the dependent variable and the independent ones (Brooks, 2008, p.27). The regression model is following:

$$R = \beta_0 + \beta_1 . X_1 + \beta_2 . X_2 + \cdots + \beta_n . X_n + \varepsilon$$

where R = return on an individual stock / stock index

β_0 = constant

β_1 ... β_n = coefficient, indicating the magnitude and the direction of the influence of macroeconomic factors on stock returns

X_n = value of the corresponding macroeconomic variable (or its normal or log return)

ε = error term, representing outside influence, which in not included in the model as a separate variable

Some of the specificities of time series is that spurious regression could appear in case of non-stationary data (Peiró, 1996). For this reason, an Augmented Dickey-Fuller (ADF) as well as a Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test are used for measuring the reliability of the variables' patterns before conducting the main analysis. Some of the variables need to be transformed and differenced in order to become stationary. This explains why many of them are included as simple or log returns in the regression. Further information is provided in Table 3.2. in Section 3.2.2. ("Explanatory variables and Expectations").

To ensure that the results of the regression are efficient, consistent and reliable, some important assumptions regarding the error terms should be fulfilled – zero mean, constant variance, normal distribution, no autocorrelation and no endogeneity with the independent variables (Brooks, 2008, p.27). Additionally, the multicollinearity between the independent variables should be checked as well because its presence leads to insignificant (or wrong too high significant) results and eliminates the efficiency of the model. For this reason, White test and Breusch-Pagan one have been conducted for confirming homoscedasticity, Durbin Watson statistics and Breusch-Godfrey one is used for autocorrelation and the independence of the explanatory variables is tested through Variance Inflation Factor (VIF) method.

3.2. Data

3.2.1. Sample Period and Stock Market Index

The choice of the Euro zone as a research area is motivated not only by absence of profound previous analysis of these markets, but by their relative importance for the global financial stability. The stock markets in the Euro area are identified by similar characteristics in terms of attractiveness to the investors, regulatory requirements and economic issues, and usually "behave in a similar fashion" (Peiró, 1996). For this reason they will be considered together in this paper and the Euro Stoxx 50 Index is taken as a representative for the whole financial market. This decision is motivated also by the fact, that "the stock market performance is measured through movement in the index" (Barakat et al., 2016). Euro Stoxx 50 is a leading Blue-chip, free float-weighted index, consisting of the largest 50 public companies in the region, operating in various industries such as Banking (14.9%), Industrial goods and services (11.5%), Chemicals (9.2%), Personal and household goods (8.2%), Oil & gas (7.3%), Insurance (6.8%), Technology (6.7%), Health care (6.5%), Automobiles (5.6%), Telecommunications (5.4%), Food & beverage etc.[2]

The variables chosen for this study are only macroeconomic indicators from the Eurozone. The research period is between Q4 1999 – Q3 2016, which includes the whole period after the adoption of the euro. Similar to Asprem (1989) and Wasserfallen (1989), quarterly data is chosen because of the nature of the research and the fact, that many macroeconomic indicators

[2] See www.stoxx.com

are published only on an annual or quarterly basis. As the time frame of the study is only 17 years, annual data would have not given enough observations to make reliable and representative conclusions. Therefore, factors such as budget deficit, gross domestic savings, public debt etc. could not be included in the research. Additionally, quarter data reduces some potential biases coming from short-term movements, which are consequence of bid-ask effects or just slowed down daily and weekly market reactions. Unfortunately, some data is missing for the first quarter (Q4 1999) and, therefore, the conclusions made will be assumed to be valid only for the period after Q1 2000. Additionally to the analysis of the whole time frame, the 17 years will be divided also in three sub-periods in order to concentrate on the impact of the macroeconomic fundamentals also during and shortly after the dot-com crisis (Q4 1999 – Q4 2002), after the financial crisis (Q1 2009 – Q3 2016) and in between. For this purpose, dummy variables are used.

As already mentioned, some variables such as the price of Euro Stoxx 50 have been transformed to their log differences in order to deliver more independent and unbiased result. Therefore, the continuously compounded return of the Euro Stoxx 50 index is chosen to be analyzed through the regression, not its price itself:

$$CCRet_t = \ln(P_t) - \ln(P_{t-1})$$

where $CCRet_t$ = continuously compounded return of the index in period t

P_t= price of the index at period t

P_{t-1} = price of the index at period t-1

ln = natural log

3.2.2. Explanatory Variables and Expectations

As already mentioned, change in cash flows (CFs) or/and discount factor would result in immediate movement in the stock price. As a consequence, each indicator which would increase the CFs (higher demand, lower competition in form of trade restrictions, lower cost of production etc.) or decrease the discount factor, would raise the asset price and for this reason is considered in this Master's thesis.

As this paper aims at finding a broader spectrum of fundamentals relevant for fluctuations on the financial markets, the independent variables are all these, which have been found significant in previous studies, also including research in totally different markets or periods. The choice of the variables has been also motivated by recent reports and forecasts of the European Commission, the World Bank, OECD, big consulting firms and providers of economic analysis, according to which the most crucial ones are defined, which move the financial sector and influence the whole economy of the Eurozone. All the factors are divided in five groups, according to their origin or importance: General economic fundamentals, Monetary and Fiscal sector, Consumer's side, Producer's side and Others.

General economic fundamentals

Business Climate Indicator

This variable reflects the general condition of the economy when it relates to business. It develops the concept of industrial confidence indicator and its calculation depends on "five balances of opinion from the industry survey: production trends in recent months, order books, export order books, stocks and production expectations" (Bloomberg Markets). As it is an important factor behind economic development, its increase is assumed to result in same movement in stock prices. No empirical evidence has been provided yet.

Current Account Balance

The current account balance gives information about the transactions of the domestic market with the rest countries (European Commission). It influences indirectly the asset returns, as it reflects the state of the economy and thus often drives the investor's risk perception. Similar to the trade balance, rise in this indicator is expected to bring the investments up (Ozcam, 1997).

Economic Sentiment Indicator (ESI)

ESI "is made up of the 15 individual components of all confidence indicators. Explicit weights are allocated to the different sectors for the computation of the composite indicator: a) Industry: 40%; b) Services: 30%; c) Consumers: 20%; d) Construction: 5%; e) Retail trade: 5%" (DG ECFIN – Directorate General for Economic and Financial Affairs). Similar to business climate indicator, no evidence exists demonstrating its effect on stock market yet, but positive one is expected.

GDP

The Gross Domestic Product (GDP) is a measure of the economic activity and is expected to influence the cash flows of the enterprises and their security prices respectively. Jareño & Negrut (2016) and Khan (2014) confirmed the significant positive relation. However, according to Gjerde & Saettem (1999) and Lee (1992) stock prices could react positively but with delay to changes in GDP.

Government Consumption

Government consumption consists of all "transactions recorded under positive uses, subsidies payable, as well as transactions in the capital account of the government". It includes delivering public goods such as compensation of employees, social benefits etc. (European Commission, OECD). According to Belo & Yu (2012), government spending is a good predictor of risk premiums, as it increases drastically in case of economic shocks and crises. Hence, it should be negatively related to stock prices.

Service Confidence Indicator

This factor is calculated on the basis of business surveys and reflects sentiment within the services industry (Bloomberg). Similar to abovementioned confidence indicators, this one is also connected to the general economic development and stability.

Trade balance

The trade balance provides information about "change in foreign capital in the domestic market" and measures the difference between exports and imports (Hanousek & Filer, 1999). Bhattacharya et al. (2001) found no casual connection to stock price movements, but Hanousek & Filer (1999) showed a positive one in some CEE countries.

Unemployment

The unemployment rate demonstrates "the total number of individuals who are not working but are actively seeking employment" (Jareño & Negrut, 2016). It is often an indicator for unstable economic environment and also causes investor's pessimism about future company's profits. Higher unemployment means lower purchasing power of the customers and lower demand, respectively decrease in CFs. Chen (2009) found a weak negative effect on the US stock market,

but insignificant. According to Jareño & Negrut (2016) the impact is again negative, but statistically significant.

Monetary and Fiscal sector

Bank Lending

This factor represents the volume of loans, given to other Euro Area residents. Its positive influence was explained by Kim & Moreno (1994), who observed that stock price movements "affect loan demand by signaling changes in economic activity". A decline would result in lower corporate earnings, shrinking capacity and lower needs of financing.

Foreign Exchange Rate (FX Rate)

This rate indicates how much entities of foreign currency could be bought with one entity domestic currency. It is mostly important for countries, closely connected to other markets with different currencies. Importing and exporting companies worldwide often use US Dollar (USD) as a trading currency and for this reason the exchange rate between the local one and USD has been mostly used as independent variable. Doong et al. (2005) claimed that there is significant positive impact on asset returns in six Asian countries. Decline in FX rate means depreciation of the local currency, which leads to unexpected inflation and decrease in stock prices. Nasiri et at. (2013) assume a delayed market reaction.

Foreign Exchange Reserves

In India Sarbapriya (2012) demonstrated a positive connection with security price movements, but Bhattacharya et al. (2001) found no such casual relation.

Inflation

This factor shows increase in price levels of good and services (McConnell et al., 2012). Its impact is often considered in two different ways – the expected one, which indicates the normal economic development and has mostly positive linkage to stocks, and the unexpected one, which is connected to economic problems and rising costs, and affects negatively the CFs of the companies. Masuduzzaman (2012) demonstrated a short-run causality from asset returns to inflation in Germany, whose sign was not defined. Firth (1979) studied UK and found a positive relation, but authors such as Fama & Schwert (1977), Fama (1981), Kaul (1987) and Gjerde &

Saettem (1999) pointed out that a negative one exists. The last one claimed that money supply plays important role in this stock price-inflation correlation.

Interest rate

Reilly & Brown (2003) defined the interest rate as "the rate of exchange between future and current consumption" (Barakat et al., 2016). As already discussed in previous chapters, following the DCF theory, interest rate is one of the most important factors, affecting the asset price. Second reason is that interest rate is closely related to the investments and future production of a company, as short-term interest rate is also the lending rate. In case of higher interest rate, the firms can afford less financing. Another reason for the negative linkage is the substitution effect – investors prefer the safer investment in form of bank deposits instead of buying stocks (Peiró, 1996). On consumer's side higher interest rate leads to lower consumer spending because of higher motivation to save instead of spend. Alam & Uddin (2007) and Gjerde & Saettem (1999) supported these theories and found negative connection with share prices respectively in Bangladesh and in Norway. Chen et al. (1986) and Humpe & Macmillan (2007) predicted the same result, but using long-term real interest rate. Peiró (1996) indicated that long-term interest rates have higher explanatory power than short-term ones for Europe. In general, it is important to study both short-term and long-term interest rate because of their different origin. The first one is caused by the monetary policy or business cycle, while the second – by long-term changes in the economy (Humpe & Macmillan, 2007).

Money supply

Money supply is a factor, whose connection to stock prices is inconclusive in the literature. The concept of money supply itself is a broad one, because of the existence of three separate money aggregates. M1 is the narrowest one and consists only of currency in circulation and overnight deposits. M2 adds deposits with maturity up to 2 years. M3 is the broadest aggregate and is calculated as the sum of M2 and long-term deposits, debt securities up to 2 years and repurchase agreements (European Central Bank). Some authors found a positive relation between this variable and security prices (Hamburger & Kochin, 1972, Fama, 1981), pointing out that increase in money supply is caused by higher money demand. This is an indicator for growing economic activity and respectively higher cash flows for the companies, which in turn raises the asset prices (Sellin, 2001). However, money supply could be positively linked to the inflation

as well, which decreases the CFs, as confirmed in the research by Flannery & Protopapadakis (2002) and Khan (2014).

Consumer's side

Consumer Confidence Indicator

Consumer confidence indicator has been calculated on the basis of a survey and "is the arithmetic average of the balances (in percentage points) of the answers to the questions on the financial situation of households, the general economic situation, unemployment expectations (with inverted sign) and savings, all over the next 12 months" (DG ECFIN – Directorate General for Economic and Financial Affairs). It could be used "as a proxy for the psychological effect" of macroeconomics on consumer's behavior because it expresses expectations about the future economic and employment condition (Chen, 2009). Hence, it is assumed to affect positively the stock prices, which is confirmed by Chen (2009) for the US market.

Consumption Market Index

The retail trade volume index "measures the monthly changes of the deflated turnover of retail trade" and is used as a proxy for consumption market index in this study (European Commission). The conclusions regarding this variable are controversial, as Chen et al. (1986) found no relation, but it is expected that positive linkage exists as this index reflects the economic condition on the market.

Consumer Price Index (CPI)

In this study CPI is used as proxy for inflation.

Disposable income

Consumption and investment are strongly interrelated and consumption depends on the disposable income of the population. Fluctuations in stock prices in turn affect the consumption, as they reflect variations in wealth and influence the demand for investment goods. In case of decrease in disposable income, people tend to invest less, because they need a higher percentage for their maintenance.

Harmonized Index of Consumer Prices (HICP)

HICP is often used as a proxy for inflation in the Eurozone, as it is "harmonized" and its calculation for all the countries use the same methodology (European Central Bank). Pilinkus (2010) provided evidence about a strong negative dependence of HICP.

Private Consumption

According to the consumption-based asset pricing models (Lucas, 1978), the asset risk and return are strongly connected to the consumption. Chaudhuri & Smiles (2004) included this variable in their analysis of the Australian market and documented long-term relation to stock market.

Savings

Saving rate is the relation between gross savings and gross disposable income (European commission). It measures the percentage, which each household (or person) is able to save and invest either in a bank or securities and is respectively positively linked to stock prices. The higher the savings, the higher the demand for financial products. However, the savings data in this thesis includes also two variables, reflecting the new deposits made by households. The deposits are a substitute product to investment in securities and tend to have negative connection with their price. When we talk about returns, they probably move together because the investors would require at least the rate of return of a bank deposit in order to invest in stocks.

Producer's side

Industrial confidence

This index is calculated on the basis of a survey and "is the arithmetic average of the balances (in percentage points) of the answers to the questions on production expectations, order books and stocks of finished products (the last with inverted sign)" (DG ECFIN – Directorate General for Economic and Financial Affairs). It could influence the investors' perception about economic and future profit stability and is expected to move together with asset prices. Similar to ESI and Business Climate Indicator, positive connection with capital markets is assumed.

Industrial production

The industrial production (volume) index measures the growth in "price-adjusted output of industry" and is found to be one of the most significant factors for stock movements in various markets by many researchers (European Commision). For example, Fama (1990) demonstrated that "future rates of industrial production, used to proxy for shocks to expected cash flows, explain 43% of the variance in annual returns". The economists expect fluctuations in level of industrial production to alter firm's profits and future dividends. Chen et al. (1986), Humpe & Macmillan (2007) and Masuduzzaman (2012) provided evidence about respectively US, US and Japanese market, and about German and UK market and reported about a positive linkage between industrial production and asset returns. Some evidence pointed out that there could be a lag in the reaction (Peiró, 1996, Gjerde & Saettem, 1999) or that stock prices actually anticipate changes in production one year in advance, not the reverse (Peiró, 2016, Samitas & Kenourgios, 2007).

Oil price

According to Chen et al. (1986) oil prices do not move the stock returns in the US, but Gjerde & Saettem (1999) demonstrated the reverse in Norway – a strong positive relation. The reason is the high number of oil exporters in Norway, where oil price is a source of profit, while it is a resource and expense for other industrial companies. On the one hand, when observing the most of the articles, they indicate that the connection is mainly negative because oil is an essential production material and the increase in its price depress the profits (Kilian, 2007, Park & Ratti, 2008). On the other hand, a rise in the oil price brings expectations of higher economic growth and higher levels of consumer confidence (Arouri & Nguyen, 2009). However, according to the latter authors there are also "asymmetric sector sensitivities", which should be considered when analyzing whole market instead of separate industries.

Producer Price Index (PPI)

The industrial PPI "measures the gross monthly change in the trading price of industrial products" (European commission). The difference to CPI is the perspective – in this case the prices are calculated from producer's point of view. Nikkinen & Sahlström (2003) reported about significant negative linkage between PPI and European stock prices.

Others

Gold

Gold is perceived as one of the main substitute investments to securities. The so-called "safe haven", is preferred not only because its comparatively stable price, but also because its scarcity and high liquidity. Gold is expected to be less dependent on economic depressions and price volatilities in other goods. Although many researchers believe that there is low correlation between this fundamental and stocks (Baur & Lucey, 2010), influence is found in some particular industries such as technology sector (positive relation) and telecommunications (negative impact) (Ratner & Klein, 2008).

Manufacturing Orders

The volume of manufacturing orders indicates the industrial development in a country and for this reason is assumed to correlate positively with the stock market. No empirical evidence has been found yet.

In Table 3.1. all the variables, the corresponding relevant literature and the expected impact are summarized.

Table 3.1. Summary of previous literature and the influence of the independent variables found.

Variable before	Positive impact	Negative impact	No impact found
Bank lending	Kim & Moreno (1994)	-	-
Business climate indicator	No empirical evidence yet		
Consumer confidence	Chen (2009)	-	-
Consumer market index	-	-	Chen et al. (1986)
CPI	Firth (1979)	Fama & Schwert (1977), Fama (1981), Kaul (1987), Gjerde & Saettem (1999)	-
Current account balance	Ozcam (1997)	-	-
Disposable income	No empirical evidence yet		
ESI	No empirical evidence yet		
Foreign exchange reserves	Sarbapriya (2012)	-	Bhattacharya et al. (2001)
Foreign exchange rate (EUR/USD)	Doong et al. (2005), Nasiri et at. (2013)	-	-
GDP	Lee (1992), Gjerde & Saettem (1999), Khan (2014), Jareño & Negrut (2016)	-	-
Gold price	Ratner & Klein (2008)	Ratner & Klein (2008)	Baur & Lucey (2010)
Government consumption	-	Belo & Yu (2012)	-
HIPC	-	Pilinkus (2010)	-
Industrial confidence	-	-	-
Industrial production	Chen et al. (1986), Peiró (1996), Gjerde & Saettem (1999), Humpe & Macmillan (2007), Masuduzzaman (2012)	-	-
Long-term interest rate	-	Chen et al. (1986), Humpe & Macmillan (2007)	-
Manufacturing orders	No empirical evidence yet		
Money supply	Hamburger & Kochin (1972), Fama (1981)	Flannery & Protopapadakis (2002), Khan (2014)	-
Oil price	Gjerde & Saettem (1999)	Kilian (2007), Park & Ratti (2008)	Chen et al. (1986)
PPI	-	Nikkinen & Sahlström (2003)	-
Private consumption	-	-	-
Savings rate	-	-	-
Services confidence indicator	No empirical evidence yet		
Short-term interest rate	-	Gjerde & Saettem (1999), Alam & Uddin (2007)	-
Trade balance	Hanousek & Filer (1999)	-	Bhattacharya et al. (2001)
Unemployment	-	Chen (2009), Jareño & Negrut (2016)	-

Table 3.2. illustrates the transformation of the other variables as well as their sources and the names used in the statistical software STATA for the analysis. Variables such as bank lending, CPI, current account balance, GDP, government consumption, industrial production, manufacturing orders and the confidence factors are seasonally-adjusted in order seasonal movements not to impact the reliability of the empirical results.

Table 3.2. STATA variables and their processing

Variable before	Units	Source [1]	Variable after [2]	Name before	Name after
EuroSTOXX50 Index	EUR	STOXX	ΔLn/Δ	eurostoxx50priceindex	ccretEuroStoxx / pricedelta
Bank lending	Mio EUR	ECB	ΔLn / first,second, third difference Δ	banklending	BankLen_delta / BankLenDelta+2+3
Business climate indicator	Index	DG ECFIN	Δ	businessclimateindicator	busclimchange
Consumer confidence	Index	DG ECFIN	Δ	consconfidence	ConsConfDelta
Consumer market index	Index	Eurostat	Δ+second difference Δ	consmarketindex	ConsMarkIDelta+2
CPI	% Change	ECB		cpi	
Current account balance	Mio EUR	ECB	simple difference/Δ	currentaccbalance	CurrAccBal / currentaccbalancedelta
Disposable income capita	% Change	Eurostat		dispincomecapita	
Disposable income household	% Change	Eurostat	Simple change	dispincomehousehold	dispincchange
ESI	Index	DG ECFIN	Δ	esi	EsiDelta
Foreign exchange reserves 1	Mio $	IMF	Δ	foreigninexchreserves1	foreignexchreserves1change
Foreign exchange reserves 2	Mio EUR	IMF	Δ	foreignineurexchreserves2	foreigneurexchreserves2change
Foreign exchange reserves 3	Mio $	IMF	Δ	foreigninexchreserves3	foreignexchreserves3change
Foreign exchange rate (EUR/USD)		WM/Reuters	Δ	forex	delta_forex
GDP	Mio EUR	Eurostat	ΔLn	gdp	GDP_delta
Gold price	$	COMEX	Δ	gold	goldchange
Government consumption	Mio EUR	Datastream	ΔLn	govrnconsumption	GoverCons_delta
HIPC	Index	Eurostat		hicp	
Industrial confidence	Index	DG ECFIN		indconfidence	
Industrial production	Index	Eurostat	Δ	indproduction	indproductionchange
Long-term interest rate	%	Datastream		ltir	
Manufacturing orders	amount(net balance)	DG ECFIN	Δ	manufactorders	manufactorderschange
Money supply M1	Mio EUR	ECB	ΔLn	m1	M1_delta
Money supply M2	Mio EUR	ECB	ΔLn / first difference Δ	m2	M2_delta / M2Delta
Money supply M3	Mio EUR	ECB	ΔLn / first difference Δ	m3	M3_delta / M3Delta
Oil price	EUR	ECB	Δ	oil	delta_oil
PPI	Index	Eurostat		ppi	
Private consumption	Mio EUR	Datastream	ΔLn	privateconsump	PrivCons_delta
Savings rate (deposits up to 3m)	%	ECB	simple difference/ Δ+second difference	savings3m	savings3mchange+2 / savings3mdelta+2
Savings rate (deposits over 2y)	%	ECB	simple difference/Δ	savings2y	savings2ychange / savings2ydelta
Savings rate household (all)	%	Eurostat		savingsall	
Services confidence indicator	Net balance	DG ECFIN	Δ	servicesconfidindic	ServConfDelta
Short-term interest rate	%	EBF	simple difference/Δ	stir	stirchange / stirdelta
Trade balance	Mio EUR	Eurostat	Δ	tradebalance	tradebalancechange
Unemployment (volume)	Thsd people	Eurostat	ΔLn / first difference Δ	unemploymentvol	Unempl_delta / Unemplchange
Unemployment rate	%	ECB	Δ+second difference Δ	unemploymentrate	UnemplRateDelta+2

[1] Sources:

ECB - European Central Bank

DG ECFIN - Directorate General for Economic and Financial Affairs

IMF - International Monetary Fund

COMEX - New York Mercantile Exchange (COMEX Division)

EBF - European Banking Federation/ACI - The Financial Markets Association

[2] Variable transformation:

ΔLn $= \ln_t - \ln_{t-1}$

Δ $= (x_t / x_{t-1}) - 1$

3.3. Variables Selection

Before conducting the regression analysis, a variable selection process is considered (Hurvich & Tsai, 1990). The motivation behind is the elimination of multicollinearity risk and hence the increase of the goodness-of-fit of the final model (R squared adjusted could be used as a proxy

for this). At the end only these variables will stay, which explain to largest extend the Euro Stoxx 50's return movements. Usually up to five variables constitute the optimal set (Halinski & Feldt, 1970). The elimination is realized through stepwise forward selection technique, stepwise backward selection one and a combination of these two with Akaike's information criterion (AIC) or with Bayesian information criterion (BIC). At the end the factors are selected, which will create the best prediction equation and are the most important ones according to at least two of these methods.

3.3.1. Forward Selection Method

This technique includes the variables one at a time, testing whether their P-value is below some predefined level. The model begins with adding the indicator, which is most significant in the initial analysis, and includes further ones till the remaining factors would not increase the explanatory power of the model anymore[3]. Table 3.3. shows the results of this selection.

Table 3.3. Forward selection, significance level of 10%

```
. stepwise, pe(0.1): regress ccretEuroStoxx BankLen_delta-Unempl_delta
                     begin with empty model
p = 0.0333 <  0.1000  adding  savings2y
p = 0.0865 <  0.1000  adding  indproductionchange
```

Source	SS	df	MS		
Model	.092240365	2	.046120183	Number of obs =	65
Residual	.721653332	62	.01163957	F(2, 62) =	3.96
				Prob > F =	0.0240
				R-squared =	0.1133
				Adj R-squared =	0.0847
Total	.813893697	64	.012717089	Root MSE =	.10789

ccretEuroStoxx	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
savings2y	-.0289322	.0157696	-1.83	0.071	-.0604551	.0025908
indproductionchange	1.332914	.7652991	1.74	0.087	-.1968968	2.862725
_cons	.0674723	.0449357	1.50	0.138	-.0223529	.1572974

When reducing the significance level to 0.05, only savings2y remains significant factor.

[3] http://www.stata.com and www.stat.ubc.ca

Same model is tested also considering the Akaike's information criterion (AIC) and Bayesian information criterion (BIC), which provide a relative measure of the goodness of the model (Akaike, 1973). Results are summarized in Table 3.4. and Table 3.5.

Table 3.4. Forward selection, Akaike's information criterion (AIC)

```
. vselect ccretEuroStoxx BankLen_delta - Unempl_delta, forward aic
3 Observations Containing Missing Predictor Values

FORWARD variable selection
Information Criteria: AIC

Final Model
```

Source	SS	df	MS		
Model	.144103813	4	.036025953	Number of obs	= 65
Residual	.669789884	60	.011163165	F(4, 60)	= 3.23
				Prob > F	= 0.0183
Total	.813893697	64	.012717089	R-squared	= 0.1771
				Adj R-squared	= 0.1222
				Root MSE	= .10566

ccretEuroStoxx	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
savings2y	-.0245782	.0155769	-1.58	0.120	-.0557367	.0065803
indproductionchange	2.309319	.9364082	2.47	0.017	.4362236	4.182414
businessclimateindicator	-.0248452	.0156657	-1.59	0.118	-.0561813	.006491
goldchange	-.2719063	.1776498	-1.53	0.131	-.6272589	.0834463
_cons	.0613273	.0443231	1.38	0.172	-.0273322	.1499868

Table 3.5. Forward selection, Bayesian information criterion (BIC)

```
. vselect ccretEuroStoxx BankLen_delta - Unempl_delta, forward bic
3 Observations Containing Missing Predictor Values

FORWARD variable selection
Information Criteria: BIC

Final Model
```

Source	SS	df	MS		
Model	.056931889	1	.056931889	Number of obs	= 65
Residual	.756961808	63	.012015267	F(1, 63)	= 4.74
				Prob > F	= 0.0333
Total	.813893697	64	.012717089	R-squared	= 0.0700
				Adj R-squared	= 0.0552
				Root MSE	= .10961

ccretEuroS~x	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
savings2y	-.034223	.015722	-2.18	0.033	-.0656409	-.0028051
_cons	.0833577	.0447048	1.86	0.067	-.0059777	.1726931

3.3.2. Backward Selection Method

This approach is similar to the first one, but the model begins with all variables and eliminate them one after another if their P-value is higher than a pre-set level. It avoids some of the problematic issues of forward selection model such as addition of a new variable, which makes another, already included in the equation one, insignificant. However, this technique has its own drawbacks like deleting indicators, which appear to be significant, if they are added at the end, after all other important factors are already in the model. Table 3.6., 3.7. and 3.8. present the results of this analysis.

Table 3.6. Backward selection, significance level of 10%

```
. stepwise, pr(0.1): regress ccretEuroStoxx BankLen_delta-Unempl_delta
                     begin with full model
```

Source	SS	df	MS		
Model	.283650097	7	.040521442	Number of obs =	65
Residual	.530243601	57	.009302519	F(7, 57) =	4.36
				Prob > F =	0.0006
				R-squared =	0.3485
				Adj R-squared =	0.2685
Total	.813893697	64	.012717089	Root MSE =	.09645

ccretEuroStoxx	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
goldchange	-.3251096	.1663067	-1.95	0.056	-.6581331	.0079139
savings3m	.2764105	.0849193	3.25	0.002	.1063626	.4464584
stir	-.1231769	.0319252	-3.86	0.000	-.187106	-.0592478
dispincomehousehold	.0758266	.0450409	1.68	0.098	-.0143661	.1660194
Unempl_delta	-2.587322	.9597491	-2.70	0.009	-4.509186	-.6654574
CurrAccBal	-2.47e-06	1.14e-06	-2.17	0.034	-4.76e-06	-1.88e-07
currentaccbalancedelta	.0058711	.0026034	2.26	0.028	.0006578	.0110844
_cons	-.3052961	.1020042	-2.99	0.004	-.5095561	-.1010362

When reducing the significance level to 0.05, only savings3m, stir and Unempl_delta remain in the equation.

Table 3.7. Backward selection, Akaike's information criterion (AIC)

```
. vselect ccretEuroStoxx BankLen_delta - Unempl_delta, backward aic
3 Observations Containing Missing Predictor Values

BACKWARD variable selection
Information Criteria: AIC
```

Final Model

Source	SS	df	MS	Number of obs =	65
				F(19, 45) =	3.05
Model	.458366423	19	.024124549	Prob > F =	0.0011
Residual	.355527275	45	.007900606	R-squared =	0.5632
				Adj R-squared =	0.3787
Total	.813893697	64	.012717089	Root MSE =	.08889

ccretEuroStoxx	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
BankLen_delta	7.020812	2.634393	2.67	0.011	1.714872	12.32675
businessclimateindicator	-.2279734	.0705318	-3.23	0.002	-.3700318	-.085915
consmarketindex	.0223147	.0090557	2.46	0.018	.0040755	.0405539
CurrAccBal	-2.83e-06	1.13e-06	-2.50	0.016	-5.12e-06	-5.46e-07
currentaccbalancedelta	.0064228	.0026022	2.47	0.017	.0011817	.0116639
dispincomecapita	-.6008906	.3393166	-1.77	0.083	-1.284309	.0825282
dispincomehousehold	.737176	.3396564	2.17	0.035	.0530729	1.421279
esi	.0453677	.0157377	2.88	0.006	.0136703	.0770651
foreignexchreserves3change	-.7979927	.5262031	-1.52	0.136	-1.85782	.2618346
goldchange	-.4524342	.1835114	-2.47	0.018	-.8220451	-.0828233
M1_delta	-3.290029	1.548512	-2.12	0.039	-6.408891	-.1711659
M2_delta	8.320469	5.78929	1.44	0.158	-3.339761	19.9807
M3_delta	-5.957808	3.968155	-1.50	0.140	-13.95008	2.034468
savings3m	.4491949	.1291238	3.48	0.001	.1891263	.7092635
servicesconfidindic	-.0180003	.0066981	-2.69	0.010	-.0314909	-.0045096
stir	-.1731705	.0502511	-3.45	0.001	-.2743815	-.0719595
tradebalancechange	.014719	.0094518	1.56	0.126	-.0043179	.0337559
unemploymentrate	.0730024	.0361129	2.02	0.049	.0002673	.1457375
Unempl_delta	-2.011217	1.364222	-1.47	0.147	-4.758901	.7364679
cons	-7.996391	2.410919	-3.32	0.002	-12.85223	-3.140552

Table 3.8. Backward selection, Bayesian information criterion (BIC)

```
. vselect ccretEuroStoxx BankLen_delta - Unempl_delta, backward bic
3 Observations Containing Missing Predictor Values

BACKWARD variable selection
Information Criteria: BIC
```

Final Model

Source	SS	df	MS	Number of obs =	65
				F(3, 61) =	5.39
Model	.170509938	3	.056836646	Prob > F =	0.0023
Residual	.643383759	61	.010547275	R-squared =	0.2095
				Adj R-squared =	0.1706
Total	.813893697	64	.012717089	Root MSE =	.1027

ccretEuroS~x	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
savings3m	.2576924	.0888521	2.90	0.005	.0800215	.4353632
stir	-.1060035	.0313718	-3.38	0.001	-.1687352	-.0432717
Unempl_delta	-3.267814	.9531971	-3.43	0.001	-5.17385	-1.361779
_cons	-.2620086	.1029441	-2.55	0.013	-.467858	-.0561591

As a consequence from the variable selection, following 10 factors are selected for further analysis: businessclimateindicator, CurrAccBal, currentaccbalancedelta, dispincomehousehold, goldchange, indproductionchange, savings2y, savings3m, stir and Unempl_delta.

3.4. Hypotheses

After the short list of relevant independent variables was defined and their expected impact on stock returns in the Eurozone has been also discussed, following hypotheses will be tested:

H1: An increase in the Business climate indicator has significant positive impact on the return of Euro Stoxx 50.

H2: An increase in the Current account balance has significant positive impact on the return of Euro Stoxx 50.

H3: An increase in the Disposable income per household has significant positive impact on the return of Euro Stoxx 50.

H4: An increase in the Change of gold price has significant negative impact on the return of Euro Stoxx 50.

H5: An increase in the Change of industrial production has significant positive impact on the return of Euro Stoxx 50.

H6: An increase in the Long-term savings (deposits over 2 years) has significant positive impact on the return of Euro Stoxx 50.

H7: An increase in the Short-term savings (deposits up to 3 months) has significant positive impact on the return of Euro Stoxx 50.

H8: An increase in the Short-term interest rate has significant negative impact on the return of Euro Stoxx 50.

H9: An increase in the Change of unemployment volume has significant negative impact on the return of Euro Stoxx 50.

H10: At least one of abovementioned 10 variables has significant impact on the return of Euro Stoxx 50.

The respective null hypotheses are:

$H0_1$: An increase in the Business climate indicator has no significant positive impact on the return of Euro Stoxx 50.

$H0_2$: An increase in the Current account balance has no significant positive impact on the return of Euro Stoxx 50.

$H0_3$: An increase in the Disposable income per household has no significant positive impact on the return of Euro Stoxx 50.

$H0_4$: An increase in the Change of gold price has no significant negative impact on the return of Euro Stoxx 50.

$H0_5$: An increase in the Change of industrial production has no significant positive impact on the return of Euro Stoxx 50.

$H0_6$: An increase in the Long-term savings (loans over 2 years) has no significant positive impact on the return of Euro Stoxx 50.

$H0_7$: An increase in the Short-term savings (loans up to 3 months) has no significant positive impact on the return of Euro Stoxx 50.

$H0_8$: An increase in the Short-term interest rate has no significant negative impact on the return of Euro Stoxx 50.

$H0_9$: An increase in the Change of unemployment volume has no significant negative impact on the return of Euro Stoxx 50.

$H0_{10}$: None of abovementioned 10 variables has significant impact on the return of Euro Stoxx 50.

4. Empirical Analysis

Next section describes the empirical analysis, going from the descriptive part through correlation and stationarity tests, and the multiple regression analysis. However, the focus of this chapter is only on the variables, which have been selected as most crucial after the variable selection in Chapter 3.3. Additional information regarding the other variables could be found in the Appendix and in the discussion after the empirical part (Section 5).

4.1. Descriptive Statistics

The descriptive statistics aims at better initial understanding of the relation between the dependent variable and the independent ones. Afterwards the indicated connections will be tested with empirical methods.

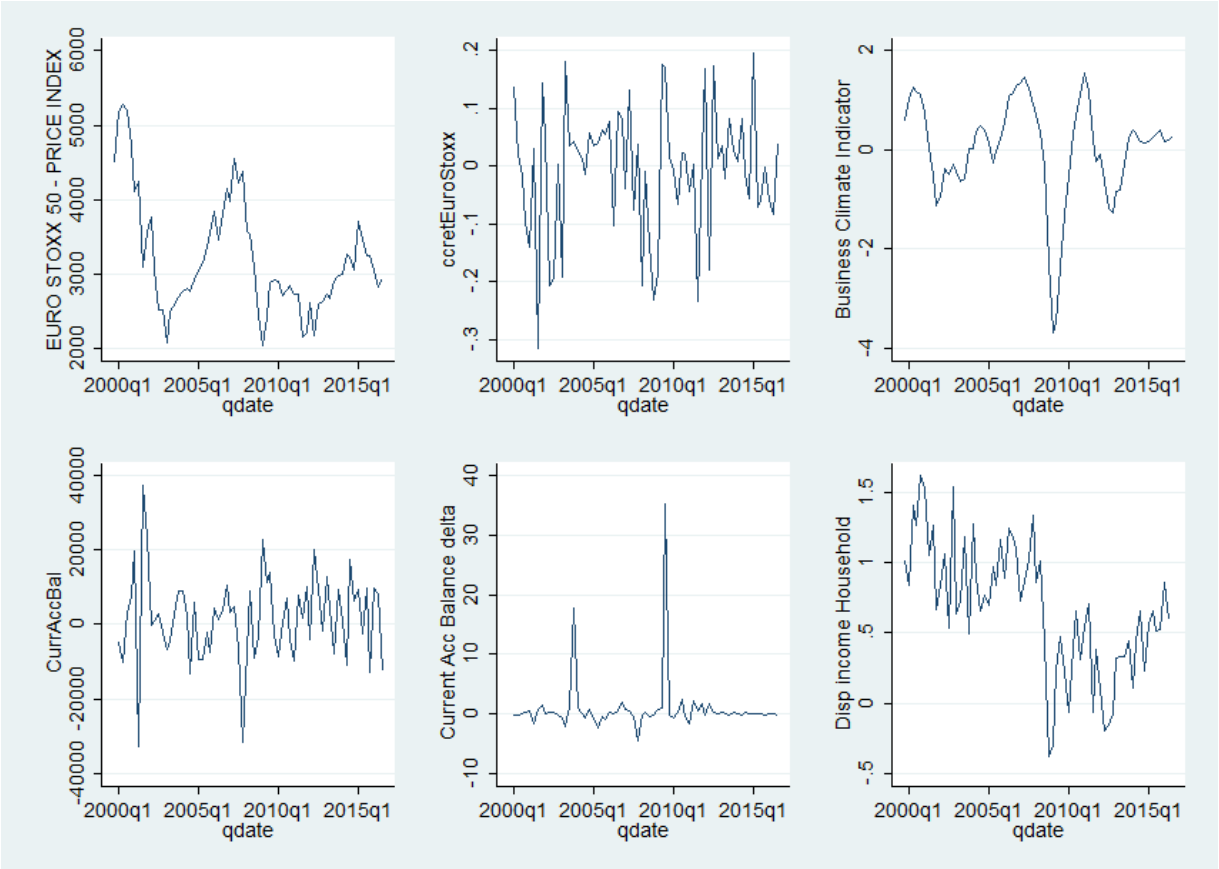
Table 4.1. presents the key property of the time series from the short list in this study – mean, variance, the minimum and maximum values. At least 67 observations of each variable were collected for the analysis. A more profound descriptive statistics of all variables could be found in Table 1. in the Appendix.

Table 4.1. Descriptive statistics of the variables in the short list for the period Q4 1999 – Q3 2016

Variable	Obs	Mean	Std. Dev.	Min	Max	corr ccretEuroStoxx
ccretEuroS~x	67	-.0064359	.1126057	-.3152685	.1950197	1.0000
businesscl~r	68	.0155882	1.037237	-3.69	1.54	0.0088
CurrAccBal	67	1764.179	11538.51	-32900	37500	-0.1425
currentacc~a	67	.8373487	4.892529	-4.464789	35.25	0.1843
dispincome~d	67	.6714925	.4637569	-.38	1.62	0.0292
goldchange	67	.0257102	.073729	-.1287203	.2570746	-0.1697
indproduct~e	67	.0012799	.0176966	-.0937225	.028153	0.2571
savings2y	67	2.701194	.9035813	.85	4.56	-0.2267
savings3m	67	1.85806	.6232423	.51	2.99	-0.1956
stir	68	2.083515	1.6836	-.301	4.969	-0.2141
Unempl_delta	67	.0024433	.0249519	-.0329819	.1117535	-0.1940

Figure 4.1. includes graphs of each variable for the whole period. Although no strong relation between the macroeconomic fundamentals and both the price and the return of Euro Stoxx 50 could be recognized in these graphs, the scatter plots in Figure 4.2. show a clearer picture of this linkage. In the case of business climate indicator and change in industrial production for example, a weak upward trend is present, which is equivalent to a positive connection. The scatter plot of current account balance (CurrAccBal) as well as this of the change in unemployment and the two plots of the savings all indicate slight negative direction. All these observations are consistent with the correlation data in Table 4.2.

Figure 4.1. Line graphs of the variables in the short list for the period Q4 1999 – Q3 2016



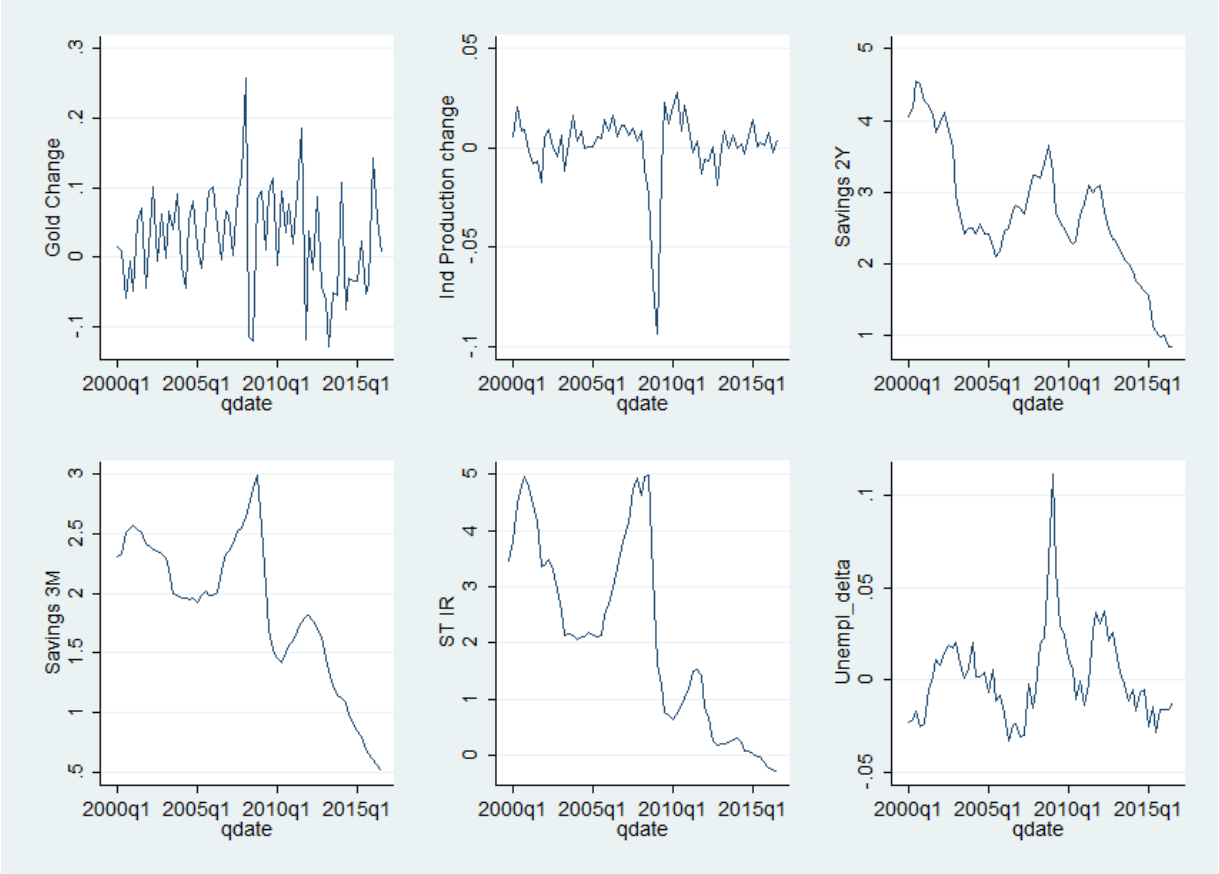
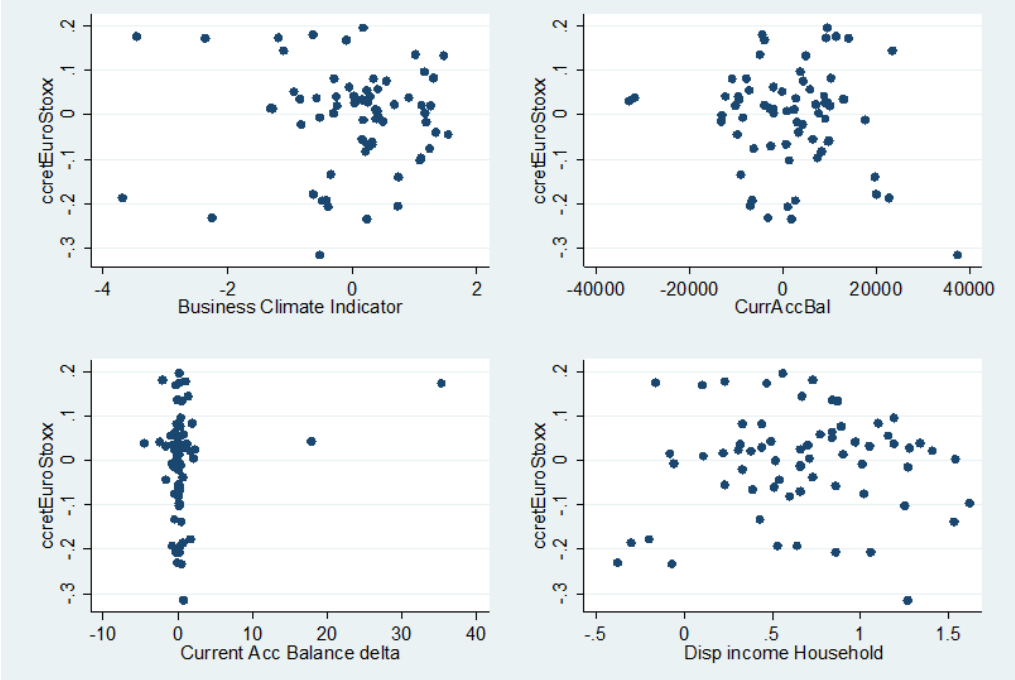
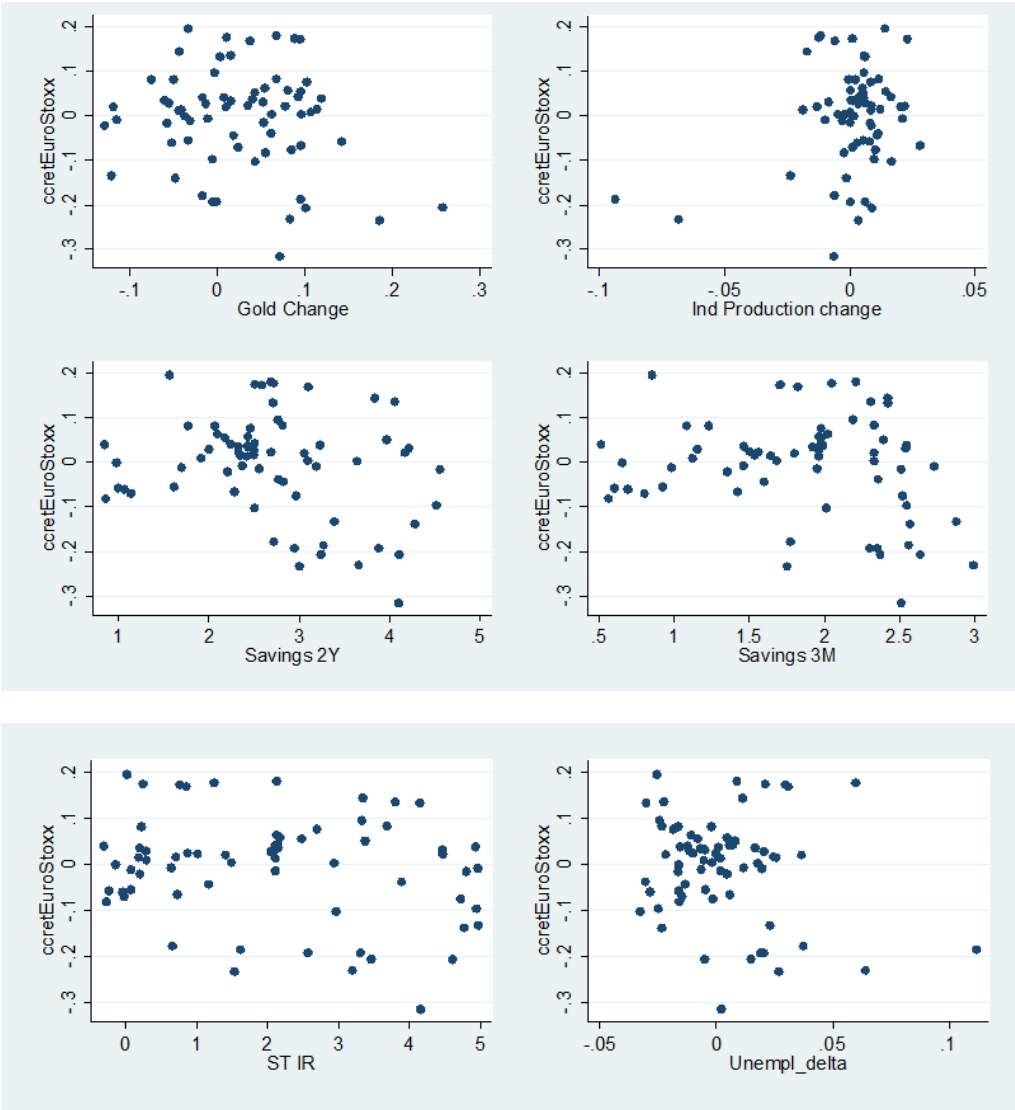


Figure 4.2. Scatter plots, displaying the relation between stock return and the variables in the short list for the period Q4 1999 – Q3 2016





4.2. Preliminary Analysis

4.2.1. Correlation Analysis

Table 4.2. facilitates the building of expectations about the connection between stock return and the target factors and confirms the conclusions, drawn from the scatter plots. CurrAccBal, goldchange, savings3mchange and Unemplchange are negatively related to ccretEuroStoxx. Busclimchange, dispincchange, indprodchange and stirchange have a positive sign.

Table 4.2. Correlations between the variables in the short list for the period Q4 1999 – Q3 2016

	ccretE~x	buscli~e	CurrAc~l	curren~a	dispin~e	goldch~e	indpro~e	~ychange	saving..	stirch~e	Unempl~e
ccretEuroS~x	1.0000										
busclimcha~e	0.3838	1.0000									
CurrAccBal	-0.1329	-0.0968	1.0000								
currentacc~a	0.1907	0.3037	0.2948	1.0000							
dispinccha~e	0.3026	0.2642	0.1004	-0.0211	1.0000						
goldchange	-0.1690	0.0022	-0.1229	0.1232	-0.1130	1.0000					
indproduct~e	0.2553	0.7608	-0.1822	0.1651	0.1554	0.0699	1.0000				
savings2yc~e	0.0380	0.0531	-0.2555	-0.0328	-0.0043	0.1411	0.1917	1.0000			
savings3mc~e	-0.2002	-0.1597	-0.2720	-0.3033	-0.2331	-0.0003	0.2415	0.5975	1.0000		
stirchange	0.1737	0.5312	-0.2140	-0.1173	0.2539	-0.1135	0.7632	0.3815	0.4226	1.0000	
Unemplchange	-0.5202	-0.6196	0.0180	-0.1809	-0.2867	0.1433	-0.5102	0.1692	0.3354	-0.2626	1.0000

The interrelations between the explanatory variables should also be considered because macroeconomic fundamentals are strongly connected to each other. This could lead to multicollinearity in the data and would make the empirical results unreliable.

When observing the correlation matrix, business climate indicator has a strong positive correlation with industrial production and a negative one with change in unemployment. This indicator is a broader reflection of the business environment than the industrial production, but includes also changes in industrial production and is expected to be positive connected to this factor. The latter in turn impacts the employment and the short-term interest rate (or the other way around). Both short-term and long-term savings as well as short-term interest rate are strongly dependent from each other. It could be explained by the fact, that increasing interest rates are usually motivation for individuals to deposit more.

4.2.2. Stationarity Tests

In order to avoid spurious regression in the data and unreliable final results, stationarity tests have been conducted. Otherwise, a high R^2 (goodness of fit) could appear although no real relation between the variables exists. Augmented Dickey-Fuller (ADF) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests are among the most common ones, indicating the order of integration of the variables. They both have been used in this thesis for more robust results. The null and alternative hypothesis of each of them are respectively:

1. ADF:

H_0: The variable is not stationary (unit root)

H_1: The variable is stationary

2. KPSS

H_0: The variable is stationary

H_1: The variable is not stationary (unit root)

The obtained results are reported in Table 4.3., which includes also the first and second differences for the indicators, where necessary. The purpose is to include in the further empirical analysis only these variables (or their differences), which are stationary. As apparent, all the variables were non-stationary at the beginning[4] (the raw data) and following random walk model, which is consistent with the initial assumption of semi-strong market efficiency. For this reason data of higher order of integration will be included in the regression. In this case all the variables will be of first order except for unemployment, where second order of integration will be used. The calculation of the differences has been realized through various methods (simple difference/ percentage difference/ log difference) in dependence from the single characteristics of each variable. Natural logs are utilized in case of variables with much higher magnitude than the dependent one as otherwise the impact would not be properly estimated. Such factors are bank lending, GDP, government and private consumption, money supply and unemployment (volume), which are measured in thousands, millions or billions. Percentage differences are chosen in case of indices or if relative high magnitude is observed, but negative values are present (as logs are not available). Otherwise simple differences are calculated.

[4] For the cases, where the two tests lead to inconclusive results, data series are assumed to be non-stationary and the first difference was calculated (businessclimateindicator; dispincomehousehold).

Table 4.3.
Unit root tests: T-value statistics

	Var. Name in STATA			First difference			Second difference		
Variables		**ADF**	**KPSS**		**ADF**	**KPSS**		**ADF**	**KPSS**
EuroSTOXX50 Index	-	-	-	ccretEuroStoxx	-8.738***	0.0805			
Business climate indicator	businessclimateindicator	-2.040	0.245	busclimchange	-3.875***	0.0747			
Current account balance	-	-	-	CurrAccBal	-8.572***	0.07			
Current account balance	-	-	-	currentaccbalancedelta	-7.890***	0.0604			
Disposable income household	dispincomehousehold	-3.686***	0.269***	dispincchange	-12.662***	0.0183			
Gold price	-	-	-	goldchange	-7.426***	0.281			
Industrial production	-	-	-	indproductionchange	-4.071***	0.101			
Savings rate (deposits up to 3m)	savings3m	0.601	0.85***	savings3mchange	-3.562***	0.367			
Savings rate (deposits over 2y)	savings2y	-0.370	0.604***	savings2ychange	-5.421***	0.16			
Short-term interest rate	stir	-0.570	0.427***	stirchange	-4.302***	0.135			
Unemployment (volume)	-	-	-	Unempl_delta	-2.665*	0.387*	Unemplchange	-7.809***	0.0669

*** Rejection of the null at the 1% level (Critical value for ADF is -3.558, for KPSS is 0.739)
** Rejection of the null at the 5% level (Critical value for ADF is -2.917, for KPSS is 0.463)
* Rejection of the null at the 10% level (Critical value for ADF is -2.594, for KPSS is 0.347)

Notes: The first differences are calculated either as a simple difference or percentage difference or log difference in dependence from the characteristics of each variable. For more detail, see Table 3.2. in Chapter 3.2.2.

4.3. Multiple Linear Regression

Following the APT model, a linear relation between the return of Euro Stoxx 50 Index and the macroeconomic variables is assumed. It was tested through a multiple linear regression, whose base equation in this research is:

$$CcretEuroStoxx = \beta_0 + \beta_1.Busclimchange + \beta_2.CurrAccBal + \beta_3.Currentaccbalancedelta + \beta_4.Dispincchange + \beta_5.Goldchange + \beta_6.Indproductionchange + \beta_7.Savings2ychange + \beta_8.Savings3mchange + \beta_9.Stirchange + \beta_{10}.Unemplchange$$

where β_0 = intercept (constant)

β_{1-10} = the sensitivity of the asset's return to the particular macroeconomic variable

The results from this first regression are presented in Table 4.4. The F-value (3.29) of the model points up that it is linear and significant, as the H_o of F-test (insignificance and non-linearity) is rejected at 5% error level. This means that at least one of the coefficients is statistically different from zero, which rejects our $H0_{10}$. The adjusted R^2-value (0.2636), which indicates the goodness of the fit of the equation, adjusted to the numbers of the variables, is relatively weak. Compared to R^2 (0.3787), the value is much lower because of the high number of explanatory factors, which decreases the degrees of freedom. Additionally, according to the T-test only two factors are obtained significant out of ten – CurrAccBal and Unemplchange (they are denoted with a star).

Table 4.4. Regression 1: all variables from the short list; t=0

Source	SS	df	MS
Model	.308198831	10	.030819883
Residual	.505694867	54	.00936472
Total	.813893697	64	.012717089

Number of obs	= 65
F(10, 54)	= 3.29
Prob > F	= 0.0022
R-squared	= 0.3787
Adj R-squared	= 0.2636
Root MSE	= .09677

ccretEuroStoxx	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
busclimchange	.0119986	.0466477	0.26	0.798	-.0815245	.1055216
CurrAccBal	-2.04e-06*	1.19e-06	-1.72	0.092	-4.43e-06	3.45e-07
currentaccbalancedelta	.0040691	.0030892	1.32	0.193	-.0021242	.0102625
dispincchange	.0501091	.0361648	1.39	0.172	-.022397	.1226151
goldchange	-.2252756	.1839666	-1.22	0.226	-.5941065	.1435552
indproductionchange	-.6165771	1.727888	-0.36	0.723	-4.080784	2.84763
savings2ychange	.0797144	.084458	0.94	0.349	-.0896138	.2490425
savings3mchange	-.0658878	.1850717	-0.36	0.723	-.4369343	.3051587
stirchange	-.0009729	.0624848	-0.02	0.988	-.1262474	.1243016
Unemplchange	-3.131025**	1.163414	-2.69	0.009	-5.463529	-.798521
_cons	.000731	.0137773	0.05	0.958	-.0268907	.0283528

Note: ★ denotes significance at 10% critical level, ★★★ denotes significance at 1% critical level

As the impact of most of the variables is not significant at 99% confidence level (5% error level) according to the T-test, improvement of the model is realized through dropping the least significant factors. As the principle is similar to the variable selection technique at the beginning, this method is considered appropriate.

Table 4.5. displays the figures after the reduction of variables. A much higher F-value (3.29) is observed, which is significant at 0.01% level, and an adjusted R^2-value (0.3078), which has approached R^2. This model indicates four significant macroeconomic factors: CurrAccBal, Currentaccbalancedelta, Dispincchange and Unemplchange. The importance and interpretation of this impact will be discussed later with all the other results.

Table 4.5. Regression 2: reduced amount of variables from the short list; t=0

Source	SS	df	MS
Model	.294560795	5	.058912159
Residual	.519332903	59	.008802253
Total	.813893697	64	.012717089

Number of obs	= 65
F(5, 59)	= 6.69
Prob > F	= 0.0001
R-squared	= 0.3619
Adj R-squared	= 0.3078
Root MSE	= .09382

ccretEuroStoxx	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
CurrAccBal	-2.18e-06★	1.09e-06	-2.00	0.051	-4.37e-06	5.95e-09
currentaccbalancedelta	.0046685★	.0025883	1.80	0.076	-.0005108	.0098477
dispincchange	.0574442★	.0319005	1.80	0.077	-.0063886	.1212769
goldchange	-.213687	.1631757	-1.31	0.195	-.5402009	.1128269
Unemplchange	-2.917375★★★	.8200657	-3.56	0.001	-4.558323	-1.276427
_cons	-.0027537	.0126478	-0.22	0.828	-.0280619	.0225545

Note: ★ denotes significance at 10% critical level, ★★★ denotes significance at 1% critical level

As the influence of the macroeconomics on stock market is a complicated and long process, some variables could be linked to asset returns with a time lag. The third regression considers this aspect. For reasons of simplicity and transparency, the table with these results is placed in the Appendix (Table 2). Although the model is significant at 5% according to the F-test (2.07), the same problem with adjusted R^2-value occurs as above. On the one hand the large number of variables (30) weakens the explanatory power of the regression, on the other hand a higher risk of multicollinearity is present, which leads to biased results. In 9 steps an upgraded and more

efficient form of this regression is created, which had considered also the interrelations between the independent variables, in order to avoid multicollinearity (Table 4.6.).

Table 4.6. Regression 4: reduced amount of variables from the short list; t=0, -1, -2

Source	SS	df	MS
Model	.468652428	9	.052072492
Residual	.346773341	54	.006421729
Total	.815425768	63	.012943266

Number of obs	= 64
F(9, 54)	= 8.11
Prob > F	= 0.0000
R-squared	= 0.5747
Adj R-squared	= 0.5039
Root MSE	= .08014

ccretEuroStoxx	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
savings2ychange	.1727212***	.0573623	3.01	0.004	.0577166	.2877257
Unemplchange	-3.535305***	.7493138	-4.72	0.000	-5.037588	-2.033021
CurrAccBal L1.	3.06e-06***	9.28e-07	3.29	0.002	1.20e-06	4.92e-06
dispincchange L1.	-.1027912***	.0352569	-2.92	0.005	-.1734771	-.0321053
savings2ychange L1.	-.1802359***	.0604318	-2.98	0.004	-.3013944	-.0590775
Unemplchange L1.	-1.511173*	.7856148	-1.92	0.060	-3.086236	.0638895
CurrAccBal L2.	-2.03e-06*	9.45e-07	-2.15	0.036	-3.93e-06	-1.37e-07
dispincchange L2.	-.0592608*	.0335798	-1.76	0.083	-.1265843	.0080627
Unemplchange L2.	-.5516183	.6877517	-0.80	0.426	-1.930477	.8272409
_cons	-.0120158	.0109564	-1.10	0.278	-.0339821	.0099505

Note: ★ denotes significance at 10% critical level, ★★★ denotes significance at 1% critical level
Note2: L1.var indicates the first lag of each variable (t=-1), L2.var indicates the second lag (t=-2).

In order to ensure, that no important variables were dropped during the manual variable selection process, single tests were conducted for each of the deleted factors. As expected, most of them did not show any significant linkage to stock returns. However, predictors such as business climate indicator (in t=0), disposable income (in t=0), the industrial production (in t=0) and some other did (Table 3 in the Appendix). Taking into consideration the intercorrelation between the macroeconomic fundamentals in general, it is not surprising, that these factors were insignificant in the multiple regression, but they demonstrate an important connection with the

assets in a single one. The reason is that some other variables, which have remained in the final model, had already accounted for the effect of these fundamentals. Looking at the correlation matrix, unemployment (both in t=0 and t=-1) appears to be a strong indicator for the above-mentioned three factors. This could easily be explained because the higher the unemployment, the less the disposable income per household. The decrease in human capital affects also actively the business and the production.

During the variable selection in the last 9 steps, some important evidence has become clear:

1. Market response: In general, stock market does not reflect the movement in macroeconomic factors immediately, as in this empirical process most of the variables from t=0 disappeared in the first 2-3 steps due to high insignificance. Moreover, the second lag (L2.var) is less significant than the first one (L1.var), which means that the market does still answer to macroeconomics in period of one quarter.
2. Interrelation between the macroeconomic factors - incorporation: As already mentioned, many factors account for movements in other factors and the significance of the first ones in the regression gains strength if the second ones are removed. Savings2y is closely related to savings3m, business climate indicator and disposable income; current account balance reflects changes in short-term interest rate and industrial production; disposable income is connected to the business climate indicator; unemployment incorporates movements in short-term interest rate from the same period and in industrial production from the previous one.
3. Interrelation between the macroeconomic factors – spurious regression: The presence of some variables in the regression could strengthen the impact of other ones without real relation to stock market. This happened between savings2y and short-term interest rate (correlation of 62%), where the first one had become less significant (5% level) although the significance was at 0% level before dropping short-term interest rate. A second example is the correlation between industrial production and short-term interest rate (76%), which made the interest rate strongly insignificant after removing the industrial production. All the tables with the detailed regression results could be find in the logfile attached to this thesis.

4. Correlation vs. significant impact – Despite correlation of 20%, savings3m is not statistically important for stock returns, but savings2y is (although the correlation is only 3.4%) .

Considering the main features of the end regression (Table 4.6.), a higher goodness of fit (adj. R^2 goes from 34% to 50%) and the same significant result of the model (at 0% level) are present. This means that these variables explain around 50% of the variation in the stock return. The factors, which have effect are savings2y in t= 0 and with one period lag (t= -1), unemployment in t=0 and t= -1, disposable income in t= -1 and t= -2 and current account balance in t= -1 and t= -2. Obviously, these four macroeconomic indicators are the most essential ones when estimating the movements in asset returns. Interesting is that each of them has double impact, as its influence stretches over time and their values both in t=0 and in t= -1 (or t= -1 and t= -2) are important. However, for most of them the connection gets stronger and more significant with the time. In case of unemployment for example, the coefficients of L2.Unemplchange (t= -2), L1.Unemplchange (t= -1) and Unemplchange (t=0) are respectively -0.5516183, -1.511173, -3.535305 and the significance levels are respectively 0.426, 0.060, 0.000. As assumed at the beginning of this thesis, the unemployment has significant negative impact on stock returns, as it reflects a weak economic environment, and hinders the industrial production and development. These factors in turn are directly connected to the cash flows of the companies and their stock prices and returns.

Considering the negative effect of disposable income, it does not correspond to the initial expectations, but could be explained by the risk aversion of the population. Even if the disposable income increases, people are not willing to invest much more than before. In times of unstable financial environment such as the two crises, which represent more than half of the sample period in this study, the population is assumed to be even less interested in investment. Whether the coefficients of disposable income alter depending on the period (crisis or not), will be tested later in Section 4.5. ("Dummies"), when the sample period is divided in sub-samples.

Current account balance's coefficients are all near zero, so they will not be discussed in detail. Last important factor – savings2y expresses different direction towards stock returns in t=0 and t= -1. The negative influence in the first lag is motivated by the "substitutional character" between deposits and securities. The positive connection in t=0 is expected as long-term bank

deposits could be generally accepted as a proxy for individual's willingness to commit to a long-term financial relation. Additionally, the investors would generally require at least the rate of return of a bank deposit in order to invest in stocks. This explains why stock returns and increase in savings2y move together.

4.4. Residuals Diagnostics

To confirm the reliability of the T-test's conclusions from the multiple regression, the residuals should be checked for some important characteristics. They should not include any important information explaining the stock price movements, which is not incorporated by the regression coefficients.

1. The error term has a zero mean

Table 4.7. displays the main characteristics of the residuals. Observing its mean (around 0), variance (around 0), skewness (around 0) and kurtosis (around 3), the error term looks like being close to normally distributed. However, further tests regarding the distribution will be made for Assumption 5.

Table 4.7. Residual diagnostics

Residuals

	Percentiles	Smallest		
1%	-.165592	-.165592		
5%	-.140616	-.1530495		
10%	-.086222	-.1516881	Obs	64
25%	-.0444144	-.140616	Sum of Wgt.	64
50%	.0071815		Mean	6.91e-11
		Largest	Std. Dev.	.0741912
75%	.0460731	.1210112		
90%	.1021854	.1436663	Variance	.0055043
95%	.1210112	.1549392	Skewness	-.0229885
99%	.1682314	.1682314	Kurtosis	2.90406

2. The error term has a constant variance (homoscedasticity)

Homoscedasticity is important in order to ensure that the regression results are robust. Graphically observed (Figure 4.3.) and then formally proven though White's test and Breusch-Pagan/Cook-Weisberg test, the error term has a constant variance. The zero hypothesis was not

rejected for both tests (Figure 4.4.), as both P-values (0.4459 and 0.4022 respectively) are higher than the critical value of 5%.

Figure 4.3. Line graph of the squared residuals

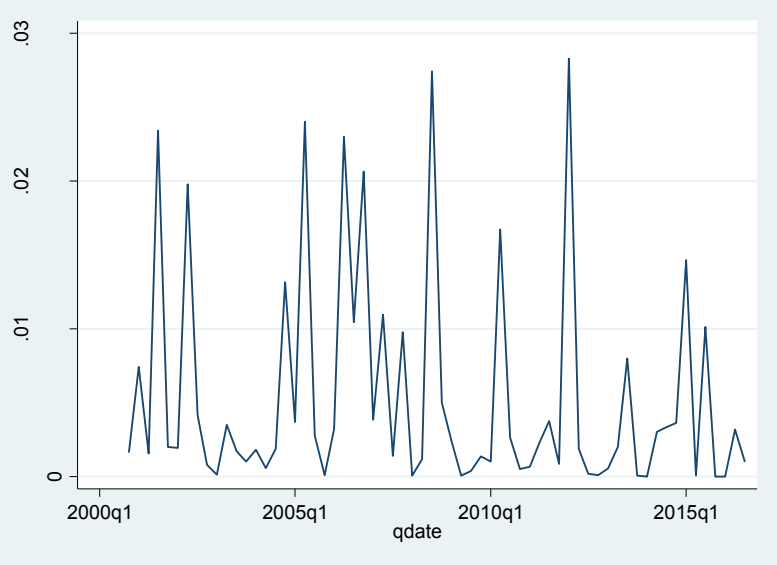


Figure 4.4. Formal tests of homoscedasticity

White's test for Ho: homoskedasticity
against Ha: unrestricted heteroskedasticity

chi2(54) = 54.75
Prob > chi2 = 0.4459

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	54.75	54	0.4459
Skewness	7.83	9	0.5510
Kurtosis	0.07	1	0.7849
Total	62.66	64	0.5240

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of ccretEuroStoxx

chi2(1) = 0.70
Prob > chi2 = 0.4022

3. No autocorrelation is present in the error term

No pattern can be noticed in the graph in Figure 4.5., the residuals are randomly distributed and independent. This was also formally confirmed using Durbin-Watson test and Breusch-Godfrey Serial Correlation LM test, where the zero hypothesis of no autocorrelation was not rejected (Figure 4.6.).

Figure 4.5. Scatter plot of residuals in t=0 and t= -1

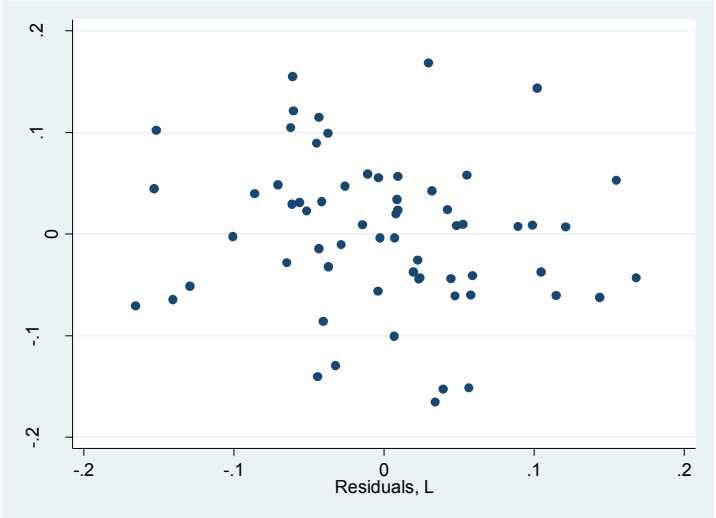


Figure 4.6. Tests for autocorrelation

Durbin's alternative test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	1.364	1	0.2428

H0: no serial correlation

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	1.606	1	0.2050

H0: no serial correlation

4. The error term is uncorrelated with all the independent variables (no endogeneity)

Table 4.8. proves that no correlation exists between residuals and the explanatory factors and confirms the unbiasedness of the coefficients.

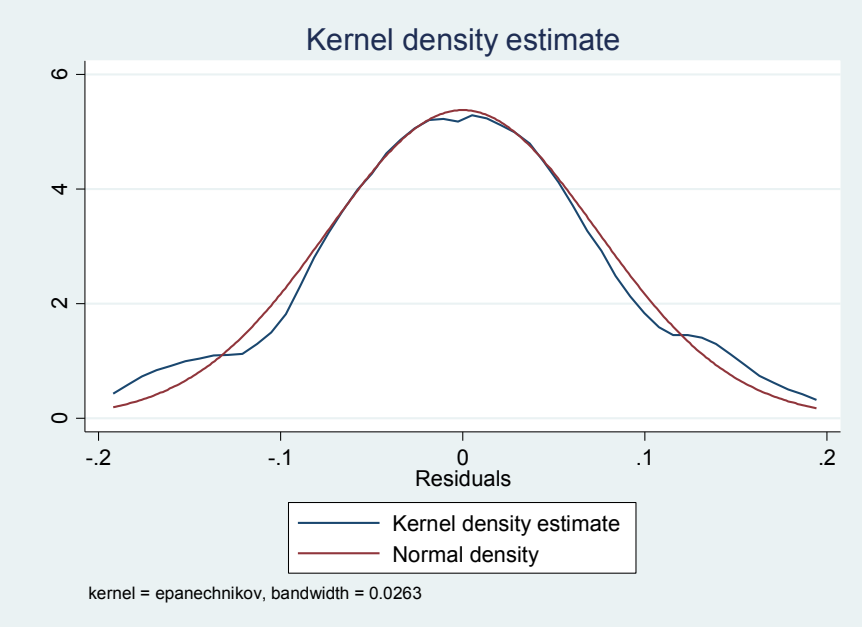
Table 4.8. Correlation matrix between the residuals and the explanatory variables

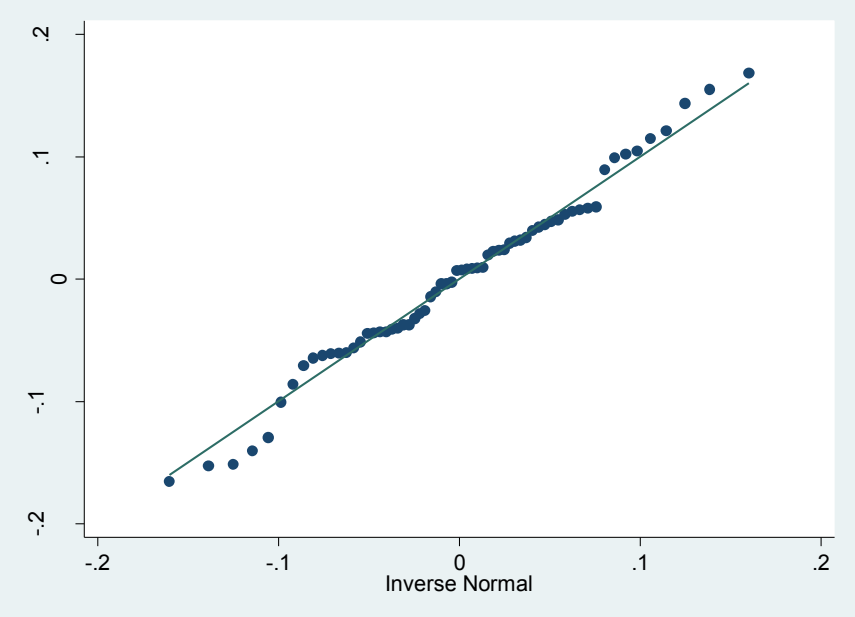
	resFF_4	~ychange	Unempl~e	CurrAc~l	L. dispin~e	L. ~ychange	L. Unempl~e	L. CurrAc~l	L2. dispin~e	L2. Unempl~e
resFF_4	1.0000									
savings2yc~e	0.0000	1.0000								
Unemplchange	0.0000	0.1650	1.0000							
CurrAccBal L1.	-0.0000	-0.1429	-0.1809	1.0000						
dispinccha~e L1.	0.0000	-0.0460	-0.2172	0.1284	1.0000					
savings2yc~e L1.	0.0000	0.3586	0.3950	-0.2458	-0.0230	1.0000				
Unemplchange L1.	0.0000	-0.0899	0.0156	0.0193	-0.2933	0.1692	1.0000			
CurrAccBal L2.	0.0000	0.1045	-0.1612	-0.0785	-0.1359	-0.1746	-0.1871	1.0000		
dispinccha~e L2.	-0.0000	0.2049	0.0408	-0.0580	-0.4350	0.0094	-0.2039	0.1065	1.0000	
Unemplchange L2.	0.0000	-0.1303	-0.0737	0.1242	0.0481	-0.0844	0.0159	0.0180	-0.2876	1.0000

5. The error term is normally distributed

Kernel density estimation and a distributional diagnostic plot are used to prove the normal distribution of the residuals besides the diagnostics in Assumption 1. As apparent on the graphs in Figure 4.7., the distribution of the error term is very close to a normal one.

Figure 4.7. Normal distribution vs. distribution of the residuals





6. No explanatory variable is a linear function of other explanatory variable (no multicollinearity)

Serious multicollinearity could increase the variance of the obtained coefficients and thus make them unreliable. For this reason a correlation matrix and a variance inflation factors (VIF)

analysis are used. Table 4.9. displays that no severe intercorrelation exists, the higher one is between L1.dispincchange and L2.dispincchange (43.5%). VIF is the reciprocal value of the level of tolerance, which is calculated as $T = 1 - R^2$. A value of VIF of more than 10 is assumed to bring multicollinearity. In this case, no such is present (Table 4.10.).

Table 4.9. Correlation matrix of all variables

	ccretE~x	~ychange	Unempl~e	L. CurrAc~l	L. dispin~e	L. ~ychange	L. Unempl~e	L2. CurrAc~l	L2. dispin~e	L2. Unempl~e
ccretEuroS~x	1.0000									
savings2yc~e	0.0398	1.0000								
Unemplchange	-0.5182	0.1650	1.0000							
CurrAccBal L1.	0.4050	-0.1429	-0.1809	1.0000						
dispinccha~e L1.	-0.0349	-0.0460	-0.2172	0.1284	1.0000					
savings2yc~e L1.	-0.4723	0.3586	0.3950	-0.2458	-0.0230	1.0000				
Unemplchange L1.	-0.1103	-0.0899	0.0156	0.0193	-0.2933	0.1692	1.0000			
CurrAccBal L2.	-0.0021	0.1045	-0.1612	-0.0785	-0.1359	-0.1746	-0.1871	1.0000		
dispinccha~e L2.	0.0106	0.2049	0.0408	-0.0580	-0.4350	0.0094	-0.2039	0.1065	1.0000	
Unemplchange L2.	0.0216	-0.1303	-0.0737	0.1242	0.0481	-0.0844	0.0159	0.0180	-0.2876	1.0000

Table 4.10. Variance inflation factors (VIF) analysis

Variable	VIF	1/VIF
dispinccha~e L1.	1.81	0.552297
L2.	1.69	0.591912
savings2yc~e L1.	1.51	0.663324
Unemplchange L1.	1.48	0.673699
--.	1.35	0.741106
savings2yc~e	1.26	0.794951
CurrAccBal L2.	1.18	0.846082
Unemplchange L2.	1.14	0.879010
CurrAccBal L1.	1.12	0.888917
Mean VIF	1.39	

As all assumptions are fulfilled, we can rely that the residuals do not contain any systematic information for the stock returns and hence all of this information is reflected by the explanatory variables.

4.5. Dummies

After investigating the general impact of the macroeconomic variables on stock performance for the whole period after adoption of the Euro (16 years), the influence of business and economic cycles should be considered as a co-factor. During recessions consumption decreases, risk aversion rises, the willingness and ability to save or invest usually weakens as well. People and firms are much more sensitive to news and changes in the environment. The question whether the impact of the macroeconomic fundamentals gains strength arises.

Empirically, this issue has been resolved using dummies, denoting three sub-periods. Both the dot-com crisis (1999-2001) and the financial crisis (2008-2016) are considered. Period 1 encompasses the results of the crash of the tech bubble, period 2 is the "no crisis" period and the third one includes the whole financial crisis and the consequences from it. They were all inserted in the last regression as variables in order to quantify their influence (Table 4.11.). The model itself is observed to be significant again, as the H_0 of F-test was rejected at 0% level. Unfortunately, the period factors do not add high explanatory power, as adjusted R^2 increased only from 0.5039 to 0.5043.

Table 4.11. Regression 5: reduced amount of variables from the short list; t=0, -1, -2; time differences also considered (Dummies)

Source	SS	df	MS
Model	.481826116	11	.043802374
Residual	.333599652	52	.006415378
Total	.815425768	63	.012943266

Number of obs	= 64
F(11, 52)	= 6.83
Prob > F	= 0.0000
R-squared	= 0.5909
Adj R-squared	= 0.5043
Root MSE	= .0801

ccretEuroStoxx	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
period						
2	.0572007	.0412485	1.39	0.171	-.0255704	.1399718
3	.0398045	.0394978	1.01	0.318	-.0394536	.1190625
savings2ychange	.1578108	.0582705***	2.71	0.009	.0408825	.2747391
Unemplchange	-3.392282	.7556351***	-4.49	0.000	-4.908575	-1.875989
CurrAccBal L1.	3.23e-06	9.35e-07***	3.45	0.001	1.35e-06	5.10e-06
dispincchange L1.	-.0997323	.0353125***	-2.82	0.007	-.170592	-.0288725
savings2ychange L1.	-.1758723	.0605155***	-2.91	0.005	-.2973055	-.0544392
Unemplchange L1.	-1.431715	.7881744*	-1.82	0.075	-3.013303	.1498728
CurrAccBal L2.	-2.08e-06	9.45e-07*	-2.20	0.032	-3.98e-06	-1.86e-07
dispincchange L2.	-.0533327	.0338335	-1.58	0.121	-.1212245	.0145591
Unemplchange L2.	-.4629212	.6902302	-0.67	0.505	-1.84797	.922127

Note: ★ denotes significance at 10% critical level, ★★★ denotes significance at 1% critical level

The new variables themselves appear to be insignificant at 10% level (T-test), but taking a look at their coefficients, some conclusions could be drawn. The dot-com crash had been automatically left out of the regression, as the coefficients of period 2 and 3 show the importance of these two economic sub-cycles in comparison to the first one. The years between the crises were obviously these with highest stock returns (0.057 higher that during 1999-2001) and the financial downturn in 2007 led to decrease, but not to the low levels from the tech crisis – 0.0398 higher.

Another detail, which is worth drawing attention to, is that the coefficients of the other variables as well as the values of their P-tests, showing the significance, got weaker. This larger regression does not seem to explain better the problem in the topic. For this reason, further tests regarding the impact of the crisis on the relation between the stock returns of Euro Stoxx 50 and the

macroeconomic indicators in the Eurozone were conducted. Single regressions for each period were made and Table 4.12. summarizes the results.

Table 4.12. Regressions of stock returns for the whole period and for each sub-period

	Q4 1999 - Q4 2001	**Q1 2002 - Q4 2007**	**Q1 2008 - Q3 2016**	Q4 1999 - Q3 2016
Prob>F	-	0.0673	0.0001	0.0000
Adj R-squared	-	0.3567	0.6089	0.5039
Variables				
savings2ychange	-	0.1600663*	0.1490805*	0.1727212***
Unemplchange	-	-3.205681	-3.903405***	-3.535305***
L1.CurrAccBal	8.14e-06	-1.10e-06	3.24e-06**	3.06e-06***
L1.dispincchange	-0.1882638	-0.0874158	-0.130155**	-0.1027912***
L1.savings2ychange	-	-0.202748**	-0.1010238	-0.1802359***
L1.Unemplchange	-	-1.007439	-1.994186*	-1.511173*
L2.CurrAccBal	-1.53e-07	8.97e-08	-7.25e-07	-2.03e-06**
L2.dispincchange	-0.0236641	-0.0116408	-0.0877855*	-0.0592608*
L2.Unemplchange	-	-4.831167*	0.058958	-0.5516183
*** Rejection of the null at the 1% level				
** Rejection of the null at the 5% level				
* Rejection of the null at the 10% level				

The division of the sample period in sub-samples has brought some disadvantages, among which the unreliability of the results as the number of observations in each group is not enough to be representative. This is the reason why many values are missing in the first column of Table 4.12. They were automatically omitted due to high collinearity. No conclusion about both the explanatory power of the test (adj R-squared and F-test) and the impact of the single variables could be drawn. Regarding the general characteristics of the test, the regression was significant for both other sub-periods at 10% and 1% respectively. Comparing the goodness of fit to this of the initial regression (column 4), the "no crisis" time shows lower fit (36%), but the coefficients in column 3 can better explain the variations in stock return during and after the financial crisis (61%).

In general the big regression provides more and strongly significant factors, but obviously the 6 variables, which are found statistically different from zero in the last period, deliver better results and have stronger explanatory power. The signs of the single indicators are the same for all the periods, except for the second lag of unemployment. It appears to be slightly positive in sub-sample 3, but insignificant. However, it seems that this factor is very important in sub-sample 2, where its coefficient increased around 8 times in comparison to the big model and is

statistically different from zero (10% error term). L1.Savings2ychange play also role in moving the asset returns in this period. Possible explanation of this relation is the cautiousness left after the dot-com crisis, which led to more deposits in the banks and less investments. The coefficients of the other variables are generally weaker.

Observing the third column, most of the coefficients are slightly stronger than these in the big equation. Additionally, compared to the "no crisis" sub-sample, the strongly significant variables were shifted to the top of the table, where factors in the present or with one lag difference are located. This shows a stronger market reaction during and after the economic downturn. The strong impact of unemployment is shifted from the second to the first lag, although the importance is weaker. The returns indicate still a negative connection to the level of unemployment in t=0 and t= -1 and the disposable income in t= -1 and t= -2. This is expected because these two factors move the consumption in the Eurozone and affect also directly the CFs of the firms and the value of their stocks. Although current account balance is found to be significant, its coefficient is approximately zero, so it will not be considered in detail. An interesting linkage is observed with savings2y, where the impact is slightly positive. Initially mentioned as a substitution to securities, long-term deposits could be considered also as an indicator of population's willingness to commit with an investment for a longer period (independent whether stocks or bank deposits). This is the reason why they move together – during the financial crisis both products were less attractive than before.

4.6. Final Results and Robustness Check

As a conclusion, it should be mentioned that no zero hypotheses except for $H0_6$ and $H0_{10}$ have been rejected. Factors such as business climate indicator (H_1), gold price (H_4), industrial production (H_5), short-term savings (H_7) and short-term interest rate (H_8) had been dropped in the secondary (manual) variable selection because of either multicollinearity or because their presence causes spurious regression in other factors. However, they all have been tested separately and no significant impact was found. It is assumed that some of the other remained indicators had already accounted for their influence on stock returns. A strong economic relation exists for example between business climate indicator, industrial production and unemployment. As the definition of the first factor includes the industrial production and labor market is directly connected to the production as well, the intercorrelation between these three is logical. Short-

term and long-term savings, and short-term interest rate show also a strong correlation, because increasing interest rates are often motivation for individual to deposit more.

The connection between current account balance (H_2) and financial markets is significant but close to zero and is not worth considering in detail. Disposable income per household has a negative effect, contrary to H_3. Long-term savings have the expected positive coefficient, but only in t=0. So, H_6 could be partly considered right. Unemployment has a negative connection in all lags, but is not significant (H_9). H_{10} could be confirmed for sure because despite of the impact not always being in the expected direction, there are four significant macroeconomic fundamentals explaining movements in Euro Stoxx 50 returns.

In order to ensure that the results are robust and reliable, additional regressions were conducted. Till now tests with variables in t=0 and with variables in t=0, t= -1 and t=-2 were made. One more was conducted only with the factors in t=0 and their first lag. The results are summarized in Table 4.13., the detailed new regression could be found in Table 4 in the Appendix. Unemplchange appears to be very robust when looking at both the sign of its coefficient and its significance. Savings2ychange, L1.CurrAccBal, and L1.savings2ychange are found to be statistically different from zero in two of three tests. L1.dispincchange and L1.Unemplchange are unfortunately not so robust.

Table 4.13. Comparison between three regressions (reduced number of variables from the short list for the whole period)

	Regression with variables in t=0			**Regression with variables in t=0, -1, -2**			**Regression with variables in t=0, -1**	
	Coefficient	P>|t|		Coefficient	P>|t|		Coefficient	P>|t|
Variables								
savings2ychange	-	-		0.173***	0.004		0.153***	0.006
Unemplchange	-2.917***	0.001		-3.535***	0.000		-2.191***	0.005
L1.CurrAccBal	-	-		3.06e-06***	0.002		3.29e-6***	0.001
L1.dispincchange	-	-		-0.103***	0.005		-	-
L1.savings2ychange	-	-		-0.180***	0.004		-.0188***	0.002
L1.Unemplchange	-	-		-1.511*	0.060		-	-
*** Rejection of the null at the 1% level								
** Rejection of the null at the 5% level								
* Rejection of the null at the 10% level								

A deeper sensitivity analysis is not able to be realized, because the data availability is relatively limited regarding different frequencies or longer period. A shorter period will not make any sense because current number of observations is already small.

5. Discussion and Conclusion

The impact of macroeconomic variables on stock returns was a central topic in many empirical researches in last 40 years. The purpose of this study was to expand this knowledge and deliver results for the Eurozone and for a larger spectrum of factors. After conducting many multiple regressions, some of the variables were dropped and not included in the final tests. Surprisingly, inflation, interest rate and oil price were eliminated in the initial variable selection. All the three factors were found significant in previous literature, mostly having a negative influence on stocks - Fama & Schwert (1977), Kaul (1987), Kilian (2007), Park & Ratti (2008) provided general results, and Wasserfallen (1989) and Asprem (1989) studied European markets. This elimination does not mean that no impact actually exists, but this impact had been already reflected by other factors, which remained in the equation. Interest rate for example is closely positively related to savings and they probably accounted also for its negative connection to asset returns (in their first lag). Inflation affects the purchasing power and the disposable income (adjusted to inflation) and the latter absorbs its negative linkage to financial markets. As already discussed, oil price influences the production process and increases the costs. If a company cannot get along with increasing costs, this causes changes in employment.

Trade balance, assumed to have a positive relation with asset returns, could have been reflected by current account balance, as they are very similar by definition. Money supply, where the direction of the impact was disputable, was also removed in first elimination phase. Together with GDP, it delivers information about general economic condition and is related to most of other macroeconomic indicators.

However, this study has some limitations, which should be taken into consideration for further research. The elimination of variables, previously proven as significant, could be done because of the choice of quarterly data, which provided only 64 observations. This number does not always lead to representative results. Additionally, linear regression is incapable to consider time-varying characteristics of time series and is sensitive to multicollinearity. Further research using other methods such as Johansen cointegration test, Vector autoregressive model (VER), Granger causality, Vector error correction model (VECM) or generalized autoregressive conditional heteroscedasticity (GARCH) could be realized. Another possible extension of this

study is to test the impact of monthly data on asset returns. In such case some of the factors considered in this thesis will not take part, but other will have probably stronger influence. To consider country-specific and sector-specific details is another recommendation for further research, as 19 different markets could not perfectly share their characteristics and each sector has its specificities as well.

In conclusion, main contributions of this paper are:

1. European market reacts immediately or within one quarter after variations in macroeconomic variables.
2. Unemployment, disposable income per household, current account balance and long-term savings have explained around 50% of movements in Euro Stoxx 50 returns over last 16 years.
3. As expected from previous studies, unemployment plays significant role in explaining movements in European stock returns and has a negative impact, which is even stronger during and after the financial crisis from 2007/8.
4. Disposable income affects negatively Euro Stoxx 50 as well, but the market reaction is slower.
5. Long-term deposits move together with stock returns in the same period, but increase in deposits in previous period causes drop in today's returns.
6. Macroeconomic fundamentals have much stronger importance in periods of recessions than in calm economic periods.

References

Adam, A., Tweneboah, G. (2008), Macroeconomic factors and stock market movement: Evidence from Ghana, MPRA Paper, University Library of Munich, Germany

Adelberger, O.L., G.Lockert (1999), An investigation into the number of factors generating German stock returns, Empirical research on the German capital market, W. Bühler, H. Hax and R. Schmidt (Eds.), Physica Verlag Heidelberg, pp.151-170

Adjasi, C.K.D. (1999), Macroeconomic uncertainty and conditional stock-price volatility in frontier African markets: Evidence from Ghana, The Journal of Risk Finance, Vol. 10, Issue 4, pp. 333 – 349

Akaike, H. (1973), Information theory and an extension of the maximum likelihood principle, Selected papers of Hirotugu Akaike, E. Parzen, K. Tanabe and G. Kitagawa (Eds.), Springer Sience+Business Media New York , pp. 199-213

Alam, M., Uddin, G.S. (2009), Relationship between interest rate and stock price: Empirical evidence from developed and developing countries, Journal of Business and Management, Vol. 4, Issue 3, pp. 43-51

Arouri, M., Nguyen, D.K. (2009), Oil prices, stock markets and portfolio investment: Evidence from sector analysis in Europe over the last decade, Energy Policy, Vol. 38, Issue 8, pp. 4528–4539

Arouri, M., Jouini, J., Nguyen, D.K. (2012), On the impacts of oil price fluctuations on European equity markets: Volatility spillover and hedging effectiveness, Energy Economics, Vol. 34, Issue 2, pp. 611–617

Asprem, M. (1989), Stock prices, asset portfolios and macroeconomic variables in ten European countries, Journal of Banking & Finance, Vol. 13, Issue 4-5, pp. 589-612

Balduzzi, P. (1995), Stock returns, inflation, and the proxy hypothesis: a new look at the data, Economics Letters, Vol. 48, Issue 1, pp. 47-53

Barakat, M.R., Elgazzar, S.H., Hanafy, K.M. (2016), Impact of macroeconomic variables on stock markets: Evidence from emerging markets, International Journal of Economics and Finance, Vol. 8, Issue. 1, pp. 195-207

Bartram, S.M., Bodnar, G.M. (1994), The exchange rate exposure puzzle, Managerial Finance, Vol. 33, Issue 9, pp. 642 - 666

Baur, D.G., Lucey, B.M. (2010), Is gold a hedge or a safe haven? An analysis of stocks, bonds and gold, The Financial Review, Vol. 45, Issue 2, pp.217-229

Bekaerta, G., Engstromb, E. (2010), Inflation and the stock market: Understanding the "Fed Model", Journal of Monetary Economics, Vol. 57, Issue 3, pp. 278–294

Belo, F., Yu, J. (2012), Government investment and the stock market, Journal of Monetary Economics, Vol. 60, Issue 3, pp. 325–339

Bessler, W., Opfler, H. (2005), Macroeconomic factors and stock returns in Germany, Innovations in Classification, Data Science, and Information Systems, D. Baier and K.-D. Wernecke (Eds.), Springer, pp.419-426

Bhattacharya, B., Mookherjee, J. (2001), Causal relationship between and exchange rate, foreign exchange reserves, value of trade balance and stock market: Case study of India, Working paper, Jadavpur University Department of Economics, Kolkata, India

Bjørnland, H.C. (2009), Oil price shocks and stock market booms in an oil exporting country, Scottish Journal of Political Economy, Vol. 56, Issue 2, pp. 232-254

Boulding, K.E. (1936), The theory of a single investment, The Quarterly Journal of Economics, Vol. 49, Issue 3, pp. 475-494

Brennan, M.J. (1970), Taxes, market valuation and corporate financial policy, National Tax Journal, Vol.23, Issue 4, pp. 417-427

Brooks, C. (2008), Introductory econometrics for finance, Cambridge University Press, Second edition

Burbidge, J., Harrison, A. (1984), Testing for the effects of oil-price rises using vector autoregressions, International Economic Review, Vol. 25, Issue 2, pp. 459-484

Chaudhuri, K., Smiles, S. (2004), Stock market and aggregate economic activity: evidence from Australia, Applied Financial Economics, Vol. 14, Issue 2, pp. 121-129

Chen N., Roll R., Ross S. (1986), Economic forces and the stock market, Journal of Business, Vol. 59, Issue 3, pp. 383- 403

Chen, S.S. (2009), Predicting the bear stock market: Macroeconomic variables as leading indicators, Journal of Banking & Finance, Vol. 33, Issue 2, pp. 211–223

Claessens, S., Dasgupta, S., Glen, J. (1995), Return behavior in emerging stock markets, The World Bank Economic Review, Vol 9, Issue 1, pp. 131–151.

Cunado, J., Gracia, F.P. (2014), Oil price shocks and stock market returns: Evidence for some European countries, Energy Economics, Vol. 42, pp. 365–377

Doong, S.-Ch., Yang, Sh.-Y., Wang, A. (2005), The dynamic relationship and pricing of stocks and exchange rates: Empirical evidence from Asian emerging markets, Journal of American Academy of Business, Vol. 7, Issue 1, pp.118-23

Fama, E. F. (1970), Efficient capital markets: A review of theory and empirical work, The Journal of Finance, Vol. 25, Issue 2, pp. 383–417

Fama, E.F. (1981), Stock returns, real activity, inflation, and money, The American Economic Review, Vol. 71, Issue 4, pp. 545-565

Fama, E.F. (1990), Stock returns, expected returns, and real activity, The Journal of Finance, Vol. 45, Issue 4, pp. 1089-1108

Fama, E.F., Schwert, G.W. (1977), Asset returns and inflation, Journal of Financial Economics, Vol. 5, Issue2, pp. 115-146

Firth, M., (1979), The relationship between stock market returns and rates of inflation, Journal of Finance, Vol. 34, Issue 3, pp. 743-49

Flannery, M.J., Protopapadakis, A.A. (2002), Macroeconomic factors do influence aggregate stock returns, The Review of Financial Studies, Vol. 15, Issue 3, pp. 751-782

Gjerde, O., Sættem, F. (1999), Causal relations among stock returns and macroeconomic variables in a small, open economy, Journal of International Financial Markets, Institutions and Money, Vol. 9, Issue 1, pp. 61–74

Grünewald, P. (1960), Unternehmensbewertung in anglo-amerikanischen Ländern, Dissertation Mainz

Halinski, R. S., Feldt, L. S. (1970), The selection of variables in multiple regression analysis, Journal of Educational Measurement, Vol. 7, Issue 3, pp. 151-157

Hamburger, M.J., Kochin, L.A. (1972), Money and stock prices: The channels of influence, Journal of Finance, Vol. 27, Issue 2, pp. 231-249

Hamilton, J.D. (1983), Oil and the macroeconomy since World War II, The Journal of Political Economy, Vol. 91, Issue 2, pp. 228-248

Hanousek, J., Filer, R.K. (1999), The Relationship Between Economic Factors and Equity Markets in Central Europe, Economics of Transition, Vol.8, Issue 3

Henry, O.T. (2009), Regime switching in the relationship between equity returns and short-term interest rates in the UK, Journal of Banking & Finance, Vol. 33, Issue 2, pp. 405–414

Hillier, D., Ross, S.A., Westerfield, R.W., Jaffe, J., Jordan, B.D. (2010), Corporate Finance, Mcgraw-Hill Education, Third edition

Humpe, A., Macmillan, P. (2007), Can macroeconomic variables explain long term stock market movements? A comparison of the US and Japan, Applied Financial Economics, Vol. 19, Issue 2, pp. 111-119

Hurvich, C. M., Tsai, C.L. (1990), The impact of model selection on inference in linear regression, The American Statistician, Vol 44, Issue 3, pp. 214–217

Jareño, F., Negrut, L. (2016), US stock market and macroeconomic factors, The Journal of Applied Business Research, Vol. 32, Issue 1, pp. 325-340

Kaneko, T., Lee, B.S. (1995), Relative importance of economic factors in the U.S. and Japanese stock markets, Journal of the Japanese and International Economies, Vol. 9, Issue 3, pp. 290-307

Kaul, G. (1987), Stock returns and inflation: The role of the monetary sector, Journal of Financial Economics, Vol. 18, Issue 2, pp. 253-76.

Khababa, N. (1998), Behavior of stock prices in the Saudi Arabian Financial Market: Empirical research findings, Journal of Financial Management & Analysis, Vol. 11 Issue 1, pp. 48-55.

Khan, A. (2014), How does stock prices respond to various macroeconomic factors? A case study of Pakistan, Journal of Management Info, Vol. 4, Issue 1, pp. 75-95

Kilian, L. (2007), The economic effects of energy price shocks, Journal of Economic Literature, Vol. 46, Issue 4, pp. 871-909

Kim, S.B., Moreno R. (1994), Stock prices and bank lending behavior in Japan, Economic Review, Issue 1, pp. 31-42

Kitati, E., Zablon, E., Maithya, H. (2015), Effect of macro-economic variables on stock market prices for the companies quoted on the Nairobi securities exchange in Kenya, International Journal of Sciences: Basic and Applied Research (IJSBAR), Vol. 21, Issue 2, pp. 235-263

Kuhner, C., Maltry, H. (2006), Unternehmensbewertung, Berlin, Heidelberg, Springler-Verlag

Lee, B.S. (1992), Causal relations among stock returns, interest rates, real activity, and inflation, The Journal of Finance, Vol. 47, Issue 4,p p. 1591-1603

Lintner, J. (1965), The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets, Review of Economics and Statistics, Vol. 47, Issue 1, pp. 13-37

Löflund, A. (1992), Arbitrage Pricing theory in a small open economy – Empirical evidence from the Swedish stock market, Research reports, Swedish School of Economics and Business Administration

Lucas, R.E. (1978), Asset prices in an exchange economy, Econometrica, Vol. 46, Issue 6, pp. 1429–1445.

Marcellino, M., Stock, J.H., Watson, M.W. (2002), Macroeconomic forecasting in the Euro area: Country specific versus area-wide information, European Economic Review, Vol. 47, Issue 1, pp. 1-18

Martinez, M.A., Rubio, G. (1989), Arbitrage pricing with macroeconomic variables: An empirical investigation using Spanish data, Working Paper, European Finance Association, Universidad del Pais Vasco

Masuduzzaman, M. (2012), Impact of the macroeconomic variables on the stock market returns: The case of Germany and the United Kingdom", Global Journal of Management and Business Research, Vol. 12, Issue 16, pp. 22-34

McConnell, C., Brue, S., Flynn, S. (2014), Macroeconomics: Principles, problems, & policies, Mcgraw-Hill Education, 20th edition

Mohanty, S., Nandha, M., Bota, G. (2010), Oil shocks and stock returns: The case of the Central and Eastern European (CEE) oil and gas sectors, Emerging Markets Review, Vol. 11, Issue 4, pp. 358–372

Morelli, D. (2002), The relationship between conditional stock market volatility and conditional macroeconomic volatility Empirical evidence based on UK data, International Review of Financial Analysis, Vol. 11, Issue 1, pp. 101–110

Nasiri, M., Khodadai, D., Ranjbar, M.H. (2013), Studying the effect of exchange rate fluctuations (USD) on stock returns of the manufacturing companies listed in Tehran Stock Exchange, Journal of Educational and Management Studies, Vol. 3, Issue 3, pp. 235-238

Nasseh, A., Strauss, J. (2000), Stock prices and domestic and international macroeconomic activity: a cointegration approach, The Quarterly Review of Economics and Finance, Vol. 40, Issue 2, pp. 229–245

Nikkinen, J., Sahlström, P (2003), Scheduled domestic and US macroeconomic news and stock valuation in Europe, Journal of Multinational Financial Management, Vol. 14, Issue 3, pp. 201–215

Nölte, U. (2008), Managementprognosen, Analystenschätzungen und Eigenkapitalkosten, Empirische Analysen am deutschen Kapitalmarkt, Ph.D. dissertation, Ruhr-Universität Bochum

Oberndorfer, U. (2009), Energy prices, volatility, and the stock market: Evidence from the Eurozone, Energy Policy, Vol. 37, Issue 12, pp. 5787–5795

Ozcam, M. (1997), An analysis of macroeconomic factors that determine stock return in Turkey, Capital Market Board of Turkey, Publication Number 75

Park, J., Ratti, R.A. (2008), Oil price shocks and stock markets in the U.S. and 13 European countries, Energy Economics, Vol. 30, Issue 5, pp. 2587–2608

Parker, R.H. (1968), Discounted cash flow in historical perspective, Journal of Accounting Research, Vol. 6, Issue 1, pp. 58-71

Pearce, D.K., Roley, V.V. (1985), Stock prices and economic news, The Journal of Business, Vol. 58, Issue 1, pp. 49-67

Peiró, A. (1996), Stock prices, production and interest rates: Comparison of three European Countries with the USA, Empirical Economics, Vol. 21, Issue 2, pp. 221-234

Peiró, A. (2016), Stock prices and macroeconomic factors: Some European evidence, International Review of Economics & Finance, Vol. 41, Issue C, pages 287-294

Pilinkus, D. (2010), Macroeconomic indicators and their impact on stock market performance in the short and long run: The case of the Baltic states, Ukio Technologinis ir Ekonominis Vystymas, Vol. 16, Issue 2, pp. 291-304

Poshakwale, S. (1996), Evidence on the weak-form efficiency and the day of the week effect in the Indian Stock Market, Finance India, Vol. 10, Issue 3, pp. 605-616.

Ratner, M., Klein, S. (2008), The portfolio implications of gold investment, The Journal of Investing, Vol. 17, Issue 1, pp. 77-87

Reilly, F., Brown, K.C. (2003), Investment analysis and portfolio management, Thomson South Western, Cincinnati, OH, Seventh edition

Ross, S.A. (1976), The arbitrage theory of capital asset pricing, Journal of Economic Theory, Vol. 13, Issue 3, pp. 341- 360.

Samitas, A., Kenourgios , D. (2007), Macroeconomic factors' influence on 'new' European countries' stock returns: The case of four transition economies", International Journal of Financial Services Management, Vol. 2, Issue 1/2, pp. 34-49

Samuelson, P. A. (1965), Proof that properly anticipated prices fluctuate randomly, Industrial Management Review, Vol. 6, Issue 2, pp. 41-49.

Sarbapriya, R. (2012), Foreign exchange reserve and its impact on stock market capitalization: Evidence from India, Research on Humanities and Social Sciences, Vol.2, Issue 2, pp. 46-60

Schmeling, M., Schrimpf, A. (2011), Expected inflation, expected stock returns, and money illusion: What can we learn from survey expectations?, European Economic Review, Vol. 55, Issue 5, pp. 702–719

Sellin, P. (2001), Monetary policy and the stock market, Journal of Economic Surveys, Vol. 15, Issue 4, pp. 491-541

Sharpe, W.F. (1964), Capital asset prices: A theory of market equilibrium under conditions of risk". Journal of Finance, Vol. 19, Issue 3, pp. 425-442

Sims, C.A. (1980), Macroeconomics and reality, Econometrica, Vol. 48, Issue 1, pp. 1-48

Singh, T., Mehta, S., Varsha, M.S. (2010), Macroeconomic factors and stock returns: Evidence from Taiwan, Journal of Economics and International Finance, Vol. 2, Isuue 4, pp.217-227

Stehle, R. (2004), Die Festlegung der Risikoprämie von Aktien im Rahmen der Schätzung des Wertes von börsennotierten Kapitalgesellschaften, Die Wirtschaftsprüfung, Vol. 17, pp. 906-927

Syllignakis, M.N., Kouretas, G.P. (2009), Dynamic correlation analysis of financial contagion: Evidence from the Central and Eastern European markets, International Review of Economics and Finance, Vol. 20, Issue 4, pp. 717–732

Voigt, C., Voigt, J., Voigt, J.F., Voigt, R. (2005), Unternehmensbewertung: Erfolgsfaktoren von Unternehmen professionell analysieren und bewerten, Gabler Verlag

Wasserfallen, W. (1989), Macroeconomics news and the stock market: Evidence from Europe, Journal of Banking & Finance, Vol. 13, Issues 4–5, pp. 613-626

Wei, K.C.J., Lee, C.F., Chen, A.H. (1991) Multivariate regression tests of the arbitrage pricing theory: The instrumental-variables approach, Review of Quantitative Finance and Accounting, Vol. 1, Issue 2, pp. 191–208

Yilmiz, M.H., Mubin, M., Bulut, E. (2014), Economic Forces and Stock Markets Under Arbitrage Price Theory: Empirical Evidence from Turkey, Journal of Poverty, Investment and Development, 2014. Available at SSRN: https://ssrn.com/abstract=2663425

Appendix

Table 1 Descriptive statistics of all the variables (long list) before any transformation for the period Q4 1999 – Q3 2016

Variable	Obs	Mean	Std. Dev.	Min	Max
eurostoxx5~x	68	3215.554	761.0409	2033.72	5281.566
ccret	67	-.0064359	.1126057	-.3152685	.1950197
banklending	68	9129480	1888807	5528280	1.11e+07
businesscl~r	68	.0155882	1.037237	-3.69	1.54
consconfid~e	68	-12.40515	7.329858	-32.83	1.83
consmarket~x	67	98.67164	3.048555	90.8	103.7
cpi	68	.1438674	.1312065	-.31168	.423643
currentacc~e	68	12.83971	36.83103	-54	94
dispincome~d	67	.6714925	.4637569	-.38	1.62
dispincome~a	67	.5767164	.4466182	-.5	1.52
esi	68	100.2971	9.336511	70.3	117.9
foreignexc~1	67	125.791	419.4424	-766	1215
foreignexc~2	68	108.433	340.1328	-724.1102	811.3351
foreignexc~3	68	208385.1	22046.42	164933	262912
forex	68	1.221573	.1771106	.8622	1.56055
gdp	68	2251.331	278.7828	1702.558	2682.955
gold	68	859.4662	480.7251	258.4	1812.5
govrnconsu~n	68	475.951	37.22889	399.7555	530.6703
hicp	68	89.48426	8.346152	74.74	100.53
indconfide~e	68	-6.100882	8.653747	-35.63	6.33
indproduct~n	68	102.3022	4.480802	91.7	113.73
ltir	68	3.139412	1.519479	-.12	5.46
manufactor~s	68	2.161765	12.81347	-40.6	23.9
m1	68	4010869	1420725	1922968	7005470
m2	68	7211333	1990718	4076716	1.06e+07
m3	68	8101588	1990439	4665227	1.12e+07
oil	68	51.05612	21.03656	22.32508	90.06437
ppi	68	95.64824	9.825383	78.5	109.27
privatecon~p	68	1285.956	63.30193	1128.222	1380.088
savingsall	67	13.22791	.7219262	11.99	14.67
savings3m	67	1.85806	.6232423	.51	2.99
savings2y	67	2.701194	.9035813	.85	4.56
servicesco~c	68	6.317647	11.53992	-22.6	31.2
stir	68	2.083515	1.6836	-.301	4.969
tradebalance	68	12935.78	24012.12	-27598.5	71781.5
unemployme~l	68	14882.88	2418.237	11456.7	19323.3
unemployme~e	68	9.577941	1.323817	7.3	12.1

Table 2 Regression 3: all variables from the short list; t=0, -1, -2

Source	SS	df	MS
Model	.536733611	30	.01789112
Residual	.276229586	32	.008632175
Total	.812963197	62	.01311231

Number of obs	= 63
F(30, 32)	= 2.07
Prob > F	= 0.0227
R-squared	= 0.6602
Adj R-squared	= 0.3417
Root MSE	= .09291

ccretEuroStoxx	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
busclimchange	.0167101	.0616552	0.27	0.788	-.1088773	.1422976
CurrAccBal	-1.12e-06	1.48e-06	-0.76	0.456	-4.14e-06	1.90e-06
currentaccbalancedelta	.0013505	.0048795	0.28	0.784	-.0085886	.0112896
dispincchange	.0589052	.0575996	1.02	0.314	-.0584214	.1762319
goldchange	.0074342	.2538759	0.03	0.977	-.5096941	.5245626
indproductionchange	.1601303	2.167132	0.07	0.942	-4.254174	4.574434
savings2ychange	.1615417	.1023876	1.58	0.124	-.047015	.3700985
savings3mchange	.120174	.2888968	0.42	0.680	-.4682896	.7086375
stirchange	-.0168751	.0802995	-0.21	0.835	-.1804397	.1466896
Unemplchange	-3.971803★	1.556389	-2.55	0.016	-7.142063	-.8015433
busclimchange L1.	-.0454073	.0654528	-0.69	0.493	-.1787302	.0879157
CurrAccBal L1.	3.26e-06★	1.61e-06	2.02	0.052	-2.93e-08	6.54e-06
currentaccbalancedelta L1.	-.0006273	.0045667	-0.14	0.892	-.0099294	.0086749
dispincchange L1.	-.0619017	.0647848	-0.96	0.346	-.193864	.0700606
goldchange L1.	-.0809132	.2235172	-0.36	0.720	-.5362028	.3743764
indproductionchange L1.	-.497513	2.17609	-0.23	0.821	-4.930063	3.935037
savings2ychange L1.	-.2022717★	.1049311	-1.93	0.063	-.4160094	.011466
savings3mchange L1.	.1032183	.282796	0.36	0.718	-.4728182	.6792549
stirchange L1.	-.0245748	.0855311	-0.29	0.776	-.1987959	.1496463
Unemplchange L1.	-2.559789	1.62652	-1.57	0.125	-5.872901	.7533232
busclimchange L2.	-.0161074	.0588415	-0.27	0.786	-.1359637	.1037489
CurrAccBal L2.	-2.61e-06★	1.53e-06	-1.70	0.099	-5.73e-06	5.17e-07
currentaccbalancedelta L2.	.0031365	.0037336	0.84	0.407	-.0044685	.0107416

dispincchange L2.	-.0531188	.0537354	-0.99	0.330	-.1625742	.0563366
goldchange L2.	.1382943	.2631466	0.53	0.603	-.3977178	.6743064
indproductionchange L2.	-2.103716	2.363641	-0.89	0.380	-6.918295	2.710863
savings2ychange L2.	-.0196104	.0957443	-0.20	0.839	-.2146351	.1754143
savings3mchange L2.	.0651558	.2647913	0.25	0.807	-.4742064	.604518
stirchange L2.	.106387	.0946866	1.12	0.270	-.0864833	.2992572
Unemplchange L2.	-2.630659	1.590153	-1.65	0.108	-5.869695	.6083762
_cons	-.0018714	.022364	-0.08	0.934	-.0474254	.0436825

Note: ★ denotes significance at 10% critical level
Notes: L1.var indicates the first lag of each variable (t=-1), L2.var indicates the second lag (t=-2).

Table 3 Single regressions with the dropped variables, three examples

Source	SS	df	MS	Number of obs =	67
				F(1, 65) =	11.91
Model	.129624264	1	.129624264	Prob > F =	0.0010
Residual	.707258827	65	.010880905	R-squared =	0.1549
				Adj R-squared =	0.1419
Total	.836883091	66	.012680047	Root MSE =	.10431

ccretEuroSt~x	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
busclimchange	.0879674★★★	.0254866	3.45	0.001	.0370672	.1388676
_cons	-.0060026	.0127443	-0.47	0.639	-.0314548	.0194495

Source	SS	df	MS	Number of obs =	66
				F(1, 64) =	5.88
Model	.070233717	1	.070233717	Prob > F =	0.0181
Residual	.764431817	64	.011944247	R-squared =	0.0841
				Adj R-squared =	0.0698
Total	.834665534	65	.012841008	Root MSE =	.10929

ccretEuroSt~x	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dispincchange	.0850244★	.0350631	2.42	0.018	.0149778	.155071
_cons	-.0066159	.0134544	-0.49	0.625	-.0334941	.0202624

Source	SS	df	MS	Number of obs =	67
				F(1, 65) =	4.63
Model	.05559816	1	.05559816	Prob > F =	0.0352
Residual	.781284931	65	.012019768	R-squared =	0.0664
				Adj R-squared =	0.0521
Total	.836883091	66	.012680047	Root MSE =	.10963

ccretEuroStoxx	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
indproductionchange	1.640088★	.7625794	2.15	0.035	.1171121	3.163064
cons	-.008535	.0134295	-0.64	0.527	-.0353556	.0182856

Note: ★denotes significance at 10% critical level, ★★★ denotes significance at 1% critical level

Table 4 Regression 6: reduced number of variables from the short list; t=0, -1

Source	SS	df	MS	Number of obs =	64
				F(5, 58) =	13.09
Model	.430970196	5	.086194039	Prob > F =	0.0000
Residual	.382028622	58	.0065867	R-squared =	0.5301
				Adj R-squared =	0.4896
Total	.812998818	63	.012904743	Root MSE =	.08116

ccretEuroStoxx	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dispincchange	.0669023	.0283687★	2.36	0.022	.0101162	.1236884
savings2ychange	.1533491	.0539319★★★	2.84	0.006	.0453927	.2613054
Unemplchange	-2.191158	.7490957★★★	-2.93	0.005	-3.690636	-.6916796
CurrAccBal L1.	3.29e-06	9.37e-07★★★	3.51	0.001	1.42e-06	5.17e-06
savings2ychange L1.	-.1881238	.0583443★★★	-3.22	0.002	-.3049126	-.071335
_cons	-.0163767	.0107002	-1.53	0.131	-.0377954	.005042

Note: ★ denotes significance at 10% critical level, ★★★ denotes significance at 1% critical level