Charles University

Faculty of Social Sciences
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MASTER'S THESIS

Relationship between Stock Returns and Net Income:
Evidence from U.S. Market

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Declaration of Authorship

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Prague, May 16, 2017

Signature

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Abstract

It is important to know if earnings variables influence stock returns. This is important not just for investors who want to know what drives stock returns, but also for the overall economy as stock returns and stock markets are also considered to be significant indicators of its performance. Many studies were conducted in the past but with inconclusive results. The aim of the thesis is to examine the relationship between net income and stock returns using two approaches, namely panel data model and multiple linear regression. We utilize a dataset of companies selected from the S&P500 Index. We also analyse possible heterogeneity in cross section and time. Moreover, we incorporate additional factors which have been proven to have significant explanation power for stock returns. Our findings from the panel data estimation suggest that there is no relationship between scaled net income and stock returns. We find there are random effects present between the companies and three structural breaks in time. Furthermore, we explore the significance of the consumer sentiment index and the percentage change in the book value per share variables in the panel estimation. We do not confirm the debt to equity ratio and the GDP growth news factors in the panel estimation as significant. Results concerning the relationship between net income and stock prices coming from the multiple linear regressions are inconclusive.

Keywords	stock returns, net income, earnings, United States of America

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Abstrakt

Je důležité vědět, zda firemní zisky ovlivňují výnosy akcií. Není to důležité jen proto, že investoři mohou rozpoznat pravou příčinu pohybů cen akcií, ale pohyby cen akcií a akciové trhy celkově jsou vnímány jako teploměry celé ekonomiky. Mnoho studií již bylo o tomto tématu napsáno, ale jejich závěry jsou nejednoznačné. Cílem této diplomové práce je vyhodnotit vztah mezi firemním ziskem a akciovými výnosy. K tomu jsou použity dva přístupy a to panelové modely a vícenásobná lineární regrese. Zkoumána jsou data společností z S&P500 indexu. Dále je v práci vyšetřována heterogenita v závislosti na jednotlivých společnostech a na čase. Navíc jsou do modelů zahrnuty i další faktory, u kterých bylo již dříve prokázáno, že vysvětlují pohyby v akciových výnosech. Výsledky z panelové regrese nám říkají, že pravděpodobně neexistuje vztah mezi firemním profitem a akciovými výnosy. Dále výpočty ukazují přítomnost náhodných efektů mezi jednotlivými společnostmi a tři strukturální šoky závislé na čase. Kromě toho také panelové modely potvrzují statistickou významnost proměnných jménem index spotřebitelského sentimentu a procentuální změna v hodnotě vlastního jmění společnosti. Zároveň nám panelový model nepotvrzuje statistickou významnost proměnných jménem poměr dluhu k vlastnímu kapitálu a zprávy ohledně vývoje HDP. Výsledky z vícenásobné lineární regrese ohledně vztahu mezi firemními zisky a výnosy akcií nám dávají nejasné závěry.

Klíčová slova akciové výnosy, profit, zisk, Spojené státy americké

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Master's Thesis Proposal

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Proposed Topic:

Relationship between Stock Returns and Net Income:
Evidence from U.S. Market

Motivation:

For the purposes of investor concerning investment into stocks, knowledge of what really drives stock return and its development is of principal importance. It is the aim of investor to look for stocks whose prices will grow, pay significant dividends or do both simultaneously. It is generally assumed that accounting information has impact on movement in stock prices but it was not proved empirically. This topic has attracted attention mainly around 1990 and earlier but it exhibited inconclusive results in findings.

We know that dividend and capital gain create motivation for investors to buy stocks but what really drives a stock value and stays behind its movements. We expect that stock price and dividends are connected with company value and its profit. People use financial statements (balance sheet, income statement, cash-flow statement etc.) to show the state of a company which reflects the reality in the best possible way. We think that company valuation is principally driven by reinvestments, free cash flow and good management. Reinvestments and free cash flow can be estimated from financial statements.

Does this theory about stock prices and earnings also apply in the real world? We have to verify empirically. In reality, it is hard to compute reinvestments and free cash flow therefore it is reason to use net income as proxy variable. Brown and Ball (1968) examined price of equities before and after release of accounting information (profit numbers). They found a positive relationship between unexpected change in net income and unexpected change in security prices. Strong and Walker (1993) divided profit to three categories (extraordinary earnings, exceptional earnings, pre-exceptional earnings and exceptional and extraordinary items) and found out that there probably exist causality between development in these earnings and abnormal stock return. On the other hand Lev (1989) and his research shows that earnings have very low explanatory power for equity prices.

Empirical results are inconclusive therefore another examination of net income development and its relationship to equity prices on current data is needed.

Hypotheses:

1. Hypothesis #1: Returns in stock prices are not affected by development in earnings.
2. Hypothesis #2: There are no cross-section variations between firms included in the estimated model.
3. Hypothesis #3: There are no time-variations between companies included in the estimated model.

Methodology:

The first step for this thesis is the collection of primary studies. I will mention possible ways how to value stocks and I will examine the theoretical connection between stock returns, dividends and earnings. I will research most recent and also baseline studies.

I will look for most recent corporate data with long-term history on stock-exchange. I want to collect between 20 and 40 corporate data with such specification. Sources as yahoo.finance.com, ThompsonReuters, Bloomberg and other will be used to collect the most suitable financial statements and stock prices.

I want to use panel data regression. I was inspired by the research from Strong and Walker (1993) where the panel data approach with different parameters and variables was applied. This approach comprises of estimation of baseline model consisting of scaled stock returns and development in earnings. After estimation of this model additional parameters and variables are gradually added to the baseline model. These additional items would be time-varying parameters, firm-varying parameters (cross-sectional) and level variables (stock price).

Expected Contribution:

I will conduct a panel data estimation of corporate data coming from United States with long-term history (S&P 500 index). This estimation will examine relationship between stock returns and development in earnings. In contrast to previous studies on this topic, I will take into an account contemporary data using different types of estimation adding time and cross-sectional varying parameters gradually. Final results will help investors to determine what really drives the stock price and its movements.

Outline:

1. Motivation: There are papers on the examination of relationship between stock returns and release of accounting information, but they are outdated and do not provide consistent results. It is reason to repeat estimation with

current data and modern methodology.
2. Theory: I will describe stock and stock exchange definition, efficient market hypothesis, stock valuation and its connection with dividend, net income and stock price.
3. Former Studies: I will depict some former papers researching the relationship between stock returns and (release of) accounting data, methodology and data used in these studies.
4. Data: I will explain how I will collect accounting and stock prices data.
5. Methods: I will briefly explain different possibilities how to estimate researched topic. Then I will explain why I used panel data regression.
6. Results: I will discuss my baseline regressions and robustness checks.
7. Concluding remarks: I will summarize my findings and their implications for investors, other stakeholders and future research.

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Acronyms

BVPS	Book Value per Share
EBIT	Earnings before Interest and Taxes
EPS	Earnings per Share
GDP	Gross Domestic Product
NNM	NASDAQ National Market
NSCM	NASDAQ Small Capitalization Market
R&D	Research and Development
S&P 500	Standard&Poors 500 Composite Index
U.S.	United States
U.S.A.	United States of America

1 Introduction

There has always been the question if accounting information provides information relevant to decision-making for people using financial statements such as stock market traders. It is crucial to know what drives changes on stock prices and stock returns. It is essential not only because of the profits which can be made on the stock market but also because of the concurrence between financial distresses and falling stock returns.

Many studies in the history were conducted to prove the connection between stock prices and new releases of accounting information. Some of them succeeded to reject the statistical significance of this relationship but some did not. Brown and Ball (1968) have discovered there is a positive relationship between an unexpected change in net income and an unexpected change in security prices. According to the research conducted by Strong and Walker (1993), earnings influence stock returns. Glezakos et al. (2012) concluded that the explanatory power of BVPS and EPS in terms of stock prices increases over time (data estimated from 1996-2008). On the other hand, Lev's (1989) research showed that the explanatory power of net income is very low for equity prices. Results of the former studies are inconclusive, therefore another examination of the relationship is necessary.

The main objective of the thesis is to test the hypothesis that returns are not affected by developments in earnings. A comprehensive approach based on the use of the contemporary U.S. stock market data covering a relatively long period before and after the global financial crisis constitutes the value added of this research. The data comes from the period between 1991 and 2016. We research contemporary data because the relationship between stock returns and net income can change through time. We examine the companies from the S&P 500 Index because they are considered to be big and stable companies with long-term histories. Our first model is inspired by the estimation made by Strong and Walker (1993), which utilizes panel regression, and the second model is inspired by the estimation by Glezakos et al. (2012), which uses multiple regression approach. Visualization, panel regression and

Hausman test should help us reveal possible time and cross sectional heterogeneity. Furthermore, we add other factors to the regression model to examine factor significance and to see how earnings variables behave.

The research in this thesis is organised in the following way. The second chapter discusses the theoretical background of the thesis. The third chapter elaborates on former studies and their results. The fourth chapter is about the data and methodology used. The fifth chapter presents empirical results and their critical evaluation. Chapter six summarizes the previous findings.

2 Literature Review

2.1 Stock and Stock Exchange Definition

The stock is a security representing a real part of the company. It is represented by an officially recognized sheet or “electronic signature”.

It represents an ideal share of the ownership of a joint stock company. Companies produce stocks to retrieve money for setting up a business or their development.

Two types of stock exist in the market. Common stocks are shares representing the ownership of a company. It means that a shareholder has a claim on a portion of profits when distributed (called dividends), a voting right at the general meeting and the right to the remaining equity in the case of liquidation. Stock owners have one vote per share to elect board members at the general meeting. General meetings are supervised by the company management. The claim on remaining equity after bankruptcy is subordinated to debt. Common stock is widely used and traded. Preferred stock is a kind of a hybrid between common stock and debt. It has usually fixed dividends with superiority to common stock in its payment. It normally does not possess any voting rights. When the company ceases to exist, preferred stocks have a senior claim compared to common stocks but a subordinated claim to debt (Fabozzi, 2002).

As generally accepted, the first stock exchange was set up in 1531 in Antwerps. In that time there were no official company shares that were traded (Smith 2004). Nowadays, we have many stock exchanges around the world providing thousands of stocks to buy. Basically, a stock exchange means an exchange of a stock between one investor who buys on one side and another investor who sells the stock on the other side. If there is no demand or supply for a stock it means that no trade deal will be realized. If there is a demand and supply it still does not mean that a trade deal will be realized. The seller and the buyer need to agree on the price and volume traded. There are two possible ways to trade stocks on a stock exchange. It is the primary and secondary market. The primary market is where new shares are first traded through an initial public offering. The secondary market is where issued stocks are already traded.

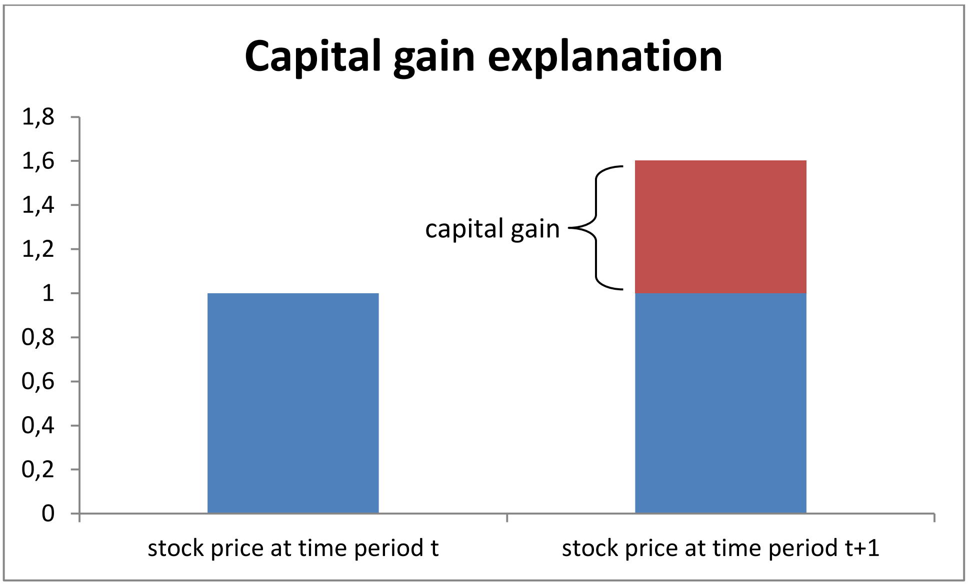
In the primary market, the share price is evaluated by investment banks with the agreement of the company which will provide its ownership shares. After evaluation, institutional investors such as hedge funds and banks purchase most of the stock. The secondary market is a place where shares are traded by individuals and institutional investors traded since the first public offering until the termination of companies.

Trading hours of stock exchanges run continuously around the world. The most important trading centers are London, New York and Tokyo. We introduce the secondary stock market participants based on the example of the New York Stock Exchange system. All world stock exchanges do not have the same system as the New York Stock Exchange but basic principles of participation go for every stock exchange. Market makers are single specialists who focus on one stock and have to provide bid and offer prices for it. Their profit is represented as a difference between the offer and bid prices which they provide. Market makers have to fulfill some rules given by stock exchanges such as providing high liquidity and a maximum spread between offer and bid prices. A market maker is either an employee or a software application provided by a trustful big private company. Other participants at the New York Stock Exchange are commission brokers. Commission brokers trade stocks on behalf of customers. They just follow their instructions and get a commission fee for the mediation. At the New York Stock Exchange, there are nearly 500 companies which provide these services. Independent floor brokers help exchange members to satisfy their orders. They help other members if they cannot carry out orders themselves or if they have big orders. They receive commission fees in return. Last participants involved at a stock exchange are registered traders. They trade on their own or occasionally represent entities to save money on the fees. Traditional stock exchanges have free entry, are very liquid and accommodate a vast number of sellers and buyers trying to create perfect competition. This process should provide the smallest gap between bid and offer prices and security. It is an auction system organized at one point.

Except of the stock exchanges which are considered to be traditional places for trading securities, there is another type of a secondary market called 'over the counter'. The over the counter market works in a very different way than traditional stock exchanges. It does not have one point (floor) where trades are settled. It works on the principle of negotiation. It means that sellers negotiate directly with buyers and other way around. The intermediary in over the counter market is a telecommunication system. There are no listed stocks in the over the counter market. Listed stocks are traded on traditional stock exchanges. Unlike the unlisted stocks, listed stocks have to meet some requirements such as particular asset value and earnings quality. Company also has to issue at least a given number of shares and pay a significant listing fee. Unlisted stocks do not have to satisfy such conditions, therefore it is sometimes more convenient for firms to go to the over the counter market. On the other hand, the over the counter market is not so liquid and stocks there may be considered to have lower quality. NASDAQ is a special type of the over the counter market because it possesses some characteristics of traditional exchanges. NASDAQ is the second biggest stock market in the U.S.A. NASDAQ does not have one point of settlement. Securities are traded through an electronic system. NASDAQ consists of two security groups. The groups differ in capitalization size. The first one is called the NASDAQ National Market (NNM) system and the second one the NASDAQ Small Capitalization Market (NSCM). A company has to fulfill some requirements to get to and stay at NASDAQ. NNM has more restrictive requirements than NSCM. On the other hand, NNM has less restrictive rules than New York Stock Exchange. For example, there are no profitability rules at NASDAQ and rules about capitalization are also weaker. If companies grow big they sometimes switch from NASDAQ to the New York Stock Exchange (not the other way around). Even though NASDAQ is the biggest over the counter market in United States, most of the securities are not traded there. Genuine over the counter markets in the United States are for instance OTC Bulletin Board and Pink Sheets. Both these markets are electronic but final agreements are settled through phones (Fabozzi, 2002).

Investors buy stock because of the profit which they expect to draw from the equity holding in the future. The gain comes from two sources. The first source is capital gains and the second one is dividends. A capital gain (or loss) is the difference between the current and the future stock price represented at one specific moment (figure [1]). For example, when an investor buys a stock and then the company goes bankrupt and stays with a zero residual value, a capital loss is the original price of the share. The second profit coming from holding the equity is the dividend which represents a share in company’s net income. A company may but does not have to pay dividends. There is no strict rule to enforce paying dividends. Companies may pay dividends even if they do not produce any profit and on the other hand, do not have to pay dividends if their profit rose rapidly.

Figure 1:



Source: Own calculations

2.2 Stock Exchange Indicators

Stock market indicators are stock indices. A stock index is a measurement of more stocks showed as one combined price (possibly a combined stock return). It means that stock index prices are weighted by index specific weights to produce one final index price. Indexes always possess just a part of the market. There basically exist three approaches to pick stocks for an index. The first one is that stock exchanges create indexes covering all stocks traded at the stock market. The second approach is to pick stocks subjectively based on index producer intentions. The third approach is to construct the stock index based on some objective measures such as the stock price development in different sectors or stock developments in geographic areas (states, regions and so on). Indices try to fulfill two basic roles. The first role is to show how the market has been behaving today. The second role is to serve for investor as a benchmark. Investors can compare how their specific equity behaves with regard to an index. All stock participants can also evaluate how some sector or geographical areas thrive with respect to the overall stock market or the whole economy. Investors can also "buy" index which means to buy stocks from the index with index specific weights.

There are three major and most used ways to weight indexes. The first way is to weight stocks by company market capitalizations. Market capitalization is equal to the number of company's shares times the current company's stock price. Then stocks in the index are weighted based on their amount of market capitalization. The second way is to weight stocks based on the price of a stock. It is equal to the sum of all index stock prices divided by the number of stocks in index. The third way is to weigh stock by equal weight for every stock. It does not take care of the price or market capitalization.

Fabozzi claims that the most referenced index is the Dow Jones Industrial Average index. The Dow Jones Industrial Average consists of 30 largest United States industrial companies listed on the New York Stock Exchange. These companies are chosen subjectively from the Wall Street Journal which owns the index. This index is a price weighted index. According to Fabozzi, other most popular indices in press are the NASDAQ Composite Index, the New York Stock Composite Index which possesses all stocks on these stock exchanges, and the Standard&Poors 500 Composite and the Value Line Composite Average which selects only particular stocks from stock exchanges.

The Standard&Poors 500 Composite Index (S&P 500) is composed of stocks from the NASDAQ Stock Market, the New York Stock Exchange and over the counter market. The S&P 500 consists of 500 stocks chosen from all kinds of industries uniformly. The S&P 500 Index is owned by the Standard & Poor's Corporation. Only the S&P 500 committee[1] decides which stocks are included in the index. The committee changes stocks in the index only occasionally. "The aim of the committee is to capture present overall stock market conditions in order to reflect a very broad range of economic indicators. (Fabozzi, 2002, p. 98)"

Stock exchanges implement trading restrictions such as price limits and trading collars for some indices. A price limit means that if a price of an index declines below the referred price, the trading on the exchange is immediately

[1] It is part of the Standard&Poors Corporation.

stopped. The referred price can be calculated for example as a percentage portion of the price from the preceding month. Trading restrictions were first situated to stock exchanges after the stock market crisis in 1987. If the situation happens, the whole trading system is usually stopped.

2.3 Efficient Market Hypothesis

The efficient market hypothesis says that asset prices fully reflect all available information. Fama et al. (1970) point out that stock prices always trade at their fair value. It means that there is no possibility to beat the market. It means that stock market immediately absorbs any kind of information and reflects it in the prices. It connotes that stocks on the market are valued precisely.

The market has to fulfill these assumptions to be effective:

1. A large number of rational investors participates in the market. They constantly analyze, value and trade. No investor can influence the stock prices on his or her own.
2. Investors have enough cheap, present and true information available. All investors acquire new information around the same time.
3. Investors react precisely and quickly on every new piece of information.
4. Deals on the market are associated with low transactional costs and there are no trade restrictions on the market.

Fama et al. (1970) suggest that stock markets can have different kinds of efficiency such as:

- The weak form of effectiveness means that the present stock prices reflect all information which could be acquired from historical data. In this case, analysts cannot predict future price behavior based on historical data and changes in prices are random.
- The medium-strong form of effectiveness is a situation when stock prices do not only incorporate historical data but reflect also the current public information. It basically means that there is no possibility to find undervalued

or overvalued stocks in the market therefore analytical predictions lose meaning.

- The strong form of effectiveness is equal to the state when stock prices incorporate all information, both historical prices and public information and all private information. In this kind of situation not even all predictions do not make sense, but also the usage of private information is useless.

The efficient market hypothesis was offended many times and there actually exist investors such as Warren Buffet who beat the market over the long-term period (Why some succeed, 1994).

2.4 Stock Valuation

Stock prices are affected by many variables but it is generally an impossible task to find out all that variables and their importance. There is no reliable method to determine the "right" value of a stock (Jílek, 2009). Jílek says that stock valuation methods pay attention only to some factors which determine the value of a company but do not take into account and even cannot in any case consider all important factors. Moreover, the significance of factors change through time and it is very hard (if not impossible) to determine the change in stock prices before it really happens.

"Currently, there are appraisal professionals who use the three methods to estimate an asset's value; the cost approach, the comparables approach, and the income approach. In the world of modern finance only the income approach has any real merit, as it is essentially a discounted cash flow method, exactly as used for other assets." (Fabozzi, 2002, p. 735)

A stock is a kind of security but how it is valued and which techniques are used for the valuation? Fabozzi says that stock valuations can be grouped into two general groups called the active and the passive strategies. The passive strategies are based on the Efficient Market Hypothesis. On the contrary, the active strategies try to outperform the market and are further divided to three groups. The first group cares about transaction timing. The second group cares about undervalued or overvalued stocks identification. The third group tries to exploit any kind of market anomalies (Fabozzi, 2002).

Fundamental analysis is the technique used by investors that believe in the active undervalued strategy. It builds on fundamental company's data such as earnings investigation, debt burden, profitability, cash flow, management quality and long-term ability to produce profit. It analyzes also other factors such as industry specific criteria[2], macroeconomic variables, GDP, employment, inflation, economic cycle, money base, exchange rate, government expenditures, payment balance, politics, development within an industry, availability of inputs, technology and other progress, overall indebtedness etc. Fabozzi (2002) claims that fundamental investors use valuation models called the discounted cash flow model, capital asset pricing model and the multi-factor asset pricing model.

Jílek (2009) claims that profit is the most important parameter in the stock valuation. We will get to this point later on in the study.

Technical analysis is the technique used by investors who believe in timing the selection of transaction. It does not take into an account company's economic situation. It is based on published stock market data. These data consist of stock prices development, trading volumes and technical indicators. This technique is used to predict short-term price movements. Technical analysis consists of a wide range of methods from easy ones to hard econometrical models. The basic point is that the stock price presents trends through its lifetime. These trends are discovered by investors and then used in the future to predict similar situations. For example, consider a stock price with an increasing long-term trend and a repeating sine oscillation around this trend. When sine goes down it is time to buy the stock because it will go up again in the future because of the increasing long-term trend.

Some investors use a mixture of fundamental and technical analysis. In that case the fundamental analysis is used for picking the undervalued stock and the echnical analysis for the transaction timing.

Market anomaly analysis is based on the inefficiency of stock markets. Investors who believe in this analysis follow patterns which recur through the time

[2] One example of such industry analysis is Porter's Five Forces.

on the market. These patterns perform positive abnormal returns. Fabozzi (2002) names anomalies which are commonly used by some investors: “ the small-firm effect, the low-price-earnings ratio effect, the neglected-firm effect, and various calendar effects”.

A subset of the anomaly analysis is psychological analysis. Psychological analysis helps to predict behavior of people. It builds on opinion that investor’s decisions are hugely affected by emotions. According to crowd psychology people never act without an impact of the outside world but they behave with accordance to a crowd. Only strong individuals have ability to not succumb to crowd behavior.

2.5 Connection between Dividend, Net Income and Stock Price

Investors care about the amount of dividends received and capital gains but where do these values come from?

It is important to know what has an impact on firm’s activities because its net income originates from the company performance and the performance depends on the current market and environment situation. Porter’s five forces introduced by Porter (2008) represent powers which come from the industry. It consists of supplier power, buyer power, competitive rivalry, the threat of substitution, the threat of new entry. An example of Porter’s five force diagram is shown in figure [2] below. PEST analysis introduced by Aguilar in 1967 is a good tool for analyzing business environment. PEST is acronym for political, economic, socio-cultural and technological factors. Even though it is important, we do not really examine business performance from this point of view in the thesis. We continue exploring technical issues that matter in any company such as company profit, dividends and stock price.

Figure 2- Porter's five force diagram:

Source: https://www.mindtools.com/pages/article/newTMC_08.htm

Dividends are paid out in three forms: cash dividends, stock dividends and property dividends. Common way to pay out dividend is cash. It is usual that dividends are paid annually (Europe) or quarterly (United States). Also one-off dividends occur on the market.

There are many studies showing that on ex-dividend day stock prices decrease almost by the same amount as dividend amount itself[3] (Borges, 2008).

Dividends are paid out to investors which hold the company stocks. It comes from company's free money. Free money is acquired from company's operations[4]. Free money is also called the free cash flow. Free cash flow is a cornerstone of discounted cash flow models but such models are used for predicting the future development. Free cash flow does not include the information about investments in assets. The free cash flow formula looks as follows:

[3] Yet, there is a significant difference between an ex-dividend change of the stock price and the amount of dividends (Borges, 2008).

$$
\begin{aligned}
&free\ cash\ flow \\
&\qquad = EBIT\ (1 - tax\ rate) + \ (depreciation) + (amortization) \\
&\qquad + \ (depletion) \ - \ (change\ in\ net\ working\ capital) \\
&\qquad - \ (capital\ expenditure).
\end{aligned}
$$

This study examines historical development of stock returns and the level of capital expenditures that is crucial for the estimation. It is crucial because capital expenditure is used to recover business assets to preserve or increase company free cash flow. Free cash flow also does not take into account the amount of interest paid to creditors. High payments to creditors may influence stock returns as well. We use net income as a proxy variable for free cash flow because it has some favorable properties. It deducts interest expenses paid to creditors and incorporates capital invested into assets. Moreover, many studies such as the papers by Strong and Walker (1993) and Glezakos et al. (2012) consider that net income is a critical variable for explaining stock market returns. The net income formula is:

$$Net\ income \ = \ EBIT - interest\ expense - corporate\ tax$$

We describe how net income is assembled in the following sections. The first part of the formula is EBIT. EBIT is an abbreviation for earnings before interest and taxes. EBIT comes from operating and non-operating activities of a company. These activities incur costs and collect revenues. Revenue is the income from customers related to the current year and costs are expenditures regarding company business related to the current year as well. The most important cost is the cost of goods sold. The cost of goods sold represents a cost directly connected to the core business of a company. Here are some examples: traffic of equipment or labor wages in a factory or price of ingredients and cooks wages in a pizzeria. Another important cost is selling, general and administrative expenses. This cost relates to direct and indirect selling expenses, general operating expenses directly related to the general operations of the company and administration expenses (which consist of executive salaries), general support and taxes. A further important cost is created by tangible assets, intangible assets and natural resources. All these assets lose their value throughout the years until there is no asset. This loss (cost) is represented in financial statements as a percentage of original value incurred every year. When the sum of all past accumulated losses (costs) is equal to the original value of an asset, the asset has no value and it is considered no longer to be an asset[5]. This cost is represented by three groups: amortization (intangibles), depreciation (tangibles) and depletion (natural resources). Following formula show EBIT decomposition:

$$EBIT = revenues - cost\ of\ goods\ sold -$$
$$-selling, general\ and\ administrative\ expenses -$$
$$-depreciation - amortization - depletion$$

Corporate tax rate is a percentage part of the EBIT. It has to be paid to the state where the company operates. Interest expense represents the cost paid to creditors in a return for borrowing money. Company profit can be used in two possible ways. It can be paid out us dividends or retained in the company:

$$Net\ Income => Dividends + Retained\ Earnings$$

If money is retained in the company as retained earnings it can be again distributed as dividends or used as investment next years:

$$Retained\ Earnings => future\ Dividends + future\ Investments$$

Investment is done usually for two important reasons. The first reason is to maintain company's profit which normally connotes something like replacing an old machine in a manufactory and building a new store instead of an old ruined one. It basically means to replace obsolete or old capital with capital which has the same productivity. It is called the gross investment. The second reason is to increase present profit. It means buying new capital which contributes to the productivity that enhances the mentioned profit. It is called net investment (Fabozzi, 2002).

We expect that an increase in net income is considered by investors either as a growth in assets which will cause a growth in future profits or an increase in dividends. Summarizing all the information, we suggest that a rise in dividends and an increase in assets cause a growth in stock prices. Net income determines the amount of dividends and a rise in assets therefore we claim that a positive (negative) change in net income should, ceteris paribus, result in a positive (negative) change in stock prices.

[5] This does not have to be truth in reality.

Stock split also influences stock prices. Stock split is the division of current stocks to more stocks. This split is described by a stock split ratio where the first number tells us how many new pieces of stock will be created and the second number tells us how many pieces of old stock will be used for the new ones. Subramanyam (2014) says that even though there is no value for shareholders in stock split according to theory, interpretation of stock split is still perceived positively. He says that a lower price arising from the split leads to the effect that it is accessible to broader range of investors because of the lower price. He also claims that stock split means that company management expects that they either improved or at least preserved the same development in firm's performance.

2.6 Additional accounting factors

The debt to equity ratio is one of the solvency ratios. It measures the firm's proportion between its company's total debt and its total equity (Subramanyam, 2014). It can be dangerous to invest in companies with high proportion of debt because these companies are more probable to go bankrupt. Companies hold debt at some level basically for two big advantages. One of them is that the loan interest which is paid back to banks is usually supposed to be lower than the return from net operating assets. The difference between loan interest and company return less taxes goes to equity investors. The second reason why companies hold substantive amount of debt is that debt is tax-deductible item whereas dividends are not tax-deductible. Even though it is very convenient to maintain high debt to equity ratio there is a big risk present. This risk is called credit risk. The bad situation comes into reality when company does not have enough cash to pay its liabilities (Subramanyam, 2014). We assume that there is a relationship between debt-to-equity ratio and stock returns. We suggest that stock traders consider companies with higher debt to equity ratios to be more probable to go bankrupt. It means that companies with high debt-to-equity ratios would, ceteris paribus, have on average smaller stock returns.

The book value is another accounting item. It is equal to total amount of assets minus total amount of liabilities Subramanyam (2014). It basically says how much money would be left if a company would go bankrupt suddenly. It is obviously better to have higher amount of net assets. On the other hand, we know that it is convenient to have some amount of debt as well. We suppose that increase in the book value would, ceteris paribus, increase stock returns.

2.7 Economic Fluctuations

All people feel economic fluctuations which come for most of the people unexpected. It is aim of macroeconomists to try to understand and to predict aggregate economic fluctuations. The growth is higher in some years than in others and sometimes it is even negative. Mankiw (2014) determines two states of aggregate output situation. If the real aggregate output grows year-on-year it is called the economic expansion. If the real aggregate output declines it is called the recession. Economic fluctuations are normally labeled in economic theory as the business cycle theory. Mankiw (2014) points out that the name "business cycle theory" says that economic expansion and recession happen in regular periods but that is not true in reality. Economic fluctuations are hard to predict and vary in their length and depth.

Gross Domestic Product in constant prices (also real GDP) is used as an economic variable showing the most comprehensive picture about the economy. It is so because GDP represents all final services and goods produced by the people in the country in the reference year. Real GDP means that GDP is adjusted for inflation.

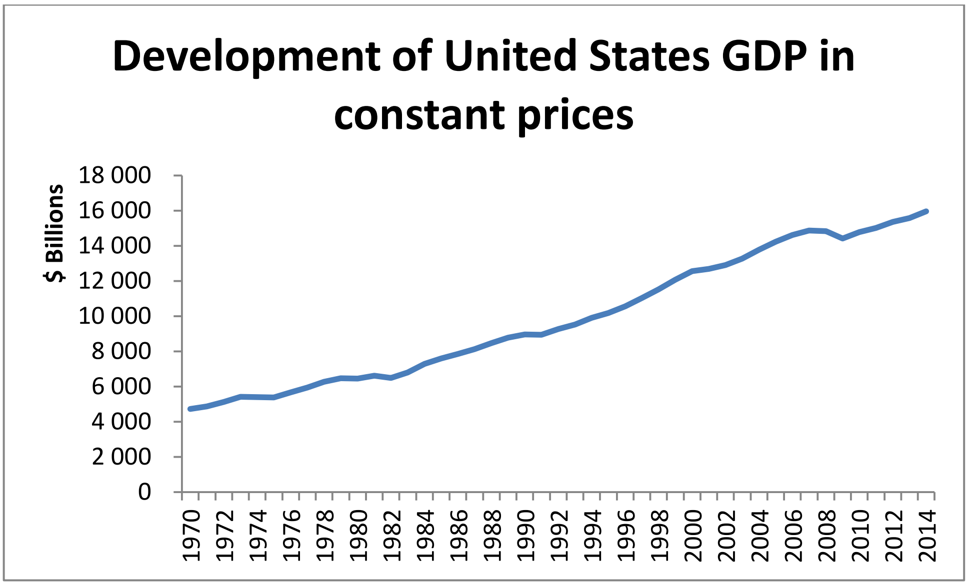
$$GDP = Investment + Consumption + Net\ Export + Government\ Expenditures$$

GDP value is calculated from money spent on any investment, people consumption, goods and services sold in abroad minus goods and services imported and sold domestically (Net Export) and expenditures governmental, municipal and state related organizations. GDP also represents the overall income in the economy. That is because all expenditures are also income for someone. GDP can be also expressed in income.

Down below is the figure [3] showing development of the United States GDP in constant prices from 1970 to 2014. The real GDP increased on average by 2.8 %

every year in this time period. We can see that there was an economic real growth in the United States in the long run. Long term economic growths are usually in the theory described by long term growth models such as the Solow model and other more sophisticated models. Economic growth is sometimes negative such as in 2008 and 2009 in the example of the United States.

Figure 3:

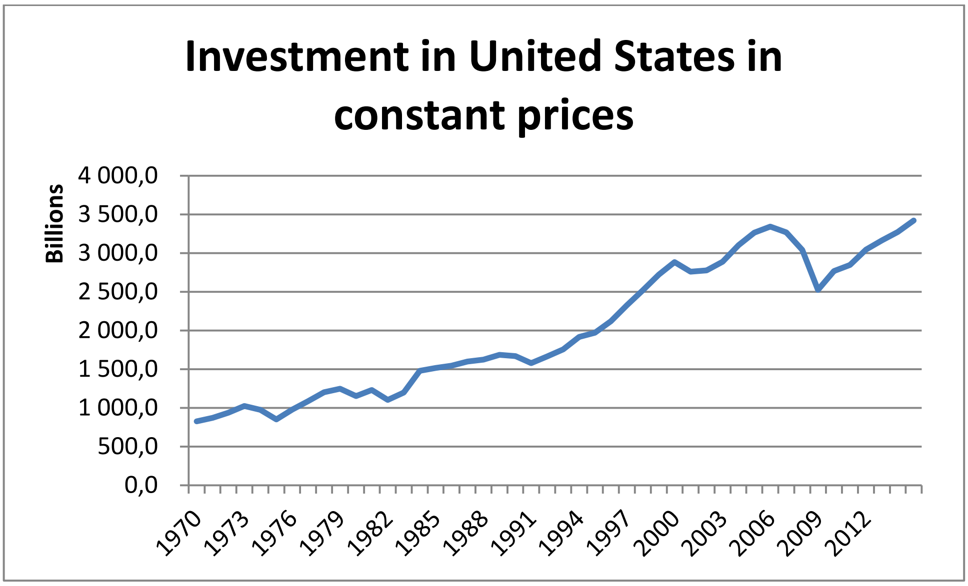


Source: OECD

Mankiw (2014) states that the alternation of economic cycle has a disproportionate impact on welfare. People view the intervals when output grows as good times and intervals when output decreases as bad times (Mankiw, 2014).

Mankiw also says that investment is the main item which dramatically changes if a recession occurs. It is reasonable because when economic conditions get worse the first place where people (companies) can save money is investment. He postulates that the significant amount which is shortening in a recession is a decline in expenditures on housing, factories and inventories. We can see that kind of relationship at figure [3] and [4]. If real GDP declines, investment usually decreases more dramatically.

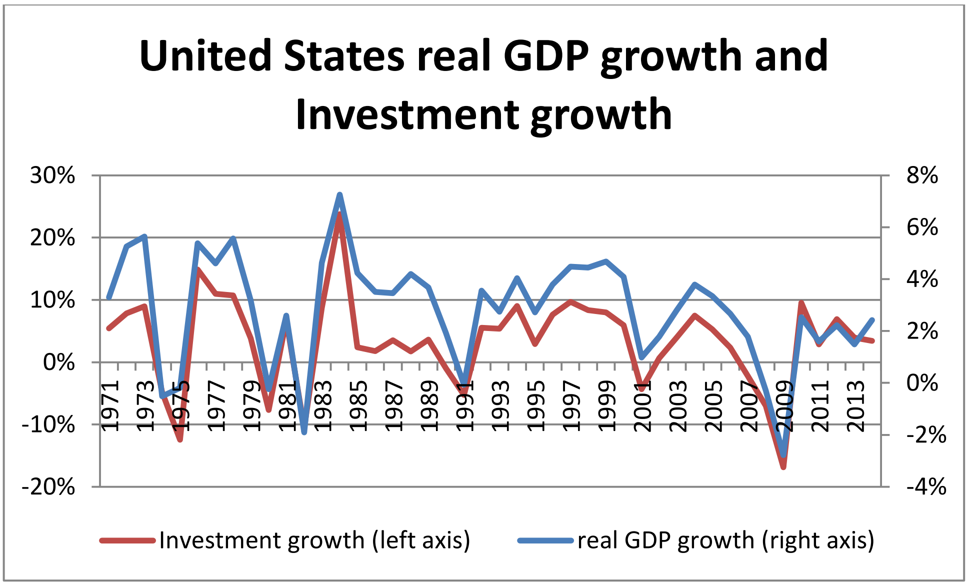
Figure 4:



Source: OECD

We can see previously explained relationship between Investment and GDP closer in the figure [5].

Figure 5:



Source: OECD

Most of the macroeconomic variables attributable to income or output actually move along with the economic cycle (Mankiw, 2014).

3 Former studies

Some studies examined price of equities before and after publishing particular information. One such attempt is the work by Brown and Ball (1968) which researched association between security prices and monthly profit numbers estimated over 246 months, January, 1946 through June, 1966 using companies from the S&P 500. They found out that there is a positive relationship between unexpected change in net income and unexpected change in security prices. It means that companies with a positive sudden change in net income, on average, lived through a positive sudden change in equity price and vice versa.

On the other hand, Lev (1989) found out that net income has very low explanatory power for equity prices. His research indicated unstable and weak correlation between stock returns and net income and low explanatory power of company profit for the development of equity prices. He used cross-sectionally regressed residual returns (April through March together 550 observations) on the percentage change in annual earnings of the New York Stock Exchange firms listed on the Center for Research in Security Prices tape (December 31 fiscal year).

Strong and Walker (1993) come with extension of previous models using panel data and other improvements. They use stock return as dependent variable. They also use three types of net incomes as independent variables or one comprehensive summary of all three types. These three types are extraordinary earnings, exceptional earnings, pre-exceptional earnings and exceptional and extraordinary items. They estimated eleven models with different variations of explanatory variables, cross section effects and time effects. The best (and also significant) results were achieved using all named variations with earnings disaggregation. Important conclusion is that all three types of earnings probably influence stock returns. Research used 2036 observations from 146 United Kingdom companies quoted on the London Stock Exchange with at least 10 consecutive years. This study should be the cornerstone for our empirical part.

Sloan (1996) focused on examination of specific parts of financial statements namely accruals, cash flow[6] and earnings itself. Results in his paper say that the information content of accruals and cash flow is systematically different. On the other hand, Sloan finds that systematic difference does not influence stock prices by that time when it impacts future earnings. He elaborates that many recent studies have provided a positive relationship between the change in earnings and stock returns but he doubts that reported earnings really summarize value relevant information. Thus, he divides net income to accruals and cash flow and expects cash flow to have higher earnings persistence and accruals to have lower earnings persistence. According to the results of the paper it seems that there is lower persistence coming from accrual component of earnings than relative to cash flow component. It also shows that investors take care more about accruals than cash flow component for prediction of earnings. Overall results imply that investors do not fully take into account the higher (lower) persistence of earnings performance attributable to the cash flow (accruals) which means that there is a possibility to earn abnormal returns because of the investor naive approach.

Glezakos et al. (2012) studied connection between the explanatory power of BVPS and EPS in terms of stock prices. Research data consisted of 38 randomly chosen companies listed on the Athens Stock Exchange. The reference period was from 1996 to 2008. Glezakos et al. estimated regression for every year separately. Results showed that coefficients of the BVPS and the EPS variables were significant and R-squares from models were high.

Johnson's (1999) research provides an extension of previous studies on the determinants of earnings respond coefficients and behaviour of stock returns. He found out that earnings persistence is significantly greater during expansions than during recessions. Consistent with a decrease in the aggregate availability of external financing when credit is tight, earnings persistence is significantly greater during credit crunch periods than during reliquification periods. It means that earnings response parameters are positively connected to GDP growth.

[6] Cash flow and accruals are meant here to be part of the earnings.

Elliot and Douglas (1996) examined how “nonrecurring and unusual” charges influence the coefficients of earnings determining stock returns. They found that earnings response coefficients generally decrease in the presence of write-offs and remain relatively low for some period thereafter. The earnings response coefficients component of earnings declines as the frequency of “nonrecurring and unusual” charges increases, becoming insignificant for longer sequences.

Harvey et al. (2014) wrote a paper examining many variables which were already researched and proved to explain movements in stock returns. They created a new multiple testing framework. A factor used as an independent variable for stock returns has to pass a much higher hurdle according to this new framework. They state that the usual hurdle of t-test equals to 2 moves to the hurdle of t-test equals to 3. They actually claim that most of the discovered findings in the past are not true because they do not pass the hurdle of the new t-test.

Amir and Lev (1995) and Lev and Zarowin (1999) found out that earnings and other accounting information do not provide explanatory power for stock returns for firms which operate in hi-tech sectors or services which have high portions of intangible assets. According to the research by Lev and Zarowin, there is a trend in developed economies that firms follow the change. The change is caused by innovation, competition or deregulation. In the accounting point of view, it basically means that the change incurs expenses, but it also delivers benefits (earnings) later on. It implies that investment expenses do not appropriately match with benefits delivered in the future. This change does not fit with the traditional view that accounting provides real and useful information for investors. Lev and Zarowin state the following about the activities which are behind the term “change” in companies: “These activities, mostly in the form of investment in intangible assets such as R&D, information technology, brands, and human resources, constantly alter firms' products, operations, economic conditions, and market values. We argue that it is in the accounting for intangibles that the present system fails most seriously to reflect enterprise value and performance, mainly due to the mismatching of costs with revenues.” They examined period from 1978 to 1996 and used regression to research the strength of the relationship between accounting information (earnings, assets and cash flows) and time. They found out that this relationship probably decreases significantly over time therefore relevance of accounting information diminishes year by year.

4 Data and Methodology

4.1 Data

We decided to examine the United States stable big blue chip stocks. The reason is that we can easily find companies which have a long-term history in both financial statements and stock prices. Unlike the new companies or smaller companies our researched firms show “stable” development. We did not pick European ones because there were no stocks with such a long history as in the U.S. We did not consider any other world stocks because of the reliability of their financial statements.

Companies used in the research come from the S&P500 Index. The first criterion for the selection of the index is that it consists of 500 biggest companies by market capitalization in the U.S. The second criterion is the diverse constituency of the stocks. The third criterion is the long-term stock price history that is possessed by the significant amount of stocks in the index. Thus, we have chosen 25 companies with their headquarters in the United States which satisfied the criterion of data availability[7] and represented all kinds of industries[8]. Industry taxonomy was chosen based on the Global Industry Classification Standard (GICS) developed and used by the S&P 500 and MSCI (MSCI, 2017).

[7] We mean availability of net income from 1991 to 2016 for every company.

[8] We actually omitted property sector because firms from that sector from the index do not satisfy the condition of data availability.

Table 1:

Companies examined in research (tickers)								
AAP	ABT	AEP	APA	AXP	BDX	BLL	CAT	CINF
CMS	CSX	CTL	DD	DUK	FTR	JPM	LLY	MCD
MMM	MO	T	CCL	NKE	GIS			

The S&P 500 stock market index is one of the most famous indices. It was founded in 1957 and it is managed by S&P Dow Jones Indices LLC. The index assets consist of roughly USD 2.2 trillion. It covers about 80 % of the available market cap in the U.S. stock market and consists of 500 big U.S. companies (S&P Dow Jones Indices, 2017).

Our data related to company income statements and balance sheets were collected from the ThompsonReuters financial database directly via their own application. Data related to company stock prices were collected from Yahoo! Finance (2017) directly through the Yahoo website. We actually had to utilize two time sequences for all data because not all companies publish their quarterly reports in the same time. The companies in the first group, which includes Nike, General Mills and Carnival Corporation, publish data always at the end of February, May, August and November every year. On the other hand, all other companies publish quarterly data at the end of March, June, September and December every year. We downloaded monthly historical stock prices data for every company and adjusted it for annual reports data. These monthly stock prices are recorded in the very beginning of every month. We needed only quarterly stock prices therefore we picked up only those months that directly follow the months when quarterly company reports were published. It ensures that we have direct information about stock prices corresponding to the published annual reports (earnings). We also had to divide companies to two groups because of the quarterly report time mismatch. We have chosen March, June, September and December for companies from group one[9] and April, July, December and January for group two[10]. Time period of our data is from March (April) 1991 to June (July) 2016.

Stock prices provided by stock exchanges are not ready to be used as benchmark for our estimation because stock splits and dividend issuances were present. Stock splits and dividend issuances influence stock prices but they are not incorporated in the price therefore we need to handle this problem. In the research, we use the stock price noted as "Close price adjusted for dividends and split" as a reference stock price for our computations and estimations. The reason is that the "stock price adjusted for dividends and split" is a stock price which is adjusted for all splits and dividend issuances recorder through the examined period. These rules adhere to the Center for Research in Security Prices standards. Applied split multipliers follow the split ratio and dividend multipliers follow the rule that a dividend is computed as a percentage of net income and then extracted from the last known original stock price. For example, when every stock is split into two company stocks, then the stock price is multiplied by two. When a company issues $0.10 dividend and the firm closing price is $25, adjusted price for dividend is equal to $=> [\left(1 - \frac{0.1}{25}\right) * pre - dividend\, price]^{11}$. We use this pre-calculated "Close price adjusted for dividends and split" because it is needed to have the stock price already adjusted for any other influences which could have an impact on estimation.

4.2 Data Description

We start with a basic data description. We have 2550 observations for our research. This dataset applies for 25 companies from March (April) 1991 to June (July) 2016. 93 % (2371) of the reported quarterly earnings were positive in the reported period. 54 % (1377) of the stock returns were positive.

At the beginning of the reference time period in March (April) 1991 was the median stock price of companies equal to $4.4. At the end of the time period in June

[9] It consists of: Nike, General Mills, Carnival Corporation.
[10] It consists of all other companies.
[11] Source: https://help.yahoo.com/kb/SLN2311.html.

(July) 2016 was the median stock price of companies equal to \$67.8. The absolute change of median between these two periods is equal to \$63.4. The relative (percentage) median change between these two periods is 1,445 %. We calculate that the inflation in the United States grew in the same period by 105 % (OECD statistics). We conclude from the previous information that stock prices grow a lot faster than the price level for the dataset.

A stock return tells us the percentage we would earn by buying the company's stock at the time t-1 and selling it at the time t. We actually calculate a median stock return between two quarters for all data and the result is equal to 3.5 %. Thus we can say that the median equity price grew by 3.5 % between every two quarters in the reported period.

Median stock return between two quarters for all data $=> median(\frac{P_{it}-P_{it-1}}{P_{it-1}})$

where:

P_{it}= stock price of a company i at period t,

P_{it-1} = stock price of a company i at period t-1

The median U.S. GDP nominal growth rate was equal to 0.66 % in the researched period. If we compare the median stock return between two quarters for all the data (3.5 %) and the median U.S. GDP nominal growth rate we conclude that it seems that stock returns grow relatively faster than GDP over time (at least in case of United the States).

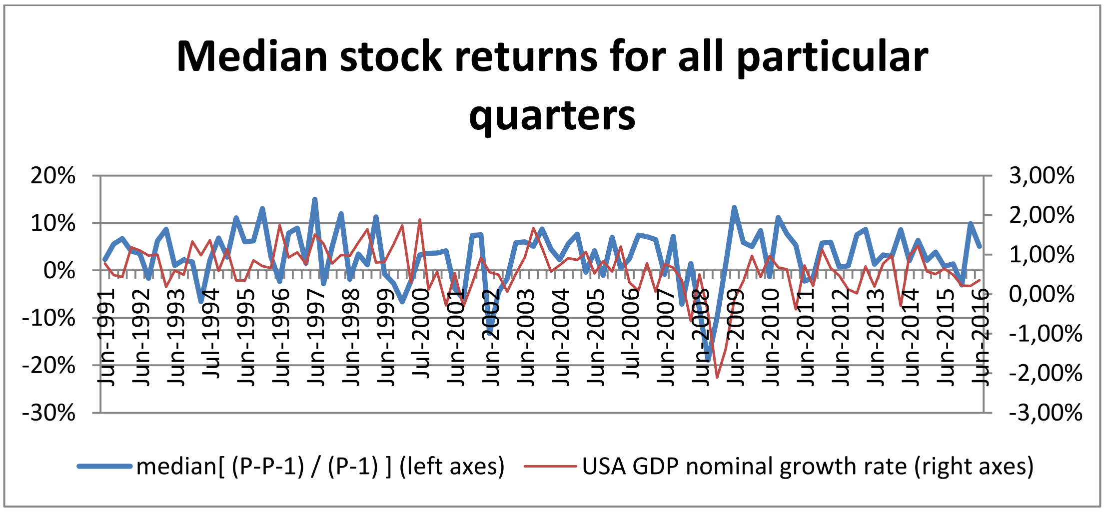
We also calculate the median stock returns of all companies for every particular period (figure [6]). We add the U.S. nominal GDP annual growth rate[12] to the figure [6] to see if there exists some possible relationship between nominal GDP growth rate and stock returns. We can see that in some periods of the time frame it seems that there exists a relationship (as between 2008 and 2009) but in some periods this relationship does not work (as just before start of 2014).

For more detailed description there is the figure [7] which shows stock returns for all firms and for the whole period. Even though it is little bit unclear

[12] https://stats.oecd.org/index.aspx?queryid=350#

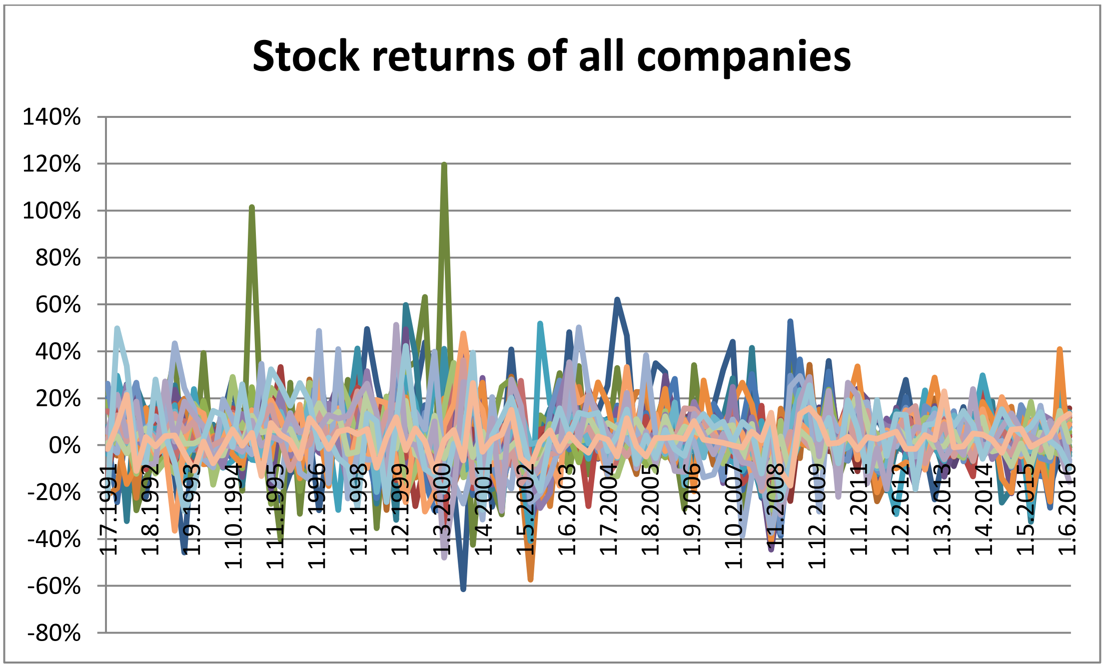
because of many data clustered in the same area in the graph, it gives us some view. We can see that most of the values oscillate between minus and plus 30 % and that some periods have bigger variations than other periods such as the years 2000 and 2015.

Figure 6:



Source: Yahoo! Finance, own calculations

Figure 7:



Source: Yahoo! Finance, own calculations

4.3 Methodology

4.3.1 The first approach: Panel estimation

Previous research suggest that there is a connection between the development of price earnings and stock price changes. We conduct various types of estimation with different variables and parameters using panel regression. We are inspired by the study from Strong and Walker (1993) and Chu et al. (1997). The following formula is the cornerstone of our research:

Equation 1:

$$\frac{P_{it} - P_{it-1}}{P_{it-1}} = a + b\frac{E_{it} - E_{it-1}}{P_{it-1}} + u_{it}$$

where:

P_{it} = stock value of company i at period t,

P_{it-1} = stock value of company i at period t-1,

$P_{it} - P_{it-1}$ = stock return of company i between period t and t-1,

E_{it} = net income of company i in period t,

a = an intercept parameter to be estimated,

u_{it} = a conventional, mean zero, disturbance term

b = a slope parameter to be estimated (generally referred to in the literature as the earnings response parameter)

Strong and Walker (1993) performed various types of estimation examining the behavior of the relationship between stock returns and the difference between firm's earnings scaled by market capitalization. Strong and Walker (1993) and Chu et al. (1997) used also another independent earnings variable which is company's profit scaled by market capitalization. In the research, we represent firm's profit as EPS and market capitalization as the stock price because we are not able to collect mass data. Fama and French (1993), Carhart (1997) and Chen et al. (1986) tried to find other factors which influence stock prices. We just choose some of these factors and we add them to our model. It is reasonable to include them because they can improve the estimates. On the other hand, we should pay attention to a possible presence of multicollinearity. We employ only a few additional factors (independent variables). The first reason is that we have a specific group of companies and the second reason is that it is hard and sometimes even impossible to collect them. Our dataset of S&P500 companies is big (according to book and market values) and represents mature companies which have a long term history at the stock market. Thus, we choose to not employ important factors such as the size and momentum. We choose these factors: the GDP growth news as representative of macroeconomic factors, the consumer sentiment index as representation of consumer preferences (what people are willing to buy), the percentage change in BVPS[13], the level of debt-to-equity ratio and possible dummy variables for structural breaks.

Firstly, we estimate our benchmark model consisting of the stock return as a dependent variable and the difference in EPS over former stock price as an independent variable (equation [1]). Then we run second estimation. We add another independent variable which is equal to EPS over former stock price. After that, we gradually incorporate other factors and always postulate results and remove insignificant factors.

The model which includes all of the independent variables looks as follows[14]:

Equation 2:

$$\frac{P_{it} - P_{it-1}}{P_{it-1}} = a + b * \frac{E_{it} - E_{it-1}}{P_{it-1}} + c * GDP + d * C + e * \frac{BVPS_{it} - BVPS_{it-1}}{BVPS_{it-1}} + f * \frac{TL_{it}}{TE_{it}} + g * D_{it} + u_{it}$$

where:

P_{it} = stock value of company i at period t,

P_{it-1} = stock value of company i at period t-1,

[13] Unfortunately, we could not obtain book equity to market value because we have access only to BVPS.

[14] However, we will not estimate it. We just use gradual approach of estimating regression, then dropping insignificant factors, adding new factors and over again until we use all factors.

E_{it} = net income of company i in period t,

a = an intercept parameter to be estimated,

u_{it} = a conventional, mean zero, disturbance term

b = a slope parameter to be estimated (generally referred to in the literature as the earnings response parameter)

c = a GDP slope parameter to be estimated

GDP = percentage nominal GDP growth (in %)

d = consumer sentiment index parameter to be estimated

C = consumer sentiment index

e = BVPS percentage change slope parameter to be estimated

$BVPS_{it}$ = BVPS of company i at period t

TL_{it} = total liabilities of company i at period t

TE_{it} = total liabilities of company i at period t

f = a debt-to-equity slope parameter to be estimated

D_{it} = 1 if itth unit is in the treatment group and 0 otherwise

g = a dummy variable slope parameter to be estimated

(Lev, 1989) warns about problems connected with estimating the relationship between the change in earnings and stock returns presented in previous papers:

1. Poor specification of the estimating equation, such as a failure to allow for cross-sectional variation in the regression parameters.
2. Inappropriate choice of the assumed proxy for expected earnings.
3. Poor informational properties (quality) of reported earnings because of biases induced by accounting measurement practices or creative "abuses" of the earnings measurement process.

We try to treat problems in our research as follows:

ad 1. We use panel regression that allows for cross-sectional variation. We employ Hausman test to differentiate if the fixed effect model or random effect model is better.

ad 2. We set our estimated variables in the same way as Strong and Walker (1993) and Chu et al. (1997) in their papers.

ad 3. We retrieve financial statement data from the worldwide application and database called the ThompsonReuters. Analysts from the ThompsonReuters restate the statements for uniform representation and correct older published misspecifications inside the statements.

At the end, we summarize results from all the estimations and draw conclusions about the role of earnings variables and other factors.

4.3.2 The second approach: Multiple linear regression estimation

We examine another approach which is based on running a simple regression on every quarter separately. We add a complementary estimation to have the hypothesis about earnings influence on stock returns more robust. This approach was performed by Glezakos et al. (2012) studying the case at the Athen's stock exchange. Glezakos used three variables. He regressed logarithmically transformed EPS and logarithmically transformed BVPS on logarithmically transformed stock prices. He suspected EPS and BVPS from collinearity therefore he ran models with BVPS and EPS separately and then together to compare results. He has found very good results showing high R-squares and significant both models and coefficients.

Following formulas represent three models estimated and examined later on:

Equation 3:

$$\log(stock\ price) = a + b * log(EPS) + c * \log(BVPS) + \varepsilon_1$$

Equation 4:

$$\log(stock\ price) = d + e * \log(EPS) + \varepsilon_2$$

Equation 5:

$$\log(stock\ price) = f + g * \log(BVPS) + \varepsilon_3$$

EPS = EPS at time t,

BVPS = BVPS at time t,

a, d, f = intercept parameters to be estimated,

b, e = intercept parameters of log(EPS) to be estimated,

c, g = intercept parameters of log(BVPS) to be estimated,

$\varepsilon_1, \varepsilon_2, \varepsilon_3$ = a conventional, mean zero, disturbance term

5 Estimation

We estimate two groups of models in this section. The first group of models are the benchmark models specified in equation [1] and [2]. They are panel data models and their estimation is inspired by Strong and Walker (1993) and Chu et al. (1997). The second group of models use a multiple regression approach that runs a simple regression on every quarter and then compares the results from all quarters. These models serve as a complementary estimation to the panel data models to verify our findings from the first estimation. Multiple regression models are specified in equation [3], [4] and [5]. The second group of models is inspired by the research by Glezakos et al. (2012).

5.1 The first approach: Panel estimation

We start with panel estimation. In the first step we have to examine if we have stationary data. We use the Augmented Dickey Fuller (AFD) test for that. We run the test for every time series from the panel model (for every company separately). We find that twenty time series from the dependent variable (stock returns) have p-value smaller than 0.01, two smaller than 0.05 and one smaller than 0.1. Thus, we reject the null hypothesis that the unit root is present at the 99,95 and 90% level of significance respectively (table [21]). It means that we expect the dependent variable to be stationary. We also analyze stationarity in independent variables. The first independent variable is the difference of EPS between two consecutive periods over the former stock price (table [24]). ADF test tells us that all twenty five time series have their p-value smaller than 0.01, therefore we reject the null hypothesis that the unit root is present at the 99% level of significance. The second independent variable is the current EPS over the former price (table [23]). The ADF test reveals that eleven time series have their p-value greater than 0.1 and four have it greater than 0.05 but smaller than 0.1. We cannot reject the null hypothesis of the unit root for eleven (four) companies at the 90 (95)% level of significance. Even though it seems that this variable is not stationary, we still try to use it in our model. On the other side we should be very careful about inference coming from this estimation. The third independent variable is the nominal percentage GDP growth rate (table [19]). A time series has its p-value smaller than 0.01. Thus, we reject the null hypothesis that the independent variable has the unit root at the 99% level of significance. The fourth independent variable is the consumer sentiment index (table [20]). A time series has its p-value smaller than 0.01 therefore we reject the null hypothesis that the independent variable has the unit root at the 99% level of significance. The last independent variable is the percentage change in BVPS. According to the ADF test, four time series have their p-value greater than 0.1, one greater than 0.05 but smaller than 0.1, three greater than 0.01 and smaller than 0.05, and all the rest time series have it smaller than 0.01. This means that we cannot reject the null hypothesis of the unit root existence in five cases at the 95% level of significance. However, we can reject the null hypothesis of the unit root at the 95% level of significance in twenty one other cases, therefore we assume that the time series from this variable are stationary. In the end, we conclude that all the independent variables and their time series seem to be stationary except of EPS over former price. We still use EPS over former price in later estimations but we are very aware of inference.

We have to take care of multicollinearity as well. We estimate all periods together to get one result. We use the variance inflation factor to find if multicollinearity is present. We run the test on all independent variables. Results of the estimation are in the table [2]. Asteriou (2011) claims that the value of variance inflation factor exceeding 10 (equivalent to 0.9 R-squared) is generally viewed as the threshold for problematic multicollinearity which could dramatically influence the model. We have all variance inflating factors smaller than 10 and even smaller than 3. It is surely interesting to point out that the variance inflating factor which is equal to 2 corresponds to R-squared equal to 0.5. Hence, we do not have to take care of multicollinearity so much.

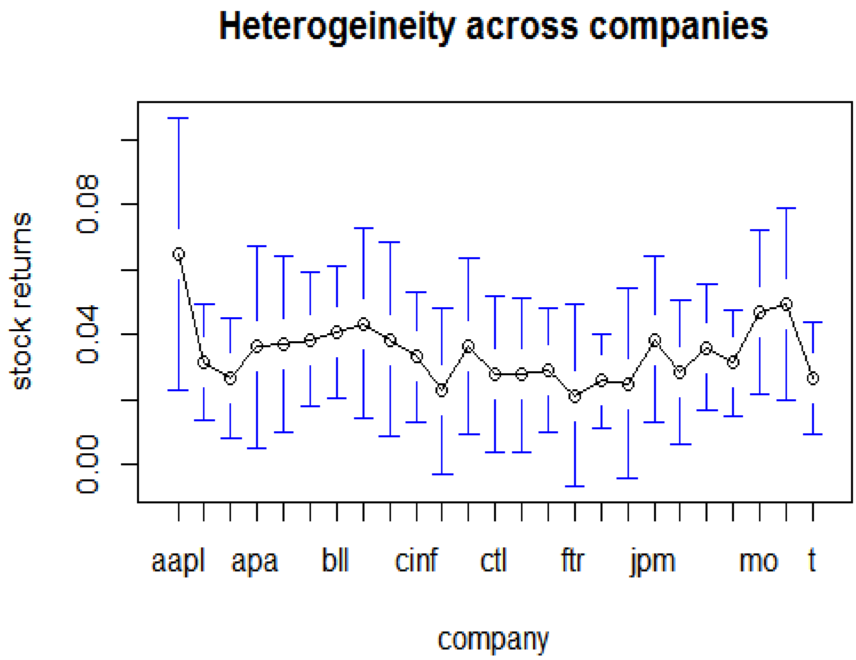
Table 2:

Examining independent variables and their possible multicollinearity			
Name of independent variable	Variance Inflating Factor	Name of independent variable	Variance inflating Factor
EPS change over stock price	1.84	BVPS percentage change	1.02
EPS over price	2.17	Expected GDP	1.16
Consumer sentiment index	1.03	Debt-to-Equity	1.37

Source: Own calculations, ThompsonReuters, University of Michigan

We plot the heterogeneity of stock returns across all 25 companies in figure [8]. This figure shows 95% confidence intervals around the means. Means are displayed as empty points connected with one line. We can see that the company with ticker aapl (Apple Inc.) suffers from the biggest variation in the group and the highest stock returns at the 95% confidence intervals. It seems that companies stock returns are not the same during the time but it does not show any big difference across the companies. We see in the figure [8] that there is some heterogeneity between companies but we do not know if this heterogeneity is caused by random or fixed effects. It is reason to test for it later on.

Figure 8:



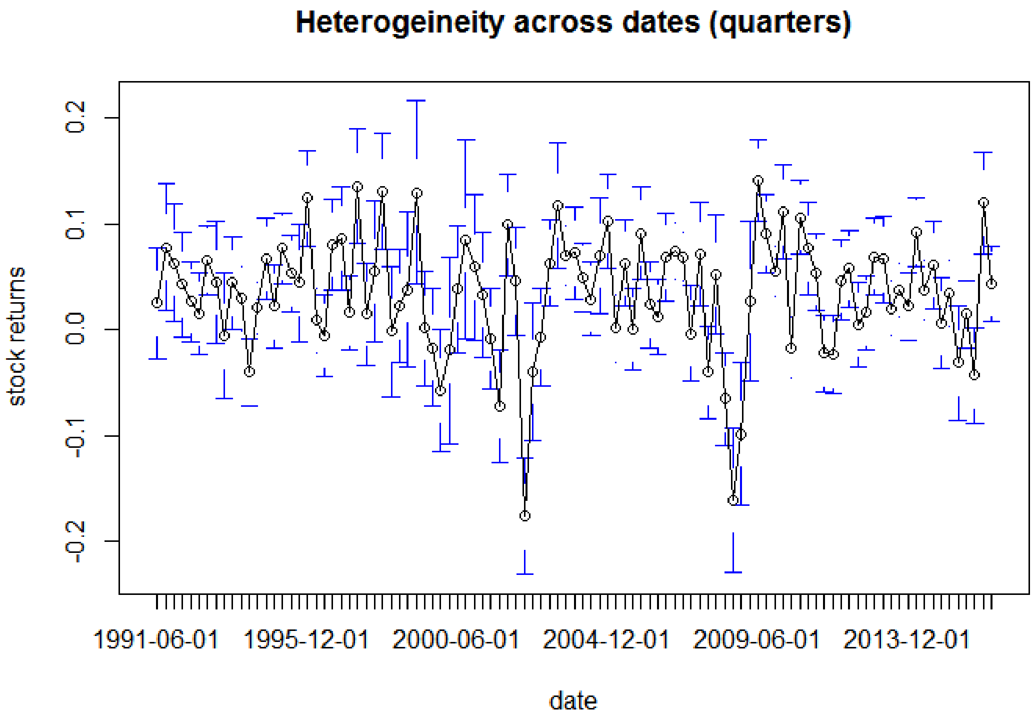
Source: Own calculations, Yahoo! Finance

We also plot heterogeneity in stock returns across all 101 quarters. Figure [9] shows this relationship. Blue lines in the graph represent 95% confidence intervals around the means and points represent means for every quarter. This graph depicts much more interesting results at the first sight. It looks like means and also confidence intervals change a lot during some quarters. It seems that there are two dramatic drops in the graph. We cannot see where exactly these drops are in the time because software output does not provide axis with all quarters. That is the reason why we calculate these means manually and find the biggest drops ourselves. The first big drop in mean is in the period ending in 1.6.2002. The value of this mean is equal to -0.18 representing a decrease by 18 % in stock returns of all companies[15] at that time on average. The second drop in mean is in the period ending in 1.9.2008. This fall is equal to -0.16 representing a decrease by 16 % in stock returns of all companies at that time on average. We see another move in stock return means which is not so apparent. It is an upward move. It is in the period ending in 1.3.2016 and it is equal to 0.12 representing an increase by 12 % in stock returns of all

[15] We remind that all stock returns are calculated with respect to the last quarter.

companies at that time on average. We try to deal with this problem using dummy variables later on.

Figure 9:



Source: Own calculations, Yahoo! Finance

It is not totally clear which panel model we should use. We assume that pooled OLS is not the right model because it does not possess any heterogeneity, neither the random nor fixed effect. The graphs above give us some notion about choosing between the random effect model and the fixed effect model. We hypothesize that the fixed effect model should be appropriate. Although we are not totally sure if individual effects (company effects) are correlated with the regressors in the model.

We start with estimating the random effect model and the fixed effect model. These models have just one independent variable - the EPS over the former stock price. We save these estimations to run tests to distinguish which model is the most appropriate one. Firstly, we run the Hausman test because we cannot be sure if we have random or fixed heterogeneity present. The null hypothesis of the test is that the preferred model is the random effect model. The Hausman test p-value is equal to 0.35 (table [3]) which means that we do not reject the null hypothesis that the random effect model is better than the fixed effect model at the 95% level of significance.

Table 3:

Hausman test – comparison of the Fixed effect model and the Random effect model	
p-value:	0.35

Source: Own calculations, Yahoo! Finance, ThompsonReuters

We have found out that we should use the random effect model. We present results from the first model incorporating just one independent variable (table [4]) and the results are surprising. Firstly, we can see that the p-value of the t-test for the independent variable is equal to 0.70, therefore we do not reject the null hypothesis that the coefficient in the model is equal to zero at the 95% level of significance because 0.70 > 0.05. We have just one independent variable in the model therefore the t-statistic is the same as the F-statistic.

Table 4:

First model				
	Estimate	t-value	Pr(>|t|)	
(Intercept)	0.0344658	17.6365	<2e-16	***
EPS change over price	0.0106493	0.3899	0.6966	
R-Squared:	6e-05			
Adj. R-Squared:	-3e-3			
F-statistic:	0.152038 on 1 and 2523 DF, p-value: 0.69663			
Signif. codes:	0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1			

Source: Own calculations, Yahoo! Finance, ThompsonReuters

A a very interesting result we have found is that the earnings independent variable coefficient does not seem to be significant. We try to improve our estimation by adding another independent variable and setting up the second model. This independent variable is the EPS over the former stock price and the results are in table [5]. We estimate surprising findings again. The P-value of the F-statistic is again higher than 0.05 (0.44 > 0.05). We do not reject the null hypothesis that all the coefficients in our model number two are zero at the 95% level of significance. Unlike Strong and Walker (1993) and Chu et al. (1997), we have got results which say that scaled earnings probably do not explain stock returns. We have not looked into the presence of serial correlation and heteroskedasticity which could cause standard errors of the coefficients to be even higher. On the other hand, we have found very poor results even without investigating the mentioned problems.

Table 5:

Second model			
	Estimate	t-value	Pr(>|t|)
(Intercept)	0.033243	14.9745	<2e-16 **
EPS change over price	-0.014621	0.034196	0.6690
EPS over price	0.047928	0.039075	0.2201
R-Squared:	7e-04		
Adj. R-Squared:	-1e-4		
F-statistic:	0.827982 on 2 and 2522 DF, p-value: 0.43705		
Signif. codes:	0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1		

Source: Own calculations, Yahoo! Finance, ThompsonReuters

Although we have discovered so poor results we try to add more independent variables to discover if the relationship could go better. Also, it is interesting to see if other factors explain the behavior of stock returns anyway.

All variables which we add continuously are either the variables which were proven to have a significant relationship with stock returns or they are proxies for such variables.

We add the consumer sentiment index which mirrors the mood of consumers about shopping. The shopping could be connected with stock purchasing. Results from the third model are available in table [6]. The F-statistic p-value is a lot smaller than 0.05, therefore we reject the null hypothesis that all coefficients in the model are zero and the model is useless at the 95% level of significance. The P-values of t-tests for coefficients of the first two variables are still greater than 0.05 (0.59 > 0.05, 0.19 > 0.05), therefore we do not reject the null hypothesis that they are zero at the 95% level of significance. On the other hand, we can see that the Consumer Sentiment Index variable has its p-value of t-test smaller than 0.05 ($4*10^{-6} < 0.05$). We reject the null hypothesis that the coefficient of this variable is equal to zero at the 95% level of significance. So far, it looks like earnings variables do not influence the stock returns but consumer sentiment does.

Table 6:

Third model				
	Estimate	t-value	Pr(>|t|)	
(Intercept)	0.0325973	14.2322	< 2.2e-16	***
EPS change over price	-0.0182986	-0.5350	0.5927	
EPS over price	0.0511383	1.2980	0.1944	
consumer index	0.1915040	4.6263	3.91e-06	***
R-Squared:	0.009			
Adj. R-Squared:	0.008			
F-statistic:	7.67387 on 3 and 2521 DF, p-value: 4.193e-05			
Signif. codes:	0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1			

Source: Own calculations, Yahoo! Finance, ThompsonReuters, University of Michigan

However, we have to be aware of other problems which could arise . It is heteroskedasticity and autocorrelation. We use the Breusch-Godfrey test embedded in R to test for serial correlation. The null hypothesis of this test is that there is no serial correlation in the model. Results from the test are available in table [7]. Our p-value is much smaller than 0.05 ($2*10^{-11} < 0.05$) that is why we have to reject the null hypothesis that there is no serial correlation in the model at 95% level of significance. We perform the Breusch-Pagan test where the null hypothesis is that the error variances are all equal (model is homoskedastic). The p-value of the test is smaller than 0.05 ($2*10^{-16} < 0.05$) hence we reject the null hypothesis that the error variances in the model are constant at 95% level of significance. It means that we have both heteroskedasticity and serial correlation present in the model.

Table 7:

Third model – testing for serial correlation and heteroskedasticity	
Breusch-Godfrey test p-value:	$2*10^{-11}$
Breusch-Pagan test p-value:	$2*10^{-16}$

Source: Own calculations, Yahoo! Finance, ThompsonReuters, University of Michigan

We can handle the problem connected with heteroskedasticity and serial correlation by using the robust covariance matrix estimation (sandwich estimator) which corrects standard errors of our estimates. Estimates with robust covariance matrix provide heteroskedasticity and serial correlation consistent results. We get the following results, presented in table [8], when we employ the sandwich estimator. The change in the t-statistic was so small that it did not take a shape in our results at all. The significance of all variables stays the same as in previous estimation without using robust estimation. We can barely notice that the p-values of coefficients changed. We look at the consumer sentiment index coefficient which is equal to 0.19. We interpret it as that a one percentage point increase in consumer sentiment index would, ceteris paribus, result in a 0.19 percentage point increase in stock returns.

Table 8:

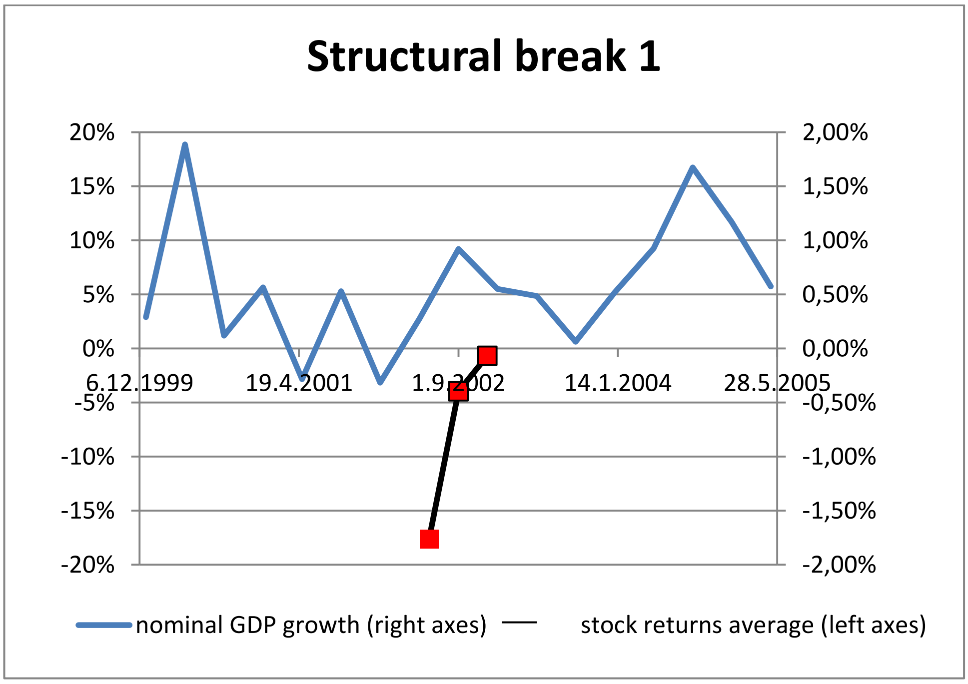
Fourth model with heteroskedastic and clustered standard errors				
	Estimate	t-value	Pr(>|t|)	
(Intercept)	0.0325973	14.2322	< 2.2e-16	***
EPS change over price	-0.0182986	-0.5368	0.5914	
EPS over price	0.0511383	1.2704	0.2040	
Consumer index	0.1915040	4.6306	3.83e-06	***
R-Squared:	0.009			
Adj. R-Squared:	0.008			
F-statistic:	7.67387 on 3 and 2521 DF, p-value: 4.193e-05			
Signif. codes:	0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1			

Source: Own calculations, Yahoo! Finance, ThompsonReuters, University of Michigan

We add another independent variables and create the fifth model. We still keep earnings variables in the model even though they were insignificant in the fourth model and seem to be useless for explaining stock returns. New independent variables are the nominal GDP growth rate from the previous quarter (proxy GDP growth news), dummy variables for dramatic decreases in stock returns in 1.6., 1.9., 1.12.2002, 1.6., 1.9., 1.12.2008 and a dummy variable for the big jump up in 1.3.2016.

We might think that these big drops, both persisting for three periods, are connected with a negative GDP growth because of the Johnson’s research (1999). We create a graph which shows the development of nominal GDP and the placement of these two drops in average stock returns (labeled with red color). We call the drops structural breaks. We can see in figure [10] that this relationship between nominal GDP growth and stock returns does not seem to be really true for the first fall in stock returns. We can see that even though the nominal GDP growth is positive (the blue line and left axes) in this time, the stock returns experience negative development (the black line with red dots and right axes).

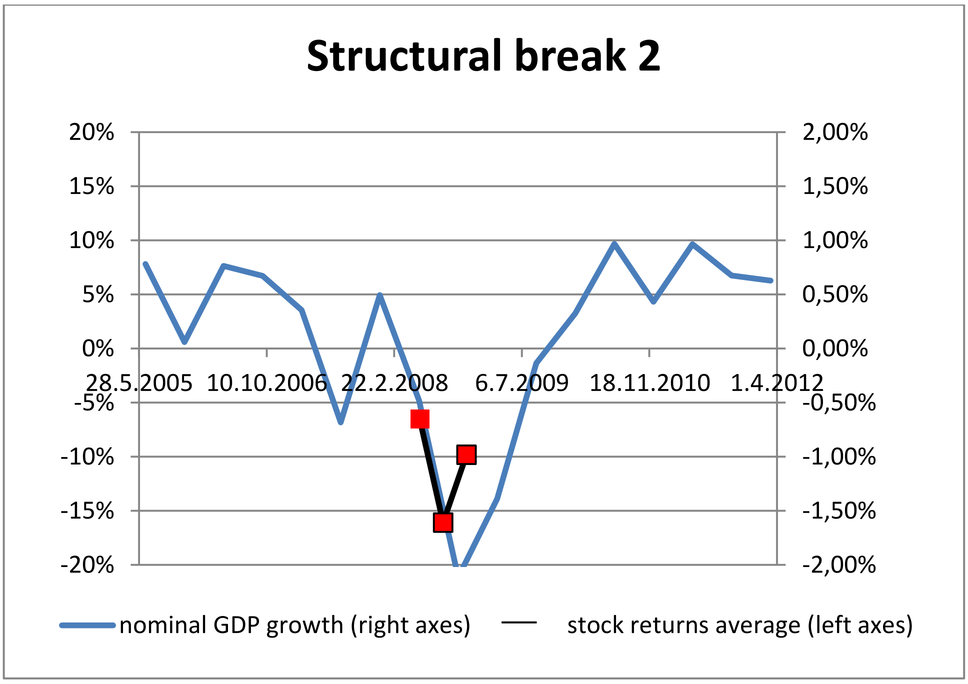
Figure 10:



Source: Own calculations, Yahoo! Finance, ThompsonReuters

We did not confirm our thought that the first big drop would be caused by the negative GDP growth. We look at the second drop which is during another three quarters. It has these announcement days: 1.6., 1.9., 1.12.2008. Figure [11] shows again the relationship between the structural break number two which is described through the three red dots and the nominal GDP growth described by the blue line. The nominal GDP growth is negative when the second structural break occurs. This relationship is coherent with the statement that when GDP growth is negative, then average stock returns experience fall. Unlike the first graph, the second graph says to us that the stated relationship between negative GDP growth and deep stock returns downgrade could be truth. We have found only two obvious drops in the graph with average stock returns. We might think that the relationship between negative GDP growth and big falls in average stock returns could be true only in some case. For example, when the GDP growth is highly negative and has long duration. The first structural break can be actually driven by something totally different. We may think about a long-lasting international political and security instability, sudden change in investor's preferences or the bad period for big companies acting in the United States. We know that the apparent relationship between nominal GDP growth and stock returns does not have to be true. We sometimes see correlation between two variables even though there is no relationship between them (spurious correlation).

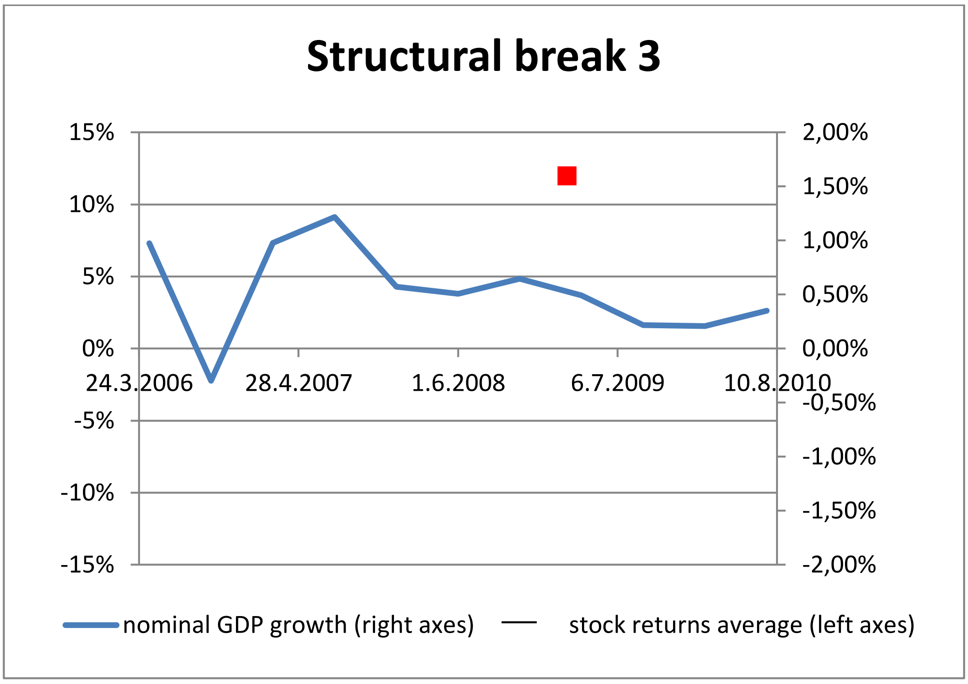
Figure 11:



Source: Own calculations, Yahoo! Finance, ThompsonReuters

We also introduce the third big move in average stock returns which happened in the first quarter in 2016. Unlike the other breaks, this one is upward. You can see this structural break in figure [12] (nominal GDP growth on the left axes and stock returns average on the right exes). We cannot really explain such a big move up but we still employ this break to our estimation as unobserved dummy effect. The same applies to the other two structural breaks which are employed in models as dummy variables as well.

Figure 12:



Source: Own calculations, Yahoo! Finance, ThompsonReuters

The fifth model presented in table [9] represents low significance of earnings variables again (change in EPS scaled by former price and EPS over former price). We do not reject the null hypothesis that the coefficients of these variables are not zero at the 95% level of significance again. We can see that these variables have very high p-values (about 0.4) which is not a good sign that it could be better after adding another variables. The nominal GDP growth which is a proxy for the GDP growth news is not significant at the 95% level of significance. This variable has a very strange sign of its coefficients. Its estimated coefficient is negative which would mean that if the nominal GDP growth from the previous quarter would be positive, ceteris paribus, it would result in a negative change in stock returns. In the case of the fifth model it would mean that a one percentage point positive change in the expected nominal GDP growth variable would, ceteris paribus, result in a 0.16 negative percentage point change in stock returns. This is not even consistent with the theory. Because of the problems of insignificance and theoretical mismatch we decide not to use this variable in the models anymore. Dummy variables for structural breaks are highly significant. All of them are significant at the 99% level of significance. Also, the coefficients of structural breaks possess the right sign of the theoretical relationship. The big drops have negative coefficients and the jump has a positive one. We can see that the values of these coefficients are reasonably high as well. In the fifth model, we incorporated dummy variables for three structural breaks which showed to be useful in the model and the independent variable nominal GDP growth from the previous quarter which showed to be useless for the model.

Table 9:

Fifth model with heteroskedastic and clustered standard errors			
	Estimate	t value	Pr(>|t|)
(Intercept)	0.0410832	10.9402	< 2.2e-16 ***
EPS change over price	-0.0274067	-0.8208	0.411818
EPS over price	0.0342938	0.8407	0.400612
consumer index	0.1316123	3.2272	0.001266 **
expected GDP	-0.1608083	-0.3878	0.698224
Struc. break 1 (dummy)	-0.1076000	-7.4431	1.343e-13 ***
Struc. break 2 (dummy)	-0.1499131	-10.2002	< 2.2e-16 ***
Struc. break 3 (dummy)	0.0779945	3.1867	0.001456 **
R-Squared:	0.072		
Adj. R-Squared:	0.069		
F-statistic:	27.8603 on 7 and 2517 DF, p-value: < 2.22e-16		
Signif. codes:	0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1		

Source: Own calculations, Yahoo! Finance, ThompsonReuters, University of Michigan

We include another two variables and set up the sixth model. New independent variables are the BVPS percentage change between quarters and the debt-to-equity level at the actual quarter. We have a look at the estimation results in table [10]. The debt to equity ratio is depicted in the study from Harvey et al. (2014) as a factor having an impact on stock returns. We find out that it is not true in our case. We do not reject the null hypothesis that the debt to equity coefficient is equal to zero at the 90% confidence interval. The p-value of this coefficient is equal to 0.93 and it is incredibly high. On the other hand, BVPS is a variable which helps to explain stock returns. We reject the null hypothesis that the BVPS coefficient is equal to zero at the 99 % level of significance. We know that the BVPS percentage change serves us here as a proxy variable for the book value over market value of equity in the absence of the total market value of equity. Unlike the debt to equity, the BVPS percentage change shows to have an explanation power with respect to stock returns. We do not reject the null hypothesis that the BVPS coefficient is equal to zero at the 95% level of significance. Even though the BVPS coefficient is significant, the real value of the coefficient is quite small (0.05). It means that a one percentage point increase in BVPS would, ceteris paribus, result in a 0.05 percentage point increase in stock returns. We have found out that the debt-to-equity ratio probably does not have any impact on stock returns in our case. This fact could have many reasons. The most important one is that value of firm's debt-to-equity does not have any impact on stock returns. There could be also other possible reasons. One of them is that the variable debt to equity ratio does not affect the stock returns of such big companies like ours from the S&P500. Another cause could be that this relationship was valid only in history and its relevancy decreases over time or the correct reason is something totally different. Earnings coefficients are still insignificant therefore we get rid of the debt to equity independent variable to see if results go any better in the next estimation.

Table 10:

Sixth model with heteroskedastic and clustered standard errors				
	Estimate	t value	Pr(>|t|)	
(Intercept)	3.8873e-02	15.2821	< 2.2e-16	***
EPS change over price	-2.7186e-02	-0.8293	0.4069953	
EPS over price	3.3226e-02	0.8608	0.3894500	
consumer index	1.3443e-01	3.3147	0.0009306	***
Struc. break 1 (dummy)	-1.0695e-01	-7.3954	1.91e-13	***
Struc. break 2 (dummy)	-1.4823e-01	-10.3988	< 2.2e-16	***
Struc. break 3 (dummy)	8.0510e-02	3.2942	0.0010007	**
BVPS relative change	5.3184e-02	2.1088	0.0350610	*
debt to equity	3.1986e-05	0.1002	0.9201730	
R-Squared:	0.073			
Adj. R-Squared:	0.071			
F-statistic:	24.9428 on 8 and 2516 DF, p-value: < 2.22e-16			
Signif. codes:	0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1			

Source: Own calculations, Yahoo! Finance, ThompsonReuters, University of Michigan

The seventh model without the debt-to-equity independent variable can be seen in table [11]. The most important thing to notice is that the earnings independent variables are again insignificant. We do not reject the null hypothesis that the coefficients of earnings variables are both zero at the 90 % level of significance. We also estimate the same model another two times excluding different earnings variable per model. We find out that in both cases earnings variables are highly insignificant (p-values were much bigger than 0.05). After many reestimations the earnings coefficients are still highly insignificant.

Table 11:

Seventh model with heteroskedastic and clustered standard errors				
	Estimate	t value	Pr(>|t|)	
(Intercept)	0.0389578	16.8704	< 2.2e-16	***
EPS change over price	-0.0273320	-0.8350	0.4038234	
EPS over price	0.0335425	0.8727	0.3829116	
consumer index	0.1344699	3.3152	0.0009286	***
Struc. break 1 (dummy)	-0.1069333	-7.3933	1.939e-13	***
Struc. break 2 (dummy)	-0.1482185	-10.3967	< 2.2e-16	***
Struc. break 3 (dummy)	0.0805455	3.2953	0.0009968	***
BVPS relative change	0.0533749	2.1160	0.0344417	*
R-Squared:	0.073			
Adj. R-Squared:	0.071			
F-statistic:	28.5173 on 7 and 2517 DF, p-value: < 2.22e-16			

Source: Own calculations, Yahoo! Finance, ThompsonReuters, University of Michigan

Let us shortly introduce the eighth model without insignificant earnings variables (table [12]). This model should be the most accurate one (considering only the previous estimations). We know that there are more variables which explain the movements in stock returns but to gather them all would be impossible for us. We find out that only the consumer sentiment index, BVPS and all the dummy variables are significant. However, the BVPS variable does have very small coefficient which equals to 0.05. It means that a one percentage point increase in BVPS would, ceteris paribus, result in a 0.05 percentage point increase in stock return of a company. The consumer sentiment index has a bigger coefficient. A one percentage point increase in the consumer sentiment index would, ceteris paribus, result in a 0.13 percentage point increase in stock returns according to the model. We also interpret all the structural break dummy variables. At the time of the first structural break should, ceteris paribus, all stock returns decrease on average by 0.11 percentage points, at the time of the second structural break should, ceteris paribus, all stock returns on average decrease by 0.15 percentage points, and at the time of the third structural break should, ceteris paribus, all stock returns increase on average by 0.08 percentage points.

Table 12:

Eighth model with heteroskedastic and clustered standard errors				
	Estimate	t value	Pr(>|t|)	
(Intercept)	0.0398426	18.5080	< 2.2e-16	***
Consumer index	0.1333486	3.2898	0.001016	**
Struc. break 1 (dummy)	-0.1074705	-7.4490	1.285e-13	***
Struc. break 2 (dummy)	-0.1482112	-10.4045	< 2.2e-16	***
Struc. break 3 (dummy)	0.0795381	3.2577	0.001138	**
BVPS relative change	0.0530261	2.1892	0.028675	*
R-Squared:	0.073			
Adj. R-Squared:	0.071			
F-statistic:	39.7664 on 5 and 2519 DF, p-value: < 2.22e-16			

Source: Own calculations, Yahoo! Finance, ThompsonReuters, University of Michigan

We have shown that moves in earnings variables probably do not explain changes in stock returns. In all models where earnings variables were present were these variables insignificant at the 90 % level of confidence. We have also shown that the variables nominal GDP growth from the last quarter (proxy GDP growth news) and the debt-to-equity ratio are insignificant in our models at the 90% of confidence interval. On the other hand, all the structural breaks, consumer sentiment index and BVPS percentage change has turned out to be significant at the 95% of confidence interval.

5.2 The second approach: Multiple linear regression

The second estimation uses multiple linear regressions to examine the relationship between stock price as the dependent variable and EPS and BVPS as the independent variables. We copy the approach from Glezakos, therefore we use logarithmic transformation for all variables.

Firstly, we research the correlation between log(BVPS) and log(EPS) to find out if we have collinearity present. If so, we have to be aware of very sensitive coefficients and big standard errors. We use the Pearson's correlation test embedded in R to examine correlation between independent variables. We calculate that the correlation coefficient between log(EPS) and log(BVPS) is equal to 0.24 and the p-value for the correlation test is smaller than 0.0001. Thus, we reject the null hypothesis of no correlation between log(EPS) and log(BVPS) at the 99% level of significance in nineteen cases out of twenty five cases. Our variables do not have so strong correlation between them but we still could have problems with collinearity such as big standard errors and sensitive coefficients. We have to be careful about it after the estimation later on.

Glezakos estimates equations with EPS and BVPS separately and then together to see the change in standard errors (its p-values), coefficients and R-squared. We remind equations from earlier section for better interpretation later on in the text:

Equation 3:

$$\log(stock\ price) = a + b * log(EPS) + c * \log(BVPS) + \varepsilon_1$$

Equation 4:

$$\log(stock\ price) = d + e * \log(EPS) + \varepsilon_2$$

Equation 5:

$$log(stock\ price) = f + g * log(BVPS) + \varepsilon_3$$

We refer to equations [3], [4] and [5] as models [3], [4] and [5]. The P-value of F-statistic for model [5] is smaller than 0.05 in 80 out of 102 cases. The P-value of F-statistic for model (4) is smaller than 0.05 in 65 cases. The P-value of F-statistic for model [3] variables is smaller than 0.05 in 87 cases. We reject the null hypothesis that all coefficients in our three models are equal to zero in 80 cases for the model [5], in sixty five cases for model [4] and eighty seven cases for model [3] at the 95 % level of significance. It is interesting that only last six periods do not show any significant relationship between any of our variables in any model because all the F-test p-values for these periods are smaller than 0.05. The P-values of particular coefficients in model [3] are smaller than 0.05 in 35 cases for the BVPS variable and in 49 cases for the EPS variable. Thus, we reject the null hypothesis of these coefficients to be zero in 35 cases for the BVPS and 49 cases for the EPS at the 95% level of significance. We can conclude that the significance of independent variables decreased using them together to explain stock returns. All the p-values of t-tests and F-tests can be found in table [16]. However, we cannot forget that independent variables seem to be correlated and the problem of collinearity may be present. It means that the decrease in significance of independent variables in the model with two independent variables could be caused by this correlation between independent variables.

We also run the Breusch-Pagan test for every period to see if heteroskedasticity occurs in our research (table [13] and more detailed in table [17]). The p-values of Breusch-Pagan test are greater than 0.05 in 85 cases for model [3] with both independent variables, greater than 0.05 in 80 cases for model [4] with the EPS variable and greater than 0.05 in 99 cases for model [5] with the BVPS. It means that we do not reject the null hypothesis of homoscedasticity in 85 cases for model [3] with both independent variables, 80 cases for model [4] with the EPS variable and 99 cases for model [5] with the BVPS variable at the 95% level of significance. It is worth noting that we rejected homoscedasticity at the 95% level of significance for the last six periods for model with both independent variables and for the model with the EPS variable.

Table 13:

Breusch-Pagan test of homoskedasticity			
	Model with following independent variables (number of occurrence in periods):		
	[3] EPS + BVPS	[4] EPS	[5] BVPS
p-value < 0.05	17	22	3
p-value > 0.05	85	80	99

Source: Own calculations, ThompsonReuters, Yahoo! Finance

The following table [14] shows in a nutshell how much of variation is explained in particular models. R-squares are separated to value intervals to show more understandable results. Every model possesses different column. For more detailed results look at table [15]. We start talking about model [5] with the BVPS independent variable. It seems that the BVPS is a variable which plays role in explanation of motion in stock price because of the results from R-squares table and

F-test table showed earlier. Then, we look at model [4] with the EPS as an independent variable. The magnitude of R-squares is spread out between all the intervals equally except of the first interval (with 29 values). It looks like the EPS variable does not show so good results as the BVPS variable. Lots of R-squares are actually smaller than 0.1 and F-tests for this model do not look so good as well. Unsurprisingly, model [3] with both independent variables shows the highest R-squares. Only nine periods in model one have R-squares sharply smaller than 0.02. Almost half of the periods (49) have R-squares in the interval between 0.2 and 0.4.

Table 14:

Explained variation (R-squared) in particular models			
R-squared:	Model with following independent variables:		
	[3] EPS + BVPS	[4] EPS	[5] BVPS
$0 \leq$ R-squared <0.1	2	29	7
$0.1 \leq$ R-squared <0.2	7	15	37
$0.2 \leq$ R-squared <0.3	25	11	41
$0.3 \leq$ R-squared <0.4	24	12	17
$0.4 \leq$ R-squared <0.5	17	10	0
$0.5 \leq$ R-squared <0.6	14	14	0
$0.6 \leq$ R-squared <1	13	11	0

Source: Own calculations, ThompsonReuters, Yahoo! Finance

Even though most of the coefficients from all models are significant, R-squares do not deliver the fit comparable to the R-squares from Glezakos's study (2012) where 10 out of 13 periods have the R-squares higher than 0.6. Thus, we interpret the findings as inconclusive.

6 Conclusion

The aim of this diploma thesis is to examine if stock returns are influenced by net income. We have decided to extend the previous research because even though the relationship between net income and stock returns seems to be clear according to the theory stated in the Literature Review part, some past empirical studies, such as Lev (1989) and Chu et al. (1997), show inconclusive results. We examine this relationship using a new up-to-date dataset representing 25 companies from the S&P500 Index accumulating a big amount of data (102 periods). A lot of studies concerning this relationship, such as Chu et al. (1997) and Collins (1997), estimate just a simple linear regression or time series. We try to enhance this approach using panel data models. In addition, we study heterogeneity in companies and time. Moreover, we incorporate other factors which should affect stock returns as well. These factors are the consumer sentiment index, the nominal GDP growth in the previous quarter, the debt to equity ratio and the book value per share percentage change. We start with a simple model including only earnings independent variables. Then, we gradually add other variables to see if the significance of earnings variables change. We also explore the significance of the other factors added.

We have discovered very interesting results for panel estimations. Earnings variables were in all models insignificant. We have found that random effects explain the heterogeneity present in the cross sections. We have revealed the presence of three structural breaks of stock returns with respect to time. The consumer sentiment index and the percentage change in book value per share have been shown as the variables explaining movements in stock returns. On the other hand, the debt to equity ratio and the nominal GDP growth rate (proxy GDP growth news) have been revealed as variables which do not explain the movements in stock returns.

Besides the panel data models, we have performed an additional estimation using the multiple linear regression approach and ran it for every period separately. We wanted to support our findings from the panel data estimation. We literally copied the approach from Glezakos (2012). Glezakos discovered that all the independent variables (earnings per share, book value per share) were significant in the joint model and most of the variables were significant in separate models in his research. We have revealed that a substantial number of models had significant variables in our estimations. Glezakos's models had very high explanatory power. Some models from our research had very high explanatory power, but some had very low one. We have also found another interesting thing. All the models had insignificant variables and very low explanatory power over the last six periods. Results show that in some periods, there seems to be a relationship between net income and stock returns, but there is none in some other periods. Findings from the multiple regression part are inconclusive.

We have used the panel data approach and the multiple regression approach to examine the relationship between net income and stock returns. The first approach results suggest no relationship between net income and stock returns and the second approach presents inconclusive findings. According to our findings, there is random heterogeneity in cross sections and there are three structural breaks in time for panel data. We run multiple panel regression models adding factors and then removing insignificant ones. The results from repeated estimations propose that the consumer sentiment index and the percentage change in book value per share are significant factors and that the debt to equity ratio and the nominal GDP growth in the previous quarter are not significant factors. The second multiple regression approach reveals inconclusive results about the explanatory power of earnings variable and the explanatory power of book value.

We believe that the reason why we have discovered different results than most of the other studies that hold earnings coefficients to be significant could be the company size. It is possible that investors do consider big cap companies to provide substantial dividends and stock gains in the long term period regardless of developments in their net income. The developments of big size companies stock returns may depend more on the overall macroeconomic factors such as consumption sentiment or depend on something else such as management qualities. We have discovered very poor results for the last six periods in the multiple regression approach. If there was any relationship between net income and stock returns in the history it might have evaporated over the last years.

It would be interesting to estimate the models again for a different dataset of small cap companies in the U.S. It could reveal if the relationship between net income failed because of the company size or for some other reason. We also suggest to examine whether the possible significance of earnings variables decreases over time especially in the last years.

7 Appendix

Table 15:

R-squared calculated for different models – multiple linear regression			
Period no.	Model with following independent variables:		
	[3] BVPS + EPS	[4] EPS	[5] BVPS
1	0.3317	0.1403	0.2002
2	0.2544	0.0000	0.2539
3	0.2677	0.1741	0.1842
4	0.1708	0.0042	0.1697
5	0.3095	0.2272	0.2080
6	0.2531	0.0115	0.2531
7	0.2256	0.0652	0.2223
8	0.3015	0.0288	0.2761
9	0.2523	0.0067	0.2501
10	0.3540	0.0024	0.3336
11	0.4556	0.3059	0.3549
12	0.4030	0.2273	0.3612
13	0.4312	0.4229	0.3138
14	0.3768	0.2896	0.3091
15	0.3888	0.2998	0.2894
16	0.2970	0.1389	0.2868
17	0.2941	0.2087	0.2719
18	0.3040	0.0014	0.2966
19	0.3444	0.1841	0.3048
20	0.3899	0.0686	0.3638
21	0.3034	0.0006	0.2922
22	0.3470	0.0745	0.2767
23	0.5665	0.5633	0.2522
24	0.5476	0.3051	0.3317
25	0.2771	0.0008	0.2678
26	0.4327	0.1717	0.2807
27	0.3578	0.0005	0.3566

28	0.4687	0.4240	0.3623
29	0.4805	0.4122	0.3573
30	0.4408	0.1482	0.3450
31	0.4122	0.2838	0.3230
32	0.3921	0.2303	0.2877
33	0.3158	0.1643	0.2845
34	0.4567	0.4504	0.2617
35	0.2837	0.1618	0.2567
36	0.2391	0.0193	0.2262
37	0.5032	0.5008	0.2090
38	0.2585	0.1046	0.2488
39	0.4741	0.3255	0.3405
40	0.3723	0.0319	0.3303
41	0.5878	0.5407	0.3649
42	0.3333	0.0540	0.3333
43	0.2904	0.0215	0.2836
44	0.2601	0.1019	0.2599
45	0.3477	0.2815	0.2658
46	0.1914	0.0407	0.1872
47	0.2187	0.1564	0.1919
48	0.3512	0.3426	0.1853
49	0.3813	0.3720	0.2017
50	0.3386	0.3179	0.2154
51	0.2634	0.1333	0.2323
52	0.6213	0.6145	0.2518
53	0.2613	0.2339	0.2129
54	0.4225	0.4224	0.2116
55	0.2063	0.0456	0.2062
56	0.2217	0.0129	0.1914
57	0.4277	0.4262	0.2203
58	0.6040	0.5686	0.2430
59	0.4452	0.3893	0.2303
60	0.1925	0.0907	0.1910
61	0.2404	0.1895	0.2165
62	0.5058	0.5044	0.2620
63	0.2902	0.2393	0.2535
64	0.2449	0.0902	0.2434
65	0.4848	0.4836	0.2702
66	0.5678	0.5673	0.1851
67	0.5550	0.5502	0.1614
68	0.3959	0.3847	0.1794
69	0.4500	0.4471	0.1671
70	0.7591	0.7587	0.1593
71	0.4677	0.3770	0.1368
72	0.2847	0.1910	0.0930
73	0.3515	0.3200	0.1245
74	0.2995	0.2052	0.1336

75	0.5411	0.5254	0.1272
76	0.6060	0.5790	0.1233
77	0.5800	0.5766	0.1082
78	0.6293	0.6239	0.1179
79	0.6230	0.6222	0.1199
80	0.5248	0.4825	0.1601
81	0.8019	0.8007	0.1751
82	0.6069	0.6064	0.1317
83	0.6140	0.6112	0.1279
84	0.7430	0.7403	0.1348
85	0.6788	0.6739	0.1347
86	0.5669	0.5447	0.1320
87	0.1613	0.0024	0.1603
88	0.5651	0.5024	0.1908
89	0.5878	0.5744	0.1761
90	0.2189	0.0170	0.1904
91	0.5250	0.5239	0.1705
92	0.4711	0.4567	0.1714
93	0.3684	0.3221	0.1715
94	0.8192	0.8186	0.1773
95	0.6592	0.6592	0.1343
96	0.3398	0.3072	0.0898
97	0.1630	0.0536	0.1054
98	0.2087	0.1390	0.0898
99	0.1000	0.0445	0.0515
100	0.0517	0.0070	0.0432
101	0.0723	0.0001	0.0704
102	0.1357	0.0505	0.0669

Source: Own calculations, ThompsonReuters, Yahoo! Finance

Table 16:

The significance of overal models and particular coefficients - multiple regression approach					
Period no.	Model with following independent variables				
	[3] EPS + BVPS			[4] EPS	[5] BVPS
	p-value for F-statistic both	p-value for t-statistic EPS	p-value for t-statistic BVPS	p-value of F-statistic EPS	p-value of F-statistic BVPS
1	0.0119	0.0493	0.0199	0.0651	0.0249
2	0.0396	0.9098	0.0120	0.9848	0.0102
3	0.0325	0.1275	0.1077	0.0379	0.0323
4	0.1274	0.8629	0.0472	0.7587	0.0408
5	0.0170	0.0859	0.1195	0.0160	0.0219
6	0.0404	0.9836	0.0141	0.6100	0.0104
7	0.0601	0.7653	0.0442	0.2180	0.0173

8	0.0193	0.3810	0.0077	0.4172	0.0070
9	0.0408	0.7983	0.0134	0.6981	0.0109
10	0.0082	0.4134	0.0022	0.8158	0.0025
11	0.0012	0.0561	0.0222	0.0041	0.0017
12	0.0034	0.2275	0.0185	0.0160	0.0015
13	0.0020	0.0446	0.5780	0.0004	0.0036
14	0.0055	0.1363	0.0932	0.0055	0.0039
15	0.0044	0.0719	0.0872	0.0046	0.0055
16	0.0207	0.5783	0.0367	0.0665	0.0058
17	0.0217	0.4147	0.1169	0.0217	0.0075
18	0.0186	0.6336	0.0053	0.8591	0.0049
19	0.0096	0.2618	0.0301	0.0323	0.0042
20	0.0044	0.3427	0.0025	0.2060	0.0014
21	0.0187	0.5577	0.0053	0.9108	0.0053
22	0.0092	0.1383	0.0062	0.1869	0.0069
23	0.0001	0.0006	0.6886	0.0000	0.0105
24	0.0002	0.0038	0.0024	0.0042	0.0026
25	0.0282	0.5998	0.0083	0.8901	0.0081
26	0.0020	0.0238	0.0043	0.0395	0.0065
27	0.0077	0.8422	0.0020	0.9193	0.0016
28	0.0010	0.0476	0.1872	0.0004	0.0015
29	0.0007	0.0324	0.1031	0.0005	0.0016
30	0.0017	0.0652	0.0026	0.0574	0.0020
31	0.0029	0.0813	0.0392	0.0061	0.0030
32	0.0042	0.0648	0.0242	0.0152	0.0057
33	0.0154	0.3273	0.0381	0.0444	0.0060
34	0.0012	0.0102	0.6200	0.0002	0.0089
35	0.0255	0.3725	0.0660	0.0462	0.0098
36	0.0495	0.5479	0.0195	0.5080	0.0163
37	0.0005	0.0016	0.7455	0.0001	0.0216
38	0.0373	0.5962	0.0440	0.1148	0.0112
39	0.0009	0.0273	0.0207	0.0029	0.0022
40	0.0060	0.2375	0.0023	0.3930	0.0027
41	0.0001	0.0023	0.1272	0.0000	0.0014
42	0.0116	0.9997	0.0061	0.2638	0.0025
43	0.0230	0.6497	0.0085	0.4845	0.0061
44	0.0364	0.9437	0.0412	0.1198	0.0092
45	0.0091	0.1107	0.1495	0.0064	0.0083
46	0.0966	0.7390	0.0552	0.3332	0.0308
47	0.0662	0.3937	0.1988	0.0504	0.0285
48	0.0086	0.0269	0.5937	0.0021	0.0317
49	0.0051	0.0192	0.5718	0.0012	0.0243
50	0.0106	0.0553	0.4157	0.0033	0.0194
51	0.0346	0.3452	0.0614	0.0727	0.0147
52	0.0000	0.0001	0.5361	0.0000	0.0106
53	0.0357	0.2429	0.3762	0.0143	0.0202
54	0.0024	0.0097	0.9666	0.0004	0.0207

55	0.0788	0.9582	0.0464	0.3054	0.0226
56	0.0635	0.3649	0.0238	0.5883	0.0287
57	0.0022	0.0099	0.8146	0.0004	0.0179
58	0.0000	0.0002	0.1748	0.0000	0.0123
59	0.0015	0.0080	0.1507	0.0009	0.0152
60	0.0951	0.8413	0.1100	0.1435	0.0289
61	0.0486	0.4147	0.2377	0.0296	0.0191
62	0.0004	0.0033	0.8030	0.0001	0.0089
63	0.0230	0.2977	0.2222	0.0131	0.0103
64	0.0455	0.8389	0.0453	0.1446	0.0122
65	0.0007	0.0062	0.8210	0.0001	0.0077
66	0.0001	0.0002	0.8741	0.0000	0.0318
67	0.0001	0.0002	0.6297	0.0000	0.0465
68	0.0039	0.0102	0.5296	0.0009	0.0349
69	0.0014	0.0028	0.7361	0.0003	0.0425
70	0.0000	0.0000	0.8520	0.0000	0.0481
71	0.0010	0.0013	0.0657	0.0011	0.0688
72	0.0251	0.0238	0.1037	0.0289	0.1383
73	0.0085	0.0111	0.3130	0.0032	0.0836
74	0.0199	0.0325	0.0993	0.0230	0.0723
75	0.0002	0.0002	0.3949	0.0000	0.0801
76	0.0000	0.0000	0.2331	0.0000	0.0852
77	0.0001	0.0001	0.6808	0.0000	0.1084
78	0.0000	0.0000	0.5768	0.0000	0.0929
79	0.0000	0.0000	0.8380	0.0000	0.0900
80	0.0003	0.0005	0.1758	0.0001	0.0475
81	0.0000	0.0000	0.7291	0.0000	0.0373
82	0.0000	0.0000	0.8728	0.0000	0.0746
83	0.0000	0.0000	0.6899	0.0000	0.0793
84	0.0000	0.0000	0.6355	0.0000	0.0710
85	0.0000	0.0000	0.5653	0.0000	0.0711
86	0.0001	0.0001	0.2999	0.0000	0.0742
87	0.1445	0.8754	0.0534	0.8169	0.0473
88	0.0001	0.0003	0.0888	0.0001	0.0290
89	0.0001	0.0001	0.4075	0.0000	0.0368
90	0.0661	0.3806	0.0262	0.5339	0.0292
91	0.0003	0.0005	0.8255	0.0000	0.0402
92	0.0009	0.0019	0.4471	0.0002	0.0396
93	0.0064	0.0157	0.2176	0.0031	0.0396
94	0.0000	0.0000	0.7827	0.0000	0.0361
95	0.0000	0.0000	0.9943	0.0000	0.0716
96	0.0104	0.0086	0.3087	0.0040	0.1456
97	0.1413	0.2316	0.1042	0.2653	0.1134
98	0.0762	0.0826	0.1776	0.0665	0.1457
99	0.3140	0.2884	0.2567	0.3115	0.2752
100	0.5578	0.6616	0.3198	0.6901	0.3188
101	0.4379	0.8346	0.2041	0.9633	0.1997

102	0.2012	0.1994	0.1552	0.2800	0.2120

Source: Own calculations, ThompsonReuters, Yahoo! Finance

Table 17:

Breusch-Pagan test for particular estimation – multiple regression approach			
Period no.	Model with following independent variables:		
	[3] BVPS + EPS	[4] EPS	[5] BVPS
1	0,4453	0,4994	0,3539
2	0,7752	0,9664	0,7353
3	0,8601	0,7426	0,4839
4	0,5455	0,3659	0,5385
5	0,9986	0,5868	0,7759
6	0,7005	0,06	0,8135
7	0,5057	0,6952	0,6401
8	0,7636	0,4671	0,7755
9	0,88	0,8479	0,8301
10	0,8124	0,0269	0,7835
11	0,784	0,6998	0,7229
12	0,9243	0,6676	0,6566
13	0,8555	0,9614	0,7451
14	0,9172	0,5919	0,9119
15	0,9756	0,9608	0,9789
16	0,9895	0,2029	0,9546
17	0,8843	0,1294	0,7991
18	0,7945	0,5924	0,899
19	0,778	0,5504	0,6075
20	0,1851	0,3556	0,1594
21	0,4384	0,0085	0,2356
22	0,9797	0,0436	0,1356
23	0,6929	0,5612	0,1186
24	0,8917	0,5419	0,018
25	0,147	0,0257	0,0512
26	0,7122	0,1291	0,1475
27	0,0245	0,009	0,0266
28	0,2708	0,7477	0,0329
29	0,1723	0,483	0,0673
30	0,2446	0,9983	0,0899
31	0,2387	0,66	0,1035
32	0,0334	0,0968	0,1055
33	0,3073	0,6108	0,1198
34	0,2602	0,6731	0,137
35	0,2449	0,1342	0,415
36	0,5653	0,247	0,4326
37	0,4323	0,301	0,3993

38	0,362	0,1695	0,3349
39	0,4005	0,2591	0,0753
40	0,2369	0,5425	0,0551
41	0,079	0,0819	0,1513
42	0,0652	0,8984	0,0933
43	0,0267	0,5336	0,1187
44	0,0716	0,9413	0,1766
45	0,4626	0,5896	0,2136
46	0,0233	0,4411	0,2372
47	0,4002	0,7722	0,1327
48	0,3704	0,4052	0,1257
49	0,5579	0,4479	0,142
50	0,5085	0,4327	0,2948
51	0,0445	0,1024	0,2171
52	0,4549	0,3453	0,1927
53	0,0344	0,0743	0,2149
54	0,0884	0,0627	0,3287
55	0,2549	0,0868	0,6012
56	0,6097	0,5102	0,5845
57	0,5069	0,3593	0,4807
58	0,5626	0,2861	0,6241
59	0,5761	0,3498	0,7525
60	0,2273	0,0593	0,8022
61	0,0555	0,0387	0,8805
62	0,772	0,9491	0,7448
63	0,1065	0,2555	0,6456
64	0,5784	0,4092	0,613
65	0,3276	0,4442	0,7055
66	0,2493	0,2923	0,7929
67	0,1839	0,6525	0,5928
68	0,5266	0,3493	0,8219
69	0,3584	0,2924	0,9144
70	0,0593	0,0492	0,8068
71	0,1357	0,0096	0,8002
72	0,3919	0,0422	0,7401
73	0,3889	0,1476	0,5177
74	0,5607	0,8632	0,5629
75	0,2649	0,2344	0,5763
76	0,0841	0,0684	0,5744
77	0,1245	0,0593	0,5063
78	0,0603	0,0084	0,4937
79	0,2736	0,1308	0,5064
80	0,2763	0,3017	0,6237
81	0,4279	0,3494	0,7386
82	0,3668	0,1768	0,5104
83	0,2568	0,1846	0,3885
84	0,21	0,059	0,2856

85	0,1703	0,1175	0,1911
86	0,0007	0	0,2133
87	0,3993	0,8819	0,1844
88	0,01	0,0004	0,2064
89	0,0044	0,0006	0,1838
90	0,0023	0,001	0,1637
91	0,0923	0,8027	0,1784
92	0,0336	0,0064	0,1623
93	0,3241	0,3256	0,1936
94	0,0826	0,0433	0,2077
95	0,4012	0,329	0,1602
96	0,6162	0,1415	0,1636
97	0,0036	0,0012	0,1511
98	0,0156	0,0017	0,1157
99	0,0028	0,0014	0,1724
100	0,0191	0,0166	0,1561
101	0,0028	0,0062	0,1863
102	0,0029	0,0008	0,2129

Source: Own calculations, ThompsonReuters, Yahoo! Finance

Table 18:

Pearson's correlation test between log(EPS) and log(BVPS)		
Ticker	p-value	Correlation coefficients
aapl	0.01	0.25
abt	<0.01	0.66
aep	0.39	0.09
apa	0.01	0.25
axp	<0.01	0.61
bdx	<0.01	0.68
bll	0.01	0.25
cat	0.031	0.21
cinf	<0.01	0.56
cms	0.02	0.24
csx	<0.01	0.26
ctl	<0.01	0.48
dd	0.11	-0.16
duk	0.08	0.18
ftr	0.03	0.22
hes	0.05	0.19
jpm	<0.01	0.32
lly	0.87	-0.02
mcd	<0.01	0.89
mmm	<0.01	0.85
mo	0.14	0.15
t	<0.01	0.34

ccl	<0.01	0.35
nke	<0.01	0.67
gis	<0.01	0.70

Source: Own calculations, ThompsonReuters

Table 19:

Augmented Dickey Fuller test for independent variable – nominal GPD growth	
p-value	0.02

Source: Own calculations, OECD

Table 20:

Augmented Dickey Fuller test for independent variable – Consumer sentiment index	
p-value	<0.01

Source: Own calculations, University of Michigan

Table 21:

Augmented Dickey Fuller test for independent variable – relative change in EPS	
Ticker	p-value
aapl	<0.01
abt	<0.01
aep	<0.01
apa	<0.01
axp	<0.01
bdx	<0.01
bll	<0.01
cat	<0.01
cinf	0.01
cms	0.08
csx	0.02
ctl	<0.01
dd	<0.01
duk	<0.01
ftr	<0.01
hes	<0.01
jpm	<0.01
lly	<0.01
mcd	<0.01
mmm	<0.01
mo	<0.01

t	<0.01
ccl	0.02
nke	<0.01
gis	0.04

Source: Own calculations, ThompsonReuters

Table 22:

Augmented Dickey Fuller test for dependent variable – stock market return	
Ticker	p-value
aapl	<0.01
abt	<0.01
aep	<0.01
apa	<0.01
axp	<0.01
bdx	<0.01
bll	<0.01
cat	<0.01
cinf	0.02
cms	<0.01
csx	<0.01
ctl	<0.01
dd	<0.01
duk	<0.01
ftr	<0.01
hes	<0.01
jpm	<0.01
lly	0.01
mcd	<0.01
mmm	<0.01
mo	<0.01
t	0.08
ccl	<0.01
nke	<0.01
gis	<0.01

Source: Own calculations, Yahoo! Finance

Table 23:

Augmented Dickey Fuller test for dependent variable – BVPS percentage change ($\frac{BVPS-BVPS_{t-1}}{BVPS_{t-1}}$)	
Ticker	p-value
aapl	0.19
abt	<0.01

aep	0.23
apa	0.34
axp	<0.01
bdx	<0.01
bll	0.35
cat	<0.01
cinf	<0.01
cms	0.05
csx	<0.01
ctl	<0.01
dd	<0.01
duk	0.04
ftr	0.02
hes	0.04
jpm	<0.01
lly	<0.01
mcd	<0.01
mmm	<0.01
mo	<0.01
t	<0.01
ccl	<0.01
nke	<0.01
gis	<0.01

Source: Own calculations, ThompsonReuters

Table 24:

Augmented Dickey Fuller test for independent variable – EPS over former price ($\frac{EPS}{P_{t-1}}$)	
Ticker	p-value
aapl	0.04
abt	0.37
aep	0.14
apa	0.52
axp	0.08
bdx	0.02
bll	<0.01
cat	<0.01
cinf	0.53
cms	0.07
csx	<0.01
ctl	0.11
dd	<0.01
duk	<0.01
ftr	0.01

hes	0.17
jpm	0.48
lly	0.04
mcd	0.22
mmm	0.26
mo	0.07
t	<0.01
ccl	0.09
nke	0.34
gis	0.10

Source: Own calculations, ThompsonReuters

Table 25:

Augmented Dickey Fuller test for independent variable – difference in EPS over former price ($\frac{EPS-EPS_{t-1}}{P_{t-1}}$)	
Ticker	p-value
aapl	<0.01
abt	<0.01
aep	<0.01
apa	<0.01
axp	<0.01
bdx	<0.01
bll	<0.01
cat	<0.01
cinf	<0.01
cms	<0.01
csx	<0.01
ctl	<0.01
dd	<0.01
duk	<0.01
ftr	<0.01
hes	<0.01
jpm	<0.01
lly	<0.01
mcd	<0.01
mmm	<0.01
mo	<0.01
t	<0.01
ccl	<0.01
nke	<0.01
gis	<0.01

Source: Own calculations, ThompsonReuters

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