POSTGRADUATE STUDING PROGRAM

DEPARTMENT OF ACCOUNTING AND FINANCE

UNIVERSITY OF MACEDONIA

ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

ΠΑΝΕΠΙΣΤΗΜΙΟ ΜΑΚΕΔΟΝΙΑΣ

ΤΜΗΜΑ ΛΟΓΙΣΤΙΚΗΣ ΚΑΙ ΧΡΗΜΑΤΟΟΙΚΟΝΟΜΙΚΗΣ

ΠΑΝΕΠΙΣΤΗΜΙΟ ΜΑΚΕΔΟΝΙΑΣ

ΠΡΟΓΡΑΜΜΑΤΑ ΜΕΤΑΠΤΥΧΙΑΚΩΝ ΣΠΟΥΔΩΝ

Master's Dissertation:

Stock Portfolios formation in S&P100, Macroeconomic Variables predictability role in returns and Beta coefficients Time-Variability test.: An Empirical Approach

Of

KONSTANTINOS PANAGIOTELIDIS

Supervising Professor: PETROS MESSIS

Thessaloniki 2021

ABSTRACT

The S&P100 Stock Index is the core of the largest companies in the U.S. Market in terms of capitalization (blue chips), characterized by relatively strong stability in their stock price changes. However, due to the different economic sectors of activity of its companies, there are sectors with different volatility behavior. This phenomenon is noticed at companies in the Financial Sector of S&P100 (less stability), in line with those of Information-Technology (greater stability), that seems to appear two of the highest S&P100 Sector's volatility returns. This study, initially classifies three different portfolio categories in relation to their structure for both of these S&P100 sectors, then forms nine different stock portfolios for each category, based on the annual prices of key fundamental stock indicators, re-adjusted each year. Descriptive Statistics of all portfolio monthly returns are presented and appear a controversial result regarding with the relation risk-return. On the one hand the purpose of this research is to examine the possible effect on portfolio returns formed due to American macroeconomic variables, on the other hand to look for a possible alteration in their individual sensitivity factors (betas) through time. This time variability in betas is attempted to be identified both visually with the graphical representation of the produced beta coefficients through a Rolling Regression process with a 60-month calendar window, as well as econometrically with the model estimation that linking beta coefficients with time for all portfolios formed. The results of this study are useful tools for both investment and academic level when considering the factors that influence portfolio returns on the S&P100 and the influence of time on them, particularly in moments of crises such as the one in 2009, combined with the level of risk tolerance even in shares that historically demonstrate limited price volatility.

Key words: S&P100 market index, stock portfolios, portfolio volatility, portfolio returns, fundamental indicators, macroeconomic variables, Rolling Regression, beta coefficients time-variability.

ACKNOWLEDGEMENTS

Throughout the writing of this dissertation, I have received a great deal of support and assistance.

Foremost, I would like to express my sincere gratitude to my advisor Prof. Petros Messis for the continuous support of my study and research, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped me in all the time of research and writing of this thesis. His insightful feedback pushed me to sharpen my thinking and brought my work to a higher level. I could not have imagined having a better advisor and mentor for my dissertation study.

Besides my advisor, I would like to thank the rest of my dissertation committee: Prof. Zapranis Achilleas and Prof. Alexandridis Antonis, for their encouragement, insightful comments, and hard questions.

Also, I would like to thank my family: my parents Panagiotelidis Theodoros and Evangelia Mina and my sister Panagiotelidou Maria, for giving birth to me at the first place, for supporting me physically and spiritually throughout my life, for offering their help whenever was needed, for guiding me and enduring all the difficulties.

CONTENTS

FIGURES

TABLES

1. INTRODUCTION

The conduct of portfolio returns has always been the subject of investigation by all parties concerned. Inhibitors of research many and complex, associated with all levels of everyday life. The state of the economy in general is one of the primary factors and the way yields move in relation to its condition is the main spotlight. The innumerable approaches that have been developed deal with different purposes that each of them aims for. It is such the nature of the stock market time series data and their volume, that it has not been found and there will probably never be, an absolute formula for modeling them, only successful methods and techniques that suit in particular economic phases, profile choices and for a limited time. This survey focuses on shares of a specific return and volatility range, with a specific course over time, with the aim of identifying the factors that affect their returns in different portfolio schemes, confirming or not the existing literature supporting the effect of macroeconomic variables on yield analysis. Also, since it is not addressed to opportunists (shares by definition are a longer-term investment, but there are also several cases of short-term decisions), but to investors or analysts of all kinds who choose the long-term investment base, the observations used are categorized in monthly horizon of 19 years. An effort is being made to study and analyze the behavior of returns in relation with the factors that affect them and the possible reasons that cause them, in two very important economic sectors of the S&P100 Stock Market Index, giving the mark for investors' decisions depending on risk tolerance over time.

For this reason, section 2 provides an extensive reference to the bibliographical background based on research at a theoretical, academic, methodological and practical level, trying to create the rationale for the analysis of yields, the selection of the initial variables to be examined and the existing research that indicates an effect of time. The 3th section presents a brief theoretical background of the S&P100 stock market index, as well as its sectors to be used in the survey, giving the reason for their choice. In the 4th section, a detailed reference is quoted for the methodology developed in the theoretical points of this survey, the calculation procedures are attributed, listing the necessary backgrounds of the numerical formulas, operations and models used. Section 5 includes all data analyses concerning the examination of the impact of macroeconomic variables and the selection of final interpretative variables. In addition, a research for the role of time factor in beta coefficients and their time course during the period of monthly observations collected is also addressed. The 6th section lists all the research results, relevant comments, diagrams and tables for analyzing them and finally the 7th section summarizes the conclusions of this work and proposals for future research.

2. BACKGROUND

2.1. Return Predictability

One of the highlights and controversial literature's subject is whether the excessive stock returns are able to be predicted. In the last 50 years many researches have been conducted for this issue and the majority of the empirical elements are concluding in the same result, stock returns are predictable. Jaffe & Westerfield (1985a), (1985b) and Kato (1990a) suggest that there are some favorable findings for the possibility of predicting markets' indexes behavior. In addition, Campell (1987) documents the fact that the state of the term structure of interest rates predicts excess stock returns, Keim & Stambaugh (1986), concluded that some predetermined variables that reflect levels of bond and stock prices appear to predict returns on various of assets. Fama & French (1988) and Rozeff (1984) showed that dividend yields could have some predictive power for stock returns while Fama & Schwert (1977), ended in the same direction between inflation and a variety of asset returns. Fama & French (1992) using fundamental factors (size and book-to-market equity) managed to find a relation between the β variation of the fundamentals and average stock return, whilst Ferson & Harvey (1993) implied that average stock returns are partially predictable for a specific number of European Markets, Jung & Boyd (1996) and more recent researches with more sophisticated methods and mechanism like Lu et al (2020), Chen et al (2003), Booth et al. (2014), Barak & Modarres (2015), Jiang et al. (2018), Rodrigues & Lleo (2018), resulting in the same direction that stock returns are able to be predicted.

2.2. Monthly-based Data

The majority of scientific and general opinion in the forecasting literature is that high-frequency data models outperform low-frequency models based solely in daily returns (Andersen et al., 2003, Chortareas et al., 2011, Horpestad et al., 2019, Koopman et al., 2005, Martens, 2001, Wei, 2012.) Instead of that, many researchers manage to overturn this consensus and prove that once low-frequency data were available, they were more informative regarding volatility and can be combined with forecasts from high-frequency models to improve the forecasting accuracy, as Ma et al. (2018) suggested. Also, a result quite close to the previous was exported by Zhang et al. (2019), who find that a combination of these 2 different types of data can be useful for research. Far more from that, Lyócsa et all (2021), find that high-frequency volatility models tend to outperform low-frequency volatility models only for short-term forecasts. As the forecast horizon increases (up to one month), the difference in forecast accuracy becomes statistically indistinguishable for most market indices. Eventually, when they conducted asset allocation based on high-frequency volatility model, forecasts do not outperform asset allocation based on low-frequency volatility model forecasts.

2.3. The role of Fundamentals

The classical approach in literature has the core idea that fluctuations in asset prices is due to changes in fundamental values. This leads to a growing research literature around the single-factor CAPM, or its expansion, a multi-factor model by using firm-level fundamental variables. Many researches in cross sectional US equity returns indicated this conclusion, such as Basu (1977) resulted that the available P/E ratios seem to possess "information content", Banz (1981) confirmed that smaller market value firms had higher risk adjusted returns, on average, than larger, Rosenberg et al (1985), De Bondt & Thaler (1987) showed that market-to-book value is able to predict excessive returns, Fama & French (1992) in the cross-section of average stock returns concluded that used alone size, E/P, leverage, and book-to-market equity have explanatory power. In addition, Rosenberg (1974) proved that a conventional security beta is a function of a variety of fundamental sizes, Frankel & Lee (1998), found that fundamental values are highly correlated with contemporaneous stock prices.

On the contrary of the above plenty of the empirical studies with equity market data, still do not generate clear-cut positive results. An alternative solution for including fundamental factors in monitoring future asset returns is by using them as an element of composing portfolios with assets of similar characteristics or with assets of similar fundamental signals. Fama & French (1993) with the 3-Factor Model proved that size and book-to-market equity, do a good job explaining the cross-section of average returns and that the model is a good description of returns on portfolios formed on them. After that Fama & French (1996) showed that the Three-Factor Model captures the returns to portfolios formed on E/P, C/P, and sales growth and recently Fama & French (2015) developed the Five-Factor Model, adding two extra factors, profitability and investment, showed that the last model version was more efficient in prediction. Ou & Penman (1989) via combining a large set of financial statement items built a summary measure which indicates the direction of one-year-ahead earnings changes and take positions in stocks based on that indicator, Lev & Thiagarajan (1993), Abarbanell & Bushee (1997) confirmed that signals from fundamental analysis for predicting future earnings growth could be applicable and examine their positions in stocks based on the signals. Fong (2017) constructed a portfolio based on high gross profits-to-asset ratio and high dividend yield, Messis et al. (2019) used the book value per share fundamental size for constructing portfolios and challenging other competitive models which were built in a similar way.

2.4. Macroeconomics for Independent variables

There is a constant effort for the financial research community in order to derive a sum of risk factors with the greatest explanatory power in the cross-sectional asset returns. Overall market condition, general economic condition, banking sector, consumers' power and the prices of alternative investment tools are some macroeconomic variables which, over the years of research, are implied to have an appreciable affect in asset returns.

From the first appearance of CAPM and all the following theories and applications that somehow relate their research with it, in mostly of them is clearly clarified the principal role of market condition where stocks are bestir themselves. Variables that are formed in a wide state economical basis affect equilibrium security returns, according to Merton (1973). Ferson & Harvey (1991) showed that asset returns arise from predictability in the economic variables and especially interest rates determine stock returns in part. After a while, Ferson & Harvey (1993) used multifactor models in which conditional betas of the national equity markets depend on local information variables (market portfolio, exchange rate, inflation, interest rates, default risk, industrial production) and manage to capture much of the predictability for many countries, including USA. But, is feasible to prove a capable predictability in asset returns with more indirect way, like Jank (2012), who found that variables that predict the real economy as well as the equity premium, including default spread, relative T-Bill rate and consumption-wealth ratio – are related to fund flows and can account for the correlation of flows and market returns.

Moreover, Paster and Stambaugh (2003) concludes that the average return on stocks with high sensitivities to liquidity is greater for stocks with higher sensitivity to general liquidity in the state and that liquidity risk factor accounts for half of the profits to a momentum strategy over the examined period (useful a look at Acharya & Pedersen (2005), Amihud et al (1990), Datar et al (1998)). Also, Gertler & Grinols (1982) showed that unemployment and inflation have predictive power over asset returns, whilst Kehoe et al (2020) proposed a model that link unemployment with asset pricing fluctuation with a negative relationship and confirmed their assumption. From the existing literature is known that commodity prices have a significant role in explaining fluctuations in macroeconomic activity and help in forecasting (Hamilton, 2009), hence they are useful as predictors of asset returns. Several studies suggest that growth and financialization of commodity markets have led to higher correlations of commodity and stock returns, so they have predicable possibilities in asset returns (Silvennoinen & Thorp (2013), Büyükşahin & Robe (2014)). Although, as Bessler & Wolff (2015) proved, industrial and precious metals as well as energy improve the performance of a stock portfolio for most asset allocation strategies and hardly find positive portfolio effects for agriculture and livestock.

Finally, is proven from past economic crisis and depressions that different sort of markets link to each other, i.e., Billio et al (2012) find that investing, trading, banking and insurance companies are highly interrelated. With the same vein, Sim et al (2014) managed to prove that overall market connectedness is a capable risk factor for predicting individual stocks' sensitivity. So, in this research we are going to attempt combining basic macroeconomic features in a multifactor model and examine their predictability in asset returns.

2.5. Non-linearities in stock markets

The original theory of the Capital Asset Pricing Model (CAPM) from Sharpe (1964) and Linter (1965a, b), Treynor (1962) and Mossin (1966) and other intertemporal models based on than, like Merton (1973), Long (1974), Cox et al (1985), are dealing with the affection in expected returns which is result of investment's risk. More or less, until the early stages of nineties, the excessive majority of the financial society had the general belief that stock returns predictability is determined by a linear regression framework. Over the next years and until now, an increasing number of evidences is growing, that relationship between asset returns and factors that are used for prediction is may be linked by a non-linear model. Provided a summary of recent works Abhyankar et al (1997) enhanced the non-linearity dependence in stock returns, whilst Min Qi (1999), Mc Millan (2001), Hasanov & Omay (2008) using a non-linear model, found to have better in-sample fit and out-of-sample forecasts compared to its linear counterpart. Huang et al (2010) confirmed what Abu and Atiya (1996) had pointed out that however predictable, it remains hard to forecast the stock price movements mainly because the financial market is a complex, evolutionary, and non-linear dynamical system.

2.6. Time variability in beta coefficients

One of the primary assumptions of CAPM (and of other models) is that beta remains constant for all the given market returns, implying that returns are stationary and are following by distributions with time-invariant parameters. How accurate is that assumption? Not far enough from the very first steps of the CAPM theory, Levy (1974) concluded that beta may not be stable when different conditions are showing up on markets and the fact of considering beta constant could be a devious belief. In the same direction, Clinebell et al (1993), controversially with Fabozzi & Francis's conclusion that alpha and beta measures do not change over bull and bear markets, ended up that stocks exhibiting different beta measures more than beta measures predicted randomly. More recently, Barry (2009) using three different measurements of beta found that there were statistically significant differences in betas between bull and bear markets and concluding that the assumption of persistent beta in hotel stocks across varying market is highly risky. Bretschger & Lechthaler (2018), on their attempt to examine the rise of Japanese financial market due to changing macroeconomic environment, showed that the historical excess return of value stocks over growth stocks and the premium on winner minus loser stocks are statistically associated with economic growth, which illustrating the necessity of considering the structural instability in relation to growth expectation, especially in emerging economies that overflowed by macroeconomic transition. Also, Kanojia & Arora (2018), detect turning points in Indian stock market and find that return and volatility differences in bull and bear markets in Indian stock market are existed and attempt to formulate a profitable investment strategy, regarding with the market condition, implying absence of beta stability. Furthermore, Messis & Zapranis (2014), (2016) and Messis et al (2019), examined a novel approach for capturing time variation in betas whose pattern is treated as a function of market returns, building a two-factor model using estimated coefficients from stocks traded on S&P500 of a nonlinear regression and tested against other models (CAPM, Fama & French three factor model, APT model, different GARCH models, Kalmar filter algorithm, Schwert and Seguin model). The results implied that their model in each one of these three studies is superior than the others in explaining portfolio returns.

With absolute consistency with the above, the examined model that will be constructed and tested is going to measure the level of precise in modelling returns from 2 basic portfolio sectors in S&P100. The first portfolio sector is derived in 3 categories regarding with their structure, constituted only by stocks from the financial sector of S&P 100 and every category divided in 9 different portfolios that constructed by a specific fundamental size. The same method is applied and in the second portfolio sector, with only difference that stocks are belonging in the Information & Technology sector of S&P 100. Data, which are in monthly based frequency, combining a non-linear model as to betas, focusing in the time variation in betas and explanatory variables are macroeconomic magnitudes.

3. BRIEF THEORY ANALYSIS

3.1. S&P 100 Market Index

The S&P 100, a sub-set of the S&P 500®, is designed to measure the performance of large-cap companies in the United States. The index comprises 101 major blue-chip companies across multiple industry groups. Individual stock options are listed for each index constituent.

Created by Standard & Poor's (S&P) and Morgan Stanley Capital International (MSCI), they are also known as the Global Industry Classification Standard (GICS). S&P sorts companies into sectors based on their primary business activity.

3.1.1. S&P 100 Sector Breakdown

S&P 100 is consisted of 11 sectors which are the following:

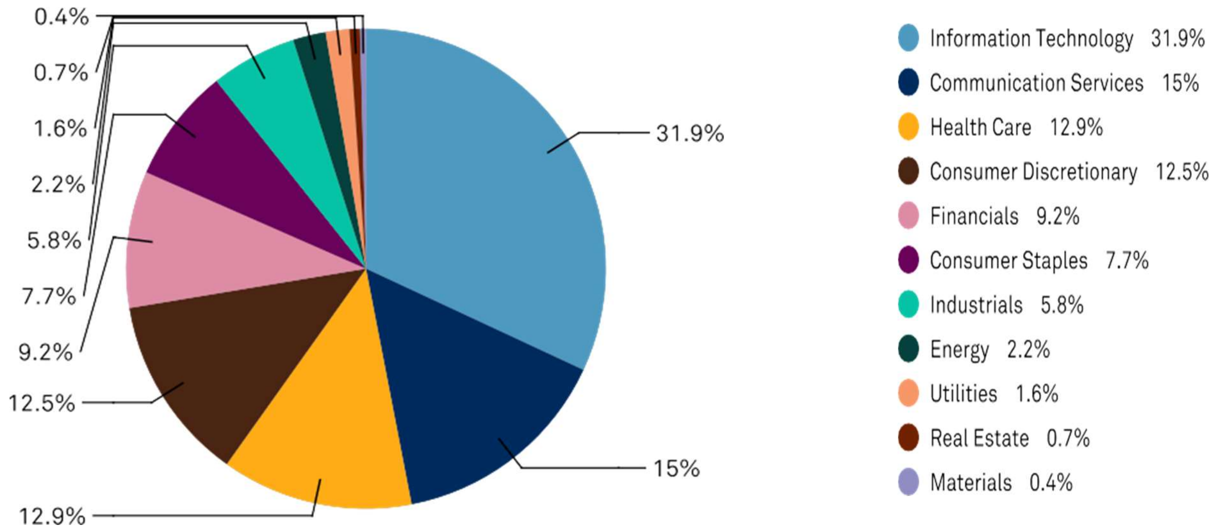

Figure 1: *S&P 100 Sector Breakdown, Standard & Poor's.*

3.1.2. Sector Breakdown Importance

Sector breakdowns help portfolio managers and investors determine the allocation of funds within a portfolio. If an investor wants to create a diversified portfolio, the portfolio should include stocks from a variety of sectors. For smaller investors seeking to create a diversified portfolio, they can easily do by investing in an index exchange-traded fund (ETF). However, if an investor is only interested in investing in, for example, technology or financial-based businesses, they can, of course, confine their investing to only the sectors they are interested in.

3.1.3. S&P 100 Sector Indexes Volatility for 2010s

The U.S. economy has expanded for a record 126 straight months, the longest time period in U.S. history, according to the National Bureau of Economic Research. The bull market in U.S. stocks has run about 10,7 years, one of the longest bull markets in history. The 2010s were the first "decade" in at least 170 years that did not experience a U.S. recession.

However, overall U.S. economic growth (including job growth, wage growth and GDP growth) during the 2010s has been slower compared to some previous U.S. expansions. According to research from S&P Global, the most volatile market sectors during the 2010s (the period between Dec. 31, 2009 and Dec. 31, 2019) were those that felt the most impact from rapid changes in oil prices. Here are listed in ascending order the top 8 sectors with the highest standard deviations.

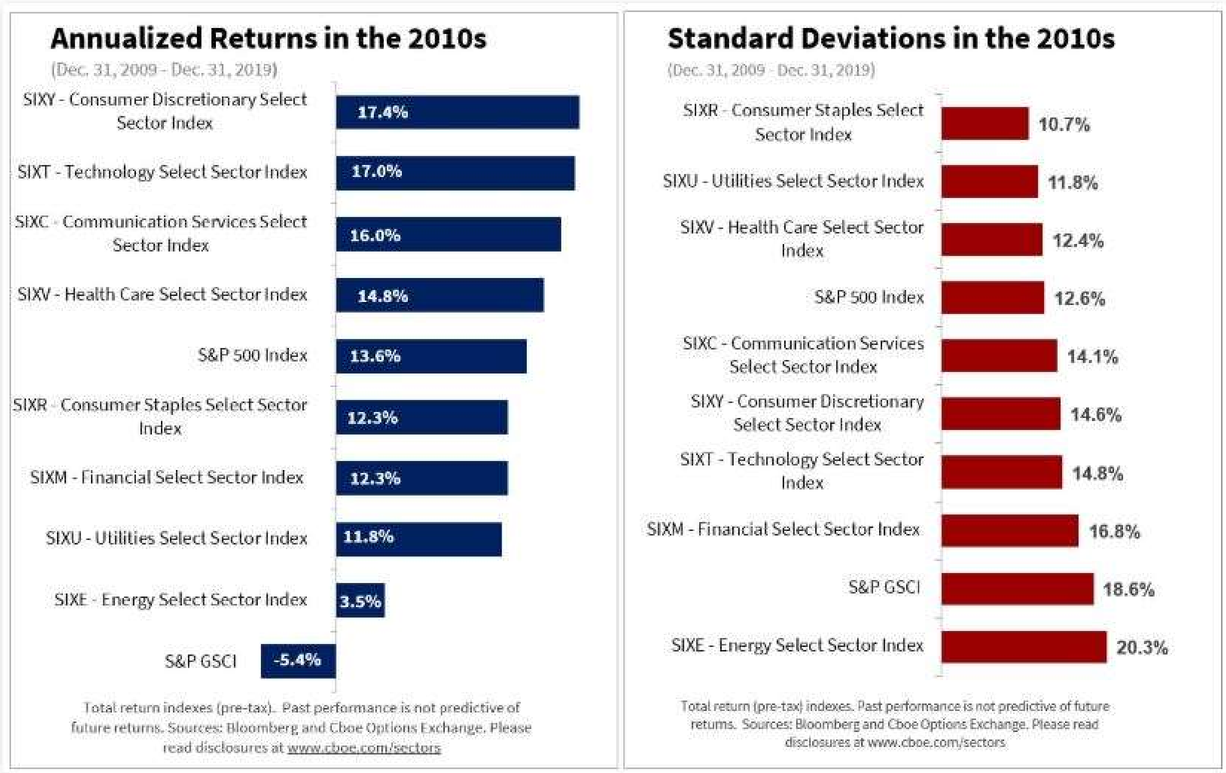

Figure 2: *Annualized Returns & Standard Deviations in S&P Sector Indexes during 2010s, S&P Global.*

3.2. Fundamental Financial Ratios

Financial ratios are created with the use of numerical values taken from financial statements to gain meaningful information about a company. The numbers found on a company's financial statements – balance sheet, income statement, and cash flow statement – are used to perform quantitative analysis and assess a company's liquidity, leverage, growth, margins, profitability, rates of return, valuation, and more. Analysis of financial ratios serves two main purposes:

1. **Track company performance**: Determining individual financial ratios per period and tracking the change in their values over time is done to spot trends that may be developing in a company. For example, an increasing debt-to-asset ratio may indicate that a company is overburdened with debt and may eventually be facing default risk.
2. **Make comparative judgments regarding company performance**: Comparing financial ratios with that of major competitors is done to identify whether a company is performing better or worse than the industry average. For example, comparing the return on assets between companies helps an analyst or investor to determine which company is making the most efficient use of its assets.

3.3. Macroeconomic Indicators

Macroeconomic indicators are statistics or data readings that reflect the economic circumstances of a particular country, region or sector. They are used by analysts and governments to assess the current and future health of the economy and financial markets. Policy-makers use them to assess their economies' health. Citizens evaluate politicians' performance using them as yardsticks. But these indicators defy simple definition, and the formulae underlying them have varied across countries and over time. Particular choices have fundamental distributive consequences. Macroeconomic indicators are important to any trader because they can have a significant influence on market movements. This is why most fundamental analysis will incorporate macroeconomic indicators.

4. METHODOLOGY

4.1. S&P 100 Sectors Selection

The ulterior aim of this study is to form various sub-portfolios based on a fundamental index, with shares of companies that are part of S&P 100 stock index, in which first will be calculated their historical performance and then will be examined the influence on it by macroeconomic variables, as well as the effect of time factor on their progress. These portfolios will consist of companies from two categories of economic sectors, i.e., the Financial and Information-Technology Sectors separately. The reason for selecting these two categories is for comparing the returns of portfolios consisting of stocks with significant fluctuations (Energy Sector is in the highest place with 20,3% standard deviation but consists only 2,2% of total S&P100 Index, so the next Sectors with high volatility are chosen), due to the different nature of their economic activity.

Financial Sector experienced tremendous volatility during the 2007-2008 financial crisis and the Great Recession that followed. For the 2010s, the financial sector's standard deviation came in third highest at 16.8%. The Information-Technology Sector ranked fourth in S&P Global's list of sectors with the highest volatility, coming in with a standard deviation of 14.8%.

4.2. Companies Data Selection

Extending the selection of the economic sectors of activity categories, the data collection focused on specific companies that are likely to be used in portfolio schemes based on a fundamental index. Therefore, it is possible that there are companies whose data were collected and ultimately may not be used, as they do not meet the desired criteria. These companies are listed in the following two summary Tables 1 & 2:

Table 1: *Possible Companies to be included in various Financial Portfolios.*

No.	Company Name	Industry Group	Ticker
1.	American International Group (NYSE)	INSURANCE - Property & Casualty Insurance	AIG
2.	Allstate Corporation (NYSE)	INSURANCE - Property & Casualty Insurance	ALL
3.	American Express Co (NYSE)	FINANCIAL SERVICES - Credit Services	AXP
4.	Bank of America Corp (NYSE)	BANKING - Money Center Banks	BAC
5.	Bank of New York Mellon Corporation (NYSE)	FINANCIAL SERVICES - Asset Management	BK
6.	Blackrock Incorporated (NYSE)	FINANCIAL SERVICES - Asset Management	BLK
7.	Berkshire Hathaway Cl B (NYSE)	INSURANCE - Property & Casualty Insurance	BRKB
8.	Citigroup (NYSE)	BANKING - Money Center Banks	C
9.	Capital One Financial Cp (NYSE)	FINANCIAL SERVICES - Credit Services	COF
10.	Goldman Sachs Group Inc (NYSE)	FINANCIAL SERVICES - Diversified Investments	GS
11.	JPMorgan Chase and Co (NYSE)	BANKING - Money Center Banks	JPM
12.	MetLife Inc (NYSE)	INSURANCE - Life Insurance	MET
13.	Morgan Stanley (NYS)	FINANCIAL SERVICES - Investment Brokerage - National	MS
14.	US Bancorp (NYSE)	BANKING - Regional - Midwest Banks	USB
15.	Wells Fargo & Company (NYSE)	BANKING - Money Center Banks	WFC

Table 2: *Possible Companies to be included in various Technology & Information Portfolios.*

No.	Company Name	Industry Group	Ticker
1.	Apple Inc (NASDAQ)	COMPUTER HARDWARE - Personal Computers	AAPL
2.	Accenture Ltd (NYSE)	COMPUTER SOFTWARE & SERVICES - Information Technology Services	ACN
3.	Adobe Systems Inc (NASDAQ)	COMPUTER SOFTWARE & SERVICES - Application Software	ADBE

4.	Salesforce.com Inc (NYSE)	INFORMATION TECHNOLOGY-Software and Computer Services	CRM
5.	Cisco Systems Inc (NASDAQ)	COMPUTER HARDWARE - Networking & Communication Dev	CSCO
6.	International Business Machines Corporation (NYSE)	COMPUTER SOFTWARE & SERVICES - Information Technology Services	IBM
7.	Intel Corp (NASDAQ)	ELECTRONICS - Semiconductor - Broad Line	INTC
8.	Mastercard Incorporated (NYSE)	DIVERSIFIED SERVICES - Business/Management Services	MA
9.	Microsoft Corp (NASDAQ)	COMPUTER SOFTWARE & SERVICES - Application Software	MSFT
10.	NVIDIA Corporation (NASDAQ)	ELECTRONICS - Semiconductor - Specialized	NVDA
11.	Oracle Corp (NYSE)	COMPUTER SOFTWARE & SERVICES - Application Software	ORCL
12.	PayPal Holdings Inc (NASDAQ)	FINANCIAL SERVICES - Credit Services	PYPL
13.	Qualcomm Inc (NASDAQ)	TELECOMMUNICATIONS - Communication Equipment	QCOM
14.	Texas Instruments Inc (NASDAQ)	ELECTRONICS - Semiconductor - Broad Line	TXN
15.	Visa Inc (NYSE)	DIVERSIFIED SERVICES - Business/Management Services	V

4.3. Classification – Fundamental Indicators

For the formation of the sub-conditional portfolios in both activity areas of S&P100, fundamental corporate indices will be used on an annual basis as classification sizes. For the calculation of these fundamental indicators, annual fundamentals of the companies were selected from their annual published Financial Statements, which are summarized in the following Table 3:

Table 3: *Financial Fundamental Sizes used for classification.*

No.	Fundamental Size	Explanation- Calculation formula
1.	Market Capitalization	The total stock market value of the company concerned for the reference year.
2.	Total Assets	The total company Assets, as reflected in the Balance Sheet in the reference year.
3.	Total Equity	The total position of the company's shareholders, as reflected in the Balance Sheet in the reference year and produced by the common equation: Total Equity= Total Assets –(minus) Total Liabilities.

4.	Book Value	The book value of the company, consisting of the net position of the shareholders.
5.	Total Book Capitalization	The company's book value, consisting of net worth and long-term debt, as reflected in the Balance Sheet in the reference year.
6.	Ordinary Shares Issued	The available common shares of the company, as reflected in the Statements in the reference year.
7.	Net Income	The company's net profit and loss as reflected in the Statement of Income in the reporting year.
8.	Total Revenue	The total gross revenue from the company's main activities, as reflected in the Statement of Income in the reporting year.
9.	Dividend	The total amount of dividends available to the shareholders of the company, as reflected in the Statements in the reference year.

All the above fundamental sizes are used for every company that mentioned in Tables 1 and 2 in order to calculate specific annual financial fundamental indicators. These fundamental indicators and their calculation formula are presented in Table 4:

Table 4: *Annual Financial Fundamental Indicators used for portfolios formation.*

No.	Fundamental Indicator	Explanation- Calculation formula
1.	P/E	Price-to-Earnings per share: Market Capitalization-to-Net Income, per share.
2.	EPS	Earnings per share: Net Income-to-Ordinary shares issued.
3.	Dividend Yield D/P	Dividend-to-Price: Dividend-to-Market Capitalization.
4.	P/BV	Price-to-Book Value: Market Capitalization-to-Book Value.
5.	P.E.G.	Price-to-Earnings Growth: Stock's price/earnings ratio (P/E ratio) divided by its percentage growth rate (g). The growth rate (g) is calculated as a geometric mean of the last 5-years EPS growth.
6.	BV/Shares	Book Value-to-Shares: Book Value-to-Ordinary shares issued.
7.	TBC/Shares	Total Book Capitalization-to-Shares: Total Book Capitalization-to-Ordinary shares issued.
8.	ROE	Return on Equity: Net Income-to-Total Equity.
9.	P/S	Price-to-Sales: Market Capitalization-to-Total Revenue.

Portfolios shall be formed on the basis of the fundamental indicator' value in the exact preceding year and shall be revised in every beginning of the year for the examined period in exactly the same way. For each economic activity sector companies will be formed 3 different portfolio categories formed by a specific fundamental indicator (further explanation for the portfolios structure form will be given in 4.7.). The general rules for every fundamental indicator in the formation of all portfolios are: 1) lower positive P/E, 2) higher positive EPS, 3) higher positive D/P, 4) lower positive P/BV, 5) lower positive P.E.G., 6) higher positive BV/Shares, 7) higher positive TBC/Shares, 8) higher positive ROE and 9) lower positive P/S.

1) Lower positive P/E: The price-to-earnings, or P/E, ratio shows how much stock investors are paying for each rupee of earnings. It shows if the market is overvaluing or undervaluing the company. A high P/E ratio may indicate that the stock is overpriced (with respect to history and/or peers) or the company's earnings are expected to grow at a fast pace. A low P/E might mean that the stock is an underperformer. It can also be a stock that people often overlook. So, the company's P/E is preferred to be as low as it may in comparison with its peers.

2) Higher positive EPS: Earnings per share (EPS) measures net income earned on each share of a company's common stock. The resulting number serves as an indicator of a company's profitability. The higher a company's EPS, the more profitable it is considered to be. EPS indicates how much money a company makes for each share of its stock and is a widely used metric to estimate corporate value. A higher EPS indicates greater value because investors will pay more for a company's shares if they think the company has higher profits relative to its share price.

3) Higher positive D/P: This metric determines the ratio of how much dividend an investor receives annually in relation the stock's price per single share. A higher figure signals that the company is doing well and could signify a good long-term investment as companies' dividend policies are generally fixed in the long run. In general, mature companies that aren't growing very quickly pay the highest dividend yields and as members of S&P 100 all companies are considered mature, so the D/P must be the highest possible.

4) Lower positive P/BV: This ratio is used to compare a company's market price to its book value. Book value, in simple terms, is the amount that will remain if the company liquidates its assets and repays all its liabilities. If the goal is to unearth high-growth companies selling at low-growth prices P/BV offers investors an effective approach to finding undervalued companies. P/BV ratio values shares of companies with large tangible assets on their balance sheets. A company with a high price-to-book ratio could mean the stock price is overvalued while a company with a lower price-to-book could be undervalued.

5) Lower positive P.E.G.: PEG ratio gives a more complete picture of stock valuation than simply viewing the price-to-earnings (P/E) ratio in isolation. The PEG ratio is used to know the relationship between the price of a stock, earnings per share (EPS) and the company's growth. the PEG ratio tells us that a company's stock price is higher than its earnings growth. This means that if the company doesn't grow at a faster rate, the stock price will decrease. The result can be compared with that of peers with different growth rates. Thus, a generally low PEG is preferred.

6) Higher positive BV/Shares: Is a financial ratio used to assess the amount of Book Value which one share of the company will give you exposure to or else represents the value of equity that remains after paying up all debts and the company's assets liquidated. Essentially, this tells a potential investor what claim on the Book Value of a company they would have by purchasing one share of the company. On its own, this is not used too commonly when valuing companies. Book value of equity per share effectively indicates a firm's net asset value (total assets - total liabilities) on a per-share basis. When a stock is undervalued, it will have a higher book value per share in relation to its current stock price in the market. The higher the ratio the more likely to have larger size than current market price.

7) Higher positive TBC/Shares: The total long-term debt and common equity of a company that constitutes its capital structure per share. Its course is similar with the previous BV/Shares ratio which means that the higher this ratio the bigger its capital investment, thus the greater the ability of the owners to obtain more capital available for investment per share, so bigger its size in the sector.

8) Higher positive ROE: ROE measures how the profitability of a corporation in relation to stockholders' equity, or else the return that shareholders get from the business and overall earnings. Whether an ROE is considered satisfactory will depend on what is normal for the industry or company peers. It helps investors compare profitability of companies in the same industry. The ratio highlights the capability of the management.

9) Lower positive P/S: The price-to-sales (P/S) ratio shows how much investors are willing to pay per dollar of sales for a stock. A low ratio could imply the stock is undervalued while a ratio that is higher-than-average could indicate that the stock is overvalued. P/S ratio is most relevant when used to compare companies in the same sector. If Acme's peers, in the same sector are of similar size in terms of market capitalization, a lower P/S ratio suggests a premium valuation for the company.

Further, since the date at which the examined companies publish their annual Financial Statements is not fixed for every Sector, resulting in different annual periods, for the sake of simplification it is considered that the data published up to 31/5 of a year are treated as data of the previous year and examined as data on 31/12 of the previous year. On the other hand, data published from 30/6 to 31/12 shall be considered as annual data for the year relating to 31/12. This abusive way makes it possible to compare the above fundamentals for the formation of portfolios.

4.4. Possible Independent Variables

As interpretative variables will be used a total of 37 economic variables, 35 of them are key-macroeconomic indicators and the rest 2 are the artificial Sector Capitalization Returns that formed for this research.

4.4.1. Macroeconomic Data Selection

This survey focused on eight major categories of U.S. Economy indicators covering the state of the market, exchange rates, interest rates, trade of goods, liquidity, price level, productivity & labor sector and commodities. For commodity indicators there is an additional division into two subcategories depending on the nature of the material being dealt with, Precious-industrial Metal and Energy. Detailed information for all macroeconomic indicators in each category, the ticker as well as explanatory comments are given in Appendix A, chapter 9.1, Table 16.

4.4.2. Sector Capitalization Indexes and Returns Formation

For every i economic activity sector, a formation of a monthly artificial Sector Index is proceeded in order to add their monthly returns as possible independent variable at the following Regressions. At this point, the type of fraction that will be used to calculate the specific Indexes is:

$$SCI_{i,t} = \sum_{n=1}^{n} SC_{n,t} \ / \ \mathrm{n} \qquad (1)$$

where,

- $SCI_{i,t}$ is the i Sector Capitalization Index at the time t.
- $SC_{n,t}$ is the individual capitalization of the n company share at the time t.
- n is the number of shares that consists of the i Sector at the time t.

After the estimation of the i monthly Sector Capitalization Index at the time t, the estimations of their monthly yield returns are calculated with the equation (2), in order to test them as possible independent variables of monthly portfolios returns.

4.4.3 Aggregate Presentation of possible Independent Variables

In Table 5 the possible independent variables are presented, with a unique variable symbol that will represent them from now on in every test in this study.

Table 5: *Aggregate Presentation of possible Independent Variables.*

No.	Possible Independent Variable	Symbol
1.	FINANCIAL SECTOR CAPITALIZATION INDEX	X01
2.	INFTEC_SECTOR CAPITALIZATION INDEX	X02
3.	S&P100	X03
4.	S&P500	X04
5.	US DOLLARS PER SDR END OF PERIOD RATE	X05
6.	US_DOLLAR_PER_SDR__PERIOD AVERAGE	X06
7.	NOMINAL EFFECTIVE EXCHANGE RATE TRADE PARTNERS BY CONSUMER PRIC	X07
8.	REAL EFFECTIVE EXCHANGE RATE BASED ON CONSUMER PRICE INDEX	X08
9.	CENTRAL_BANK_POLICY_RATE	X09
10.	DISCOUNT RATE	X10
11.	MONEY MARKET RATE	X11
12.	TREASURY_BILL_RATE	X12
13.	LENDING RATE	X13
14.	GOVERNMENT BONDS	X14
15.	10-YEAR_GOVERNMENT_BONDS	X15
16.	GOODS, VALUE OF IMPORTS CIF US DOLLARS	X16
17.	GOODS, VALUE OF EXPORTS US DOLLARS	X17
18.	INTERNATIONAL LIQUIDITY, TOTAL_RESERVES, EXCLUDING_GOLD, US_DOLLAR	X18
19.	INTERNATIONAL LIQUIDITY, TOTAL RESERVES, EXCLUDING GOLD, FOREIGN	X19
20.	INTERNATIONAL LIQUIDITY, GOLD HOLDINGS NATIONAL VALUATION, US DOL	X20
21.	PRICES, PRODUCER_PRICE_INDEX, ALL_COMMODITIES, INDEX	X21
22.	PRICES, CONSUMER PRICE, INDEX, ALL ITEMS, INDEX	X22
23.	INFLATION RATE	X23
24.	ECONOMIC_ACTIVITY, OIL_PRODUCTION_CRUDE, INDEX	X24
25.	ECONOMIC ACTIVITY, INDUSTRIAL PRODUCTION MANUFACTURING INDEX	X25
26.	ECONOMIC ACTIVITY, INDUSTRIAL PRODUCTION INDEX	X26
27.	INDUSTRIAL_PRODUCTION, SEASONALLY_ADJUSTED, INDEX	X27
28.	LABOR FORCE, PERSONS NUMBER OF	X28
29.	LABOR MARKETS UNEMPLOYMENT RATE, PERCENT	X29
30.	UNEMPLOYMENT_PERSONS, NUMBER_OF	X30
31.	GOLD	X31
32.	SILVER	X32
33.	COPPER	X33
34.	CRUDE OIL	X34
35.	GASOLINE	X35
36.	NATURAL GAS	X36
37.	HEATING OIL	X37

4.5. Portfolios Formation Assumptions

Following the classification for the formation of portfolios based on the fundamental indicator examined each time, it is necessary to make a number of basic assumptions for this purpose. These assumptions are as follows:

1) There are no transaction costs in share trading in the formation of portfolios, the securities are fully and directly able to liquid and assets are fully divided.
2) Purchases and sales of shares are unrestricted.
3) Short-selling is allowed.
4) All investors can lend and borrow funds without restrictions at zero interest rates.
5) All purchases and sales of shares for portfolio reconstructions take place on the first day of the last month of the year that passes.
6) Lack of taxation.
7) The beta coefficients of the various portfolios do not remain stable over time.
8) Risk-free rate is zero.

4.6 Selection of Yield Equation

During the model development, the type of returns on the shares that make up the individual portfolios should be chosen, before applying the model. Due to the time series order nature of the data a choice between 1) the simple return and 2) the logarithmic return has to be done. Simple return is chosen because monthly data is considered more appropriate than logarithmic and also a portfolio of shares as a whole is examined, rather than the individual course of a share.

So, if we call $P_{i,t}$ the monthly closing price of the *i* stock and $P_{i,t-1}$ the closing price of the previous month, the simple return of *t*-month is given by the following equation:

$$r_{i,t} = \frac{P_{i,t}}{P_{i,t-1}} - 1 \qquad (2)$$

4.7. Portfolios Return Calculation

Once the individual monthly simple returns of the *n* stocks, which meet one of the criteria of classification to be included in the *i* portfolio, are calculated, then for the *i* portfolio that formed the monthly return should be calculated. At this point, the usual type of portfolio returns will be used to calculate the specific returns:

$$Rp_{i,t} = \sum_{n=1}^{n} w_{n,t} r_{n,t} \qquad (3)$$

Regarding to the portfolio structure that has been pointed in 4.4., is related to the weights $w_{n,t}$ of every n stock in each portfolio, so portfolios are formed using three different methods:

i) portfolios that include the 5 best shares based on the price of the examined fundamental indicator and weighted in equal measure,

ii) portfolios that include the 5 best shares based on the price of the examined fundamental indicator and weighted in proportion to their individual price and

iii) portfolios formed from all sector shares and weighted according to the price of the fundamental indicator of the share considered.

In case of equal sizes resulting in more than 5 companies complying with the rule of entry into a portfolio based on the fundamental indicator examined, then all companies are included in the underling portfolio, whereas if the criteria are not met by at least 5 companies then only those that meet the criterion are included in the portfolio. Furthermore, in the last structural type, where all shares are participating, if a stock's fundamental indicator has a negative sign that results in a short position in this particular stock based on its negative size.

4.8. Variables Stability Test

For testing the possible variables stagnation an Augmented Dickey-Fuller test is used. However, before the methodology of this test is given, a brief reference to the key points of the unit root is mentioned.

4.8.1. Basic Unit Root Test

The standard procedure includes a simple AR(1) sequence:

$$y_t = \rho y_{t-1} + x'_t\delta + \varepsilon_t \qquad (4)$$

where x_t are optional exogenous regressors which may consist of constant, or a constant and trend, ρ and δ are parameters to be estimated, and the ε_τ are assumed to be white noise. If $|\rho| \geq 1$, y is a nonstationary series and the variance of y increases with time and approaches infinity. If $|\rho| < 1$, y is a (trend-)stationary series. Thus, the hypothesis of (trend-)stationarity can be evaluated by testing whether the absolute value of ρ is strictly less than one. The unit root tests generally test the null hypothesis H_0: $\rho = 1$ against the one-sided alternative H_0: $\rho < 1$.

4.8.2. The Augmented Dickey-Fuller Test (ADF)

The standard DF test is carried out by estimating the (4) after subtracting y_{t-1} from both sides of the equation:

$$\Delta y_t = \alpha y_{t-1} + x'_t\delta + \varepsilon_t \tag{5}$$

Where a = ρ -1. The null and alternative hypothesis may be written as,

$$H_0: \alpha = 0$$

$$H_1: \alpha < 0 \tag{6}$$

and evaluated using the conventional t-ratio for α. The Augmented Dickey-Fuller (ADF) test constructs a parametric correction for higher-order correlation by assuming that the *y* series follows an AR(p) process and adding p lagged difference terms of the dependent variable *y* to the right-hand side of the test regression:

$$\Delta y_t = \alpha y_{t-1} + x'_t\delta + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \ldots + \beta_p \Delta y_{t-p} + u_t \tag{7}$$

This augmented specification is then used to test (5) using the t-ratio. An important result obtained by Fuller is that the asymptotic distribution of the t-ratio for α is independent of the number of lagged first differences included in the ADF regression.

4.9. Model Estimation

4.9.1. Independent Variables Selection

For selecting the most appropriate interpretative variables a sequence of four-stage actions is developed, where the first concerns the elimination of collinearity between the candidate interpretive variables, the second concerns a stepwise regression for all portfolios returns and the remaining variables from collinearity test. The third stage aims to exclude consecutively the variables that qualified from the stepwise regression and showing statistically non-significant beta coefficients and the last stage targets to conclude in the final independent variables for every portfolio category formed by specific fundamental indicator.

4.9.1.1. Collinearity Test

In the first phase all possible independent variables are inserted in a Multicollinearity Test through covariance analysis in pairs by 2. Multicollinearity exists whenever an independent variable is highly correlated with one or more of the other independent variables in a multiple regression equation. Multicollinearity is a problem because it undermines the statistical significance of an independent variable. Usually, variables that present covariance >= 0,70 lead to a collinearity issues and one of them should be excluded for the procedure.

4.9.1.2. Stepwise Regression for all Portfolios returns

In the second phase, the process is more complicated and involves the development of significance control using a stepwise forward regression process between the returns of all individual portfolios and the remaining variables resulting from the previous phase. From the results, the most appropriate variables for further analysis are selected in every portfolio formed.

4.9.1.3. Exclusion of non-significant Variables

In this stage, those candidate independent variables resulting from the second phase separately for every portfolio, were used in successive exclusion process of the variable that presents the highest p-value of beta coefficients in a simple linear regression that conducted in all portfolios returns. The process in every regression stops when all the remaining variables produce statistically significant beta coefficients.

4.9.1.4. Final Independent Variables Selection

In the final stage, in every category of portfolio returns formed by a specific of the 9 fundamental indicators from 4.3. in Table 4, the common variables of the portfolio categories remaining from exclusion process and which simultaneously produce statistically significant beta coefficients in simple linear regressions with their particular portfolios returns, are selected as final independent variables for every fundamental indicator.

4.9.2. Time Variability and Rolling Regression Analysis

From the Rolling Regression Stage Analysis, by producing 5-year statistically significant beta coefficients of the independent variables used, the proof of the temporal variability of these beta coefficients is achieved, that is a primary target of this study.

This procedure shall be carried out for the calculation of all individual 5-year beta coefficients, changing every month, between the independent variables resulting from the 4.9.1.3. and all portfolios returns separately. Observations have been used in a particular time base since the last 60 months, i.e., the horizon is constant and equal to 5 years. This is achieved by isolating the sample from each variable in sixty observations, starting the calculations initially exactly after 60 months from the first calendar monthly observation and at each subsequent step, observations of the following month are added and observations of the first month, that are used in the previous Rolling Regression process are subtracted, always maintaining a stable horizon of 60 months.

4.9.3. Model Selection

In order to confirm the results from the Rolling Regression Stage Analysis both in numbers and graphics, except of visual control, a statistical test is required. For this reason, an attempt is being made to develop a model function of the beta coefficients in relation with time for 2 different cases: a) the successive 5-year beta coefficients produced by Rolling Regression, b) the monthly beta coefficients produced by regressions between every portfolio returns formed by a specific fundamental indicator and the final independent variables from 4.9.1.3.

4.9.3.1. 5-year beta coefficients from Rolling Regression

With the successive 5-year beta coefficients that are produced from Rolling Regression, a regression between them (dependent variable) and time factor (independent variable) is executed for all the produced beta coefficients in every portfolio category formed by a specific fundamental indicator. Through this process a possible affect with time is tested.

The model of time-varying $\beta_{i,y}$ factors in relation with time t has the following format:

$$\beta_{i,y,t} = \beta_{i,y} + \alpha_{i,y} t + \gamma_{i,y} t^2 + \delta_{i,y} t^3 + v_{i,y,t} \qquad (8)$$

where,

- $\beta_{i,y,t}$ the sensitivity factor of the y portfolio with i as independent variable at time t.
- $\beta_{i,y}$ the sensitivity factor of the y portfolio with i as independent variable.

- $\alpha_{i,y}$ is the sensitivity factor of simple time t of the y portfolio with i as independent variable.
- $\gamma_{i,y}$ is the sensitivity factor of quadratic time t^2 of the y portfolio with i as independent variable.
- $\delta_{i,y}$ is the sensitivity factor of cubic time t^3 of the y portfolio with i as independent variable.
- $v_{i,y,t}$ the residuals of time-varying $\beta_{i,y,t}$ factor of the y portfolio with i as independent variable at time t.

This relationship is used in three different cases of tests to confirm the results of the Rolling Regression process, in order to compare the first results of their regressions and to find the most appropriate relationship that describes (if it is possible) the course of the beta coefficient over time, as well as to analyze them in this way. The cases are:

1) When α=0 and γ=0, then $\beta_{i,t} = \beta_i$, and beta factor is the known estimator from the OLS.
2) When γ=0, then $\beta_{i,t} = \beta_i + \alpha t$, indicating a simple linear relationship with time.
3) When no coefficient is considered zero, therefore a non-linean relationship with time is tested.

4.9.3.2. Monthly beta coefficients

After that, it is meaningful to test also the relation between the monthly beta coefficients of the independent variables with time. For this purpose, an attempt to construct a regression model for the monthly returns of portfolios using as basis the multifactor CAPM model (risk free rate is considered zero as stated in 4.5) is made. The final function tested is:

$$\mathrm{r}_{y,\mathrm{t}} = \mathrm{c} + \sum_{i=1}^{n} \beta_{\mathrm{i},y,\mathrm{t}} \times \mathrm{F}_{i,t} + \mathrm{u}_{y,t} \qquad (9)$$

Or replacing (8) in (9):

$$\mathrm{r}_{y,\mathrm{t}} = \mathrm{c} + \sum_{i=1}^{n} \beta_{\mathrm{i},y} \times \mathrm{F}_{i,t} + \alpha_{i,y} I_{i,t}^{*} + \gamma_{i,y} I_{i,t}^{**} + \delta_{i,y} I_{i,t}^{***} + \mathrm{u}_{y,t} \qquad (10)$$

where,

- $r_{,y,t}$ is the return of the y portfolio at time t.
- $F_{i,t}$ is the i independent variable (Factor) at time t.
- $I^*_{i,t} = F_{i,t}\ x\ t$ from (10).
- $I^{**}_{i,t} = F_{i,t}\ x\ t^2$ from (10).
- $I^{***}_{i,t} = F_{i,t}\ x\ t^3$ from (10).
- $u_{y,t}$ the residuals of the $r_{,y,t}$ return of the y portfolio at time t.

This relationship is used in three different cases in order to find the most appropriate relationship that describes (if it is possible) the course of the beta coefficient over time, as well as to analyze them in this way. The cases are:

1) When α=0, γ=0 and δ=0 then $\beta_{i,t} = \beta_i$, and beta factor is the known estimator from the OLS.
2) When γ=0 and δ=0, then $\beta_{i,t} = \beta_i + \alpha t$, indicating a simple linear relationship with time.
3) When δ=0, then $\beta_{i,t} = \beta_i + \alpha t + \gamma t^2$, indicating a non-linear relationship with time.
4) When no coefficient is considered zero, therefore a non-linear relationship with time is tested.

5. DATA ANALYSIS

5.1 Data Collection

The published data of the Annual Financial Statements and the stock prices of the examined companies were collected from Yahoo Finance website platform, as well as those relating to the macroeconomic data of the American Economy from the International Monetary Fund's website (IMF).

In more detail, monthly data were collected for the shares closing prices of the companies in Tables 1 and 2, from 1/1/2001 to 1/10/2019, which are members of the stock index S&P100 and belong to the Financial and Information-Technology activity Sectors, with a total of 226 observations for every company. Annual data for the fundamentals of these companies for the period 2000 to 2019 were also gathered. Finally, regarding with the key macroeconomic indicators given in Table 5, their monthly data for the above period were collected with similar way, composed of 226 observations each one of them.

5.2. Pre-edit Data Process

5.2.1. Data Filtering

At this stage, the collected data are checked for i) absence of observation values, ii) impossible observation values and iii) unlikely observation values in both dependent variables and independent for the period 1/1/2001 to 1/10/2019. Nothing remarkable was noticed.

The same procedure was carried out for the data used to form the fundamental indicators of the companies from two economic activity sectors. For the Information-Technology portfolios, the Accenture plc company data start from 1/8/2001, the Salesforce.com Inc. company data start from 1/8/2004, the Mastercard Incorporated company data start from 1/6/2006, the PayPal Holdings Inc. company data start from 1/8/2015 and the Visa Inc company data start from 1/3/2008.

Therefore, the exclusion of the PayPal Holdings Inc company data was decided both in calculation of the fundamental indicators and the capitalization index, at the stage of the selection of interpretative variables, as well as in the calculation of the returns of the various technological portfolios, due to a lack of sufficient observations. On the other hand, for the remaining shares of the companies mentioned above, their participation was decided as soon as this is possible on the basis of the methodology followed and analyzed in 4.3. in each case of calculation of the sizes to be formed.

5.2.2 Data Stability Test

All variables' data went through the stability test to ensure that there was no trend to their course, through a Unit-Root Test -Augmented Dickey-Fuller Test. All the results from these tests are given in chapter 9.2., Appendix B, Tables 29 to 33. Briefly and regarding with the final ADF test results for the candidate independent variables, stable at their level were the returns of the indicators i) *S&P100* and ii) *S&P500*, as well as macroeconomic variables i) *Economic Activity-Industrial Production Index*, ii) *Economic Activity-Industrial Production-Manufacturing Index*, iii) *Goods-Value of Imports-CIF-US Dollars* and iv) *International Liquidity-Gold Holdings-National Valuation-US D*. For macroeconomic variables i) *Labor Markets Unemployment rate percentage* and ii) *Unemployment persons number of*, it was necessary to proceed to 2nd level differences in order to make them stable. For all other candidate independent variables, it took the 1st level difference to turn into stable.

For the variables used as dependents, including the artificial Capitalization Indexes, are stationary at their level. In addition, all the returns of the various portfolios that constructed and calculated, were tested using the same method and proved to be stable at their level.

5.3. General Statistical Information for formed Portfolios and Sector Indexes

Before the main part of Data Analysis is occupied, a short presentation of some general and important descriptive statistics for portfolio returns that formed, following the Methodology as mentioned in paragraph 4.3., as well as for the artificial Sector Capitalization Indexes that formed (paragraph 4.8.) and will be used in various regression tests for the isolation of the main independent variables in Financial and Information-Technology Sector's portfolios. Three different structural types of portfolios developed, as mentioned in paragraph 4.7., and in every type all the nine portfolios based on a specific fundamental indicator are formed for further analysis.

5.3.1 Portfolios with 5 stocks equally weighted

Through a visual and numerical analysis in 9 portfolios for both Sectors formed with 5 stocks equally weighted, the most important clues are: i) all portfolios have positive mean and median returns over period, ii) none portfolio returns do not follow a normal distribution. Information-Technology Portfolios have higher average monthly returns, lower average St. Errors in their returns and their return's graphical illustration of frequency distribution is presenting a significantly less abnormality.

During the period between 2008-2010, returns in Financial Portfolios are presenting bigger deviation and unnormal course, which is may due to the American Financial Crisis. Also, in all 9 portfolios the first half of 2008-2010 the returns are negative, especially those that formed by P/E, BV/Shares, EPS, PEG, ROE and TBC/Shares, in the second half of this period returns are presenting an extremely positive course, covering the majority of the previous loses. After that period, it seems to follow a more stable course.

In Information-Technology Portfolios that phenomenon does not seem to be followed. Instead of that, the period 2001-2004 the returns seem to have a more unstable course and in the next period are following a more stable behavior. That means that they did not affected in the same way as Financial Sector by the Recession and seem to be a preferable investment source, with less risk.

5.3.1.1. Financial Sector Portfolios

In Figure 3 the monthly yield returns are captured for the 9 Financial Sector Portfolios formed with 5 stocks equally weighted, during the period 1/1/2001-1/10/2019.

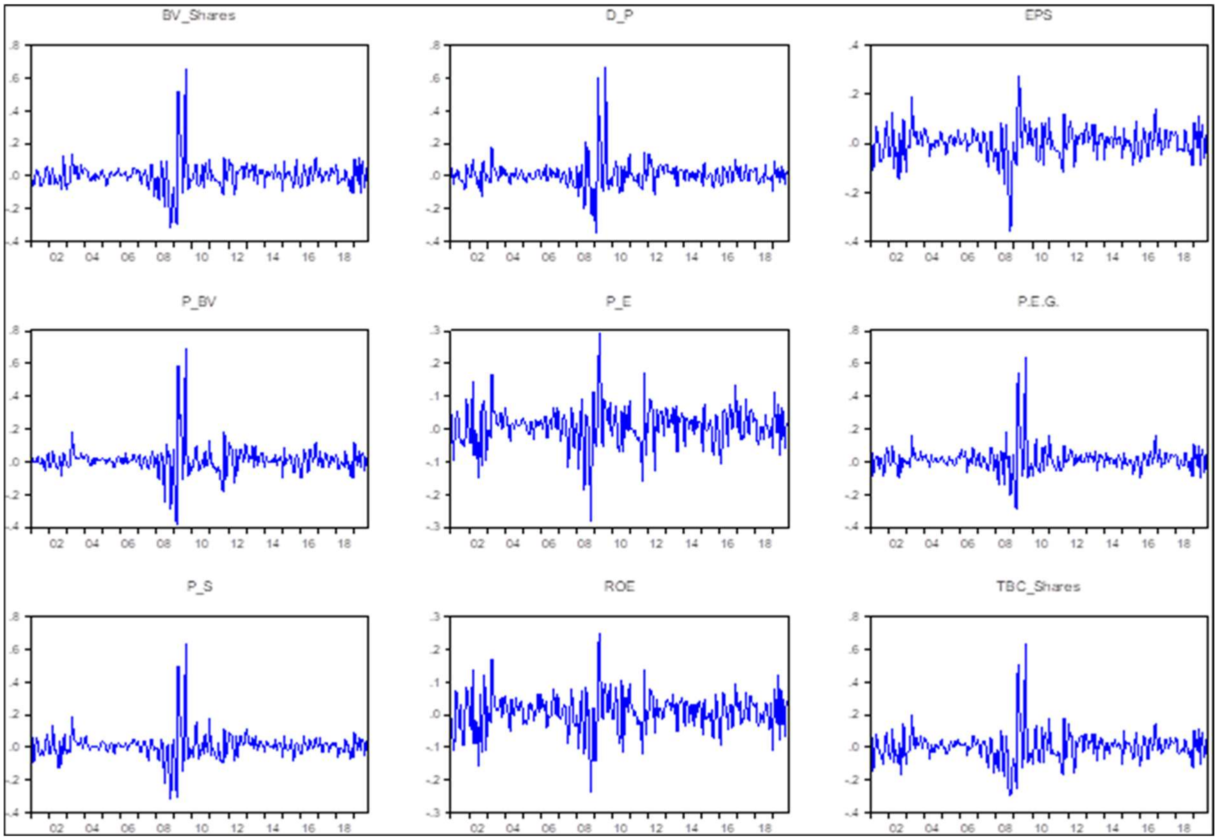

Figure 3: Financial Sector Portfolios' monthly returns formed with 5 stocks equally weighted.

In Table 6 the main Descriptive Statistics are listed for the 9 Financial Sector Portfolios monthly returns formed with 5 stocks equally weighted, during the period 1/1/2001-1/10/2019.

Table 6: Descriptive Statistics for Financial Portfolios' monthly returns formed with 5 stocks equally weighted.

	Fundamental Ratio as basis in Portfolios' Structure								
	BV/Shares	**D/P**	**EPS**	**P/BV**	**P/E**	**P.E.G.**	**P/S**	**ROE**	**TBC/Shares**
Mean	0,005	0,008	0,003	0,010	0,009	0,013	0,009	0,007	0,003
Median	0,005	0,004	0,003	0,007	0,014	0,013	0,008	0,012	0,006
Maximum	0,660	0,668	0,278	0,689	0,292	0,636	0,634	0,248	0,636
Minimum	-0,319	-0,344	-0,358	-0,384	-0,282	-0,291	-0,314	-0,239	-0,302
Std. Dev.	0,088	0,090	0,066	0,093	0,062	0,083	0,082	0,060	0,095
Skewness	2,226	2,544	-0,573	2,275	-0,268	2,717	2,366	-0,239	1,671
Kurtosis	21,888	23,444	7,920	23,117	6,798	24,412	24,028	5,240	14,699
Jarque-Bera	3545,969	4179,379	240,295	4005,852	138,544	4595,438	4374,774	49,386	1393,854
Probability	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%
Observations	226	226	226	226	226	226	226	226	226

5.3.1.2. Information-Technology Sector Portfolios

In Figure 4 the monthly yield returns are captured for the 9 Information-Technology Sector Portfolios formed with 5 stocks equally weighted during the period 1/1/2001-1/10/2019.

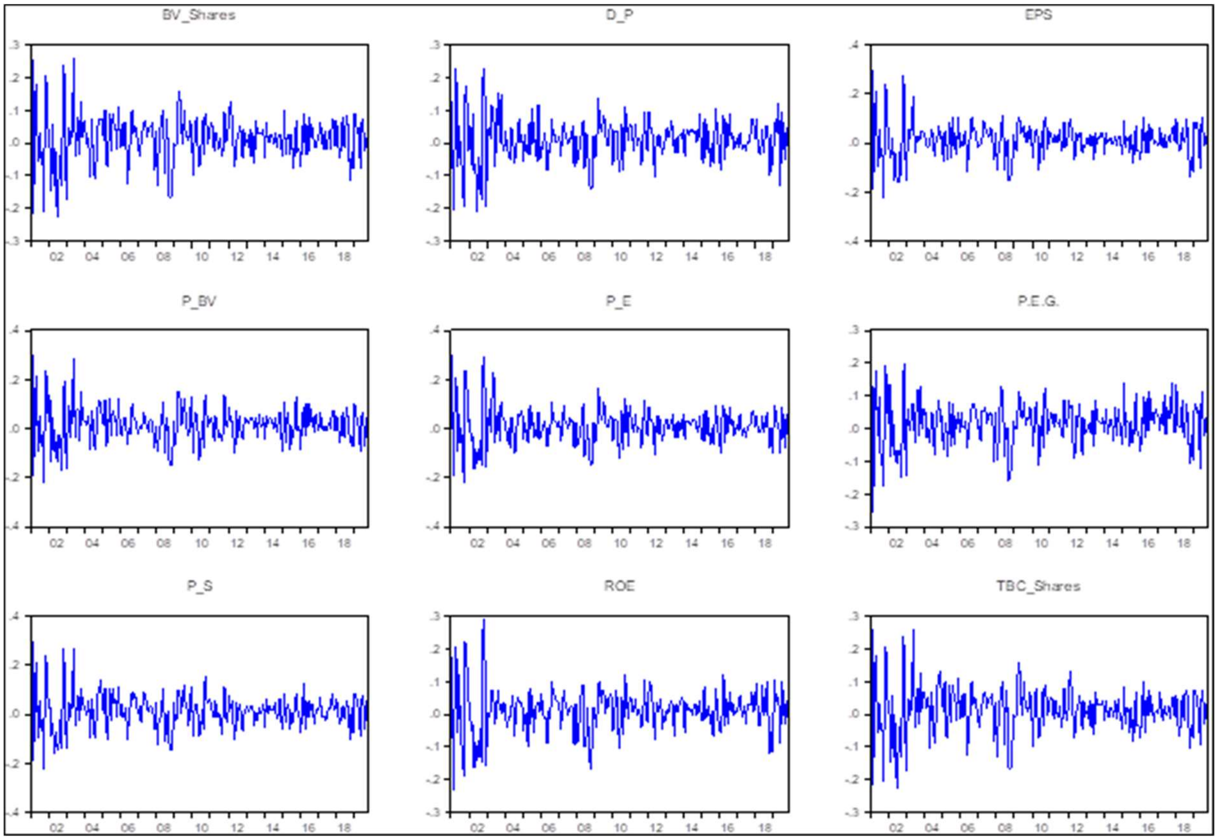

Figure 4: *Information-Technology Sector Portfolios' monthly returns formed with 5 stocks equally weighted.*

In Table 7 the main Descriptive Statistics are listed for the 9 Information-Technology Sector Portfolios' monthly returns formed with 5 stocks equally weighted during the period 1/1/2001-1/10/2019.

Table 7: *Descriptive Statistics for Information-Technology Portfolios' monthly returns formed with 5 stocks equally weighted.*

	Fundamental Ratio as basis in Portfolios' Structure								
	BV/Shares	**D/P**	**EPS**	**P/BV**	**P/E**	**P.E.G.**	**P/S**	**ROE**	**TBC/Shares**
Mean	0,014	0,009	0,013	0,017	0,010	0,017	0,014	0,011	0,014
Median	0,019	0,013	0,014	0,019	0,011	0,019	0,017	0,015	0,018
Maximum	0,259	0,229	0,300	0,300	0,300	0,200	0,300	0,292	0,259
Minimum	-0,227	-0,207	-0,222	-0,222	-0,222	-0,255	-0,222	-0,231	-0,227
Std. Dev.	0,074	0,068	0,072	0,077	0,075	0,067	0,075	0,069	0,074
Skewness	-0,119	-0,156	0,213	0,221	0,470	-0,418	0,301	0,041	-0,106
Kurtosis	4,718	4,675	5,473	4,494	5,223	4,119	4,932	5,378	4,693
Jarque-Bera	28,317	27,336	59,317	22,860	54,857	18,375	38,558	53,307	27,397
Probability	0,0001%	0,0001%	0,0000%	0,0011%	0,0000%	0,0102%	0,0000%	0,0000%	0,0001%
Observations	226	226	226	226	226	226	226	226	226

5.3.2. Portfolios with 5 stocks proportionally weighted

Through a visual and numerical analysis in 9 portfolios for both Sectors formed with 5 stocks proportionally weighted, the most important clues are: i) almost all portfolios have positive mean and median returns over period, ii) none portfolio's returns do not follow a normal distribution. Information-Technology Portfolios have in average higher monthly returns, lower average St. Errors in their returns and their return's graphical illustration of frequency distribution is presenting a significantly less abnormality.

The period between 2008-2010, returns in Financial Portfolios are presenting bigger deviation and unnormal course in regard with their average course during the whole examination period, which is may due to the American Financial Crisis. Also, in all 9 portfolios the first half of 2008-2010 the returns are negative, especially those that formed by P/E and EPS and in the second half of this period returns are presenting an extremely positive course, covering the majority of the previous loses. After that period, it seems to follow a more stable course.

In Information-Technology Portfolios that phenomenon does not seem to be followed. Instead of that, the period 2001-2004 the returns seem to have a more unstable course and in the next period are following a more stable behavior. That means that they did not affected in the same way as Financial Sector by the American Crisis.

Comparing with the Portfolios with 5 stocks equally weighted, the majority of descriptive statistics appear a similar situation, except for the Financial portfolios formed by P/E, EPS, ROE and P/BV that present higher volatility in their returns during the whole period which is not followed by higher returns in general. So, from investing perception the previous category of portfolios formation is more appealing and effective.

5.3.2.1. Financial Sector Portfolios

In Figure 5 the monthly yield returns are captured for the 9 Financial Sector Portfolios formed with 5 stocks proportionally weighted, during the period 1/1/2001-1/10/2019.

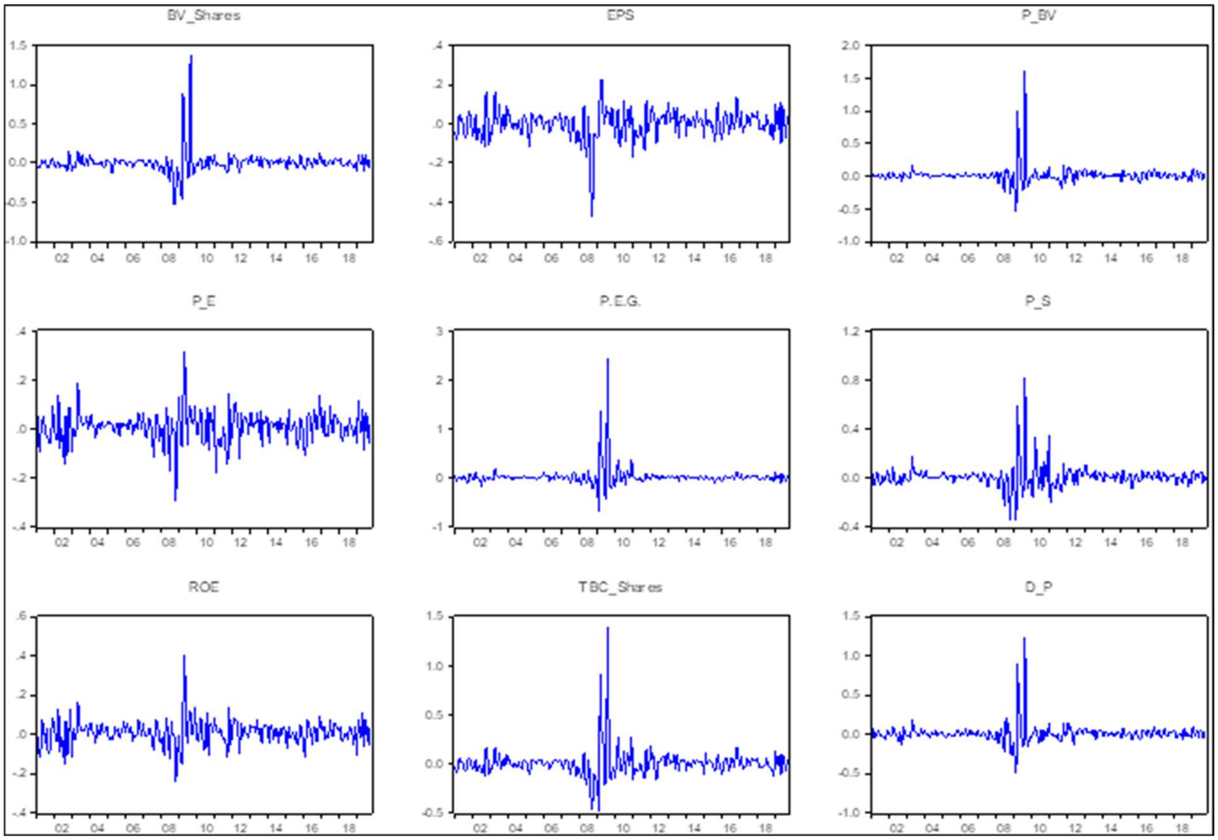

Figure 5: *Financial Sector Portfolios' monthly returns formed with 5 stocks proportionally weighted.*

In Table 8 the main Descriptive Statistics are listed for the 9 Financial Sector Portfolios' monthly returns formed with 5 stocks proportionally weighted, during the period 1/1/2001-1/10/2019.

Table 8: *Descriptive Statistics for Financial Portfolios' monthly returns formed with 5 stocks proportionally weighted.*

	Fundamental Ratio as basis in Portfolios' Structure								
	BV/Shares	**D/P**	**EPS**	**P/BV**	**P/E**	**P.E.G.**	**P/S**	**ROE**	**TBC/Shares**
Mean	0,002	-0,001	0,014	0,008	0,023	0,011	0,008	0,003	0,010
Median	0,001	0,003	0,006	0,014	0,011	0,006	0,010	0,005	0,004
Maximum	1,381	0,226	1,605	0,318	2,439	0,821	0,407	1,393	1,229
Minimum	-0,525	-0,472	-0,533	-0,296	-0,671	-0,338	-0,243	-0,478	-0,496
Std. Dev.	0,139	0,074	0,148	0,064	0,209	0,097	0,064	0,146	0,127
Skewness	4,946	-1,485	6,575	-0,185	7,924	3,256	0,593	4,583	5,120
Kurtosis	52,128	11,682	69,817	7,024	88,827	30,052	9,844	45,286	50,851
Jarque-Bera	23648,800	792,745	43669,140	153,801	71730,680	7290,392	454,296	17629,380	22549,080
Probability	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%
Observations	226	226	226	226	226	226	226	226	226

5.3.2.2. Information-Technology Sector Portfolios

In Figure 6 the monthly yield returns are captured for the 9 Information-Technology Sector Portfolios formed with 5 stocks proportionally weighted during the period 1/1/2001-1/10/2019.

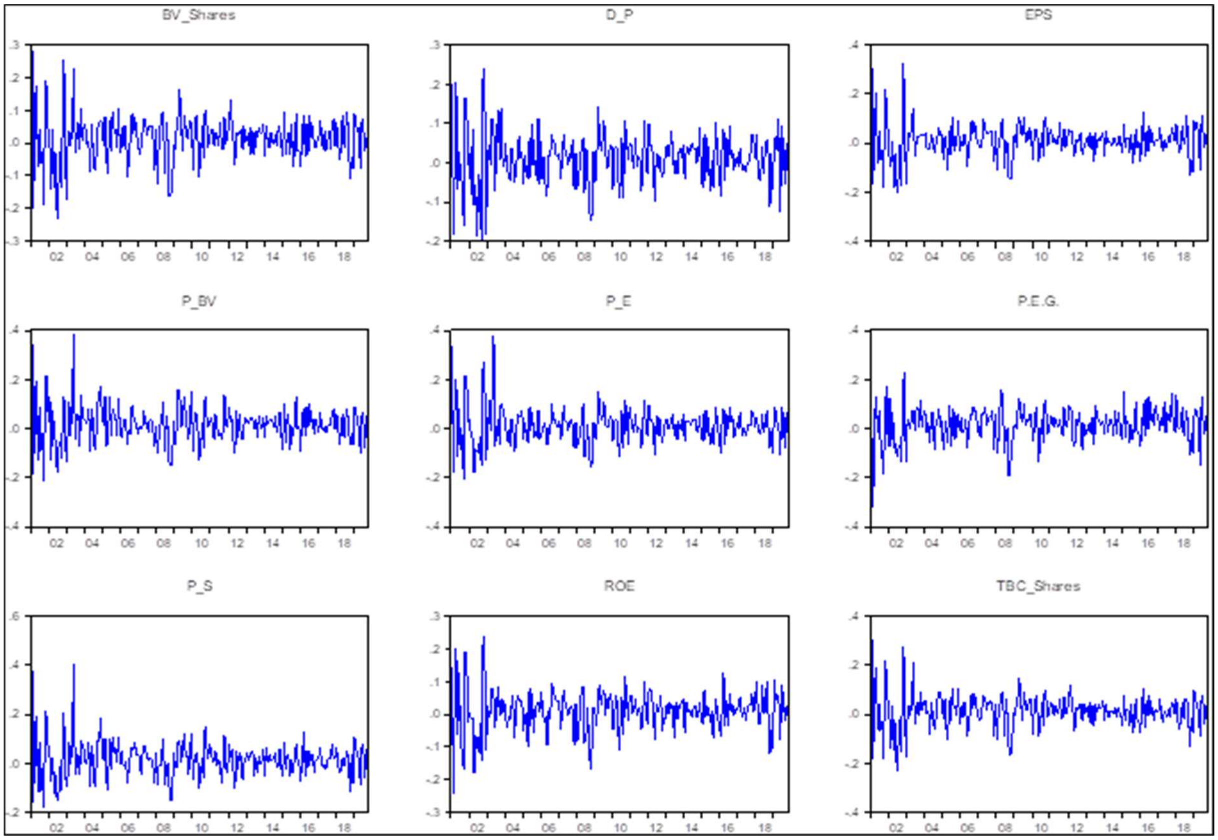

Figure 6: *Information-Technology Sector Portfolios' monthly returns formed with 5 stocks proportionally weighted.*

In Table 9 the main Descriptive Statistics are listed for the 9 Information-Technology Sector Portfolios' monthly returns formed with 5 stocks proportionally weighted during the period 1/1/2001-1/10/2019.

Table 9: *Descriptive Statistics for Information-Technology Portfolios' monthly returns formed with 5 stocks proportionally weighted.*

	Fundamental Ratio as basis in Portfolios' Structure								
	BV/Shares	**D/P**	**EPS**	**P/BV**	**P/E**	**P.E.G.**	**P/S**	**ROE**	**TBC/Shares**
Mean	0,015	0,010	0,011	0,018	0,010	0,016	0,016	0,009	0,013
Median	0,024	0,014	0,015	0,017	0,008	0,018	0,017	0,013	0,018
Maximum	0,280	0,243	0,324	0,383	0,378	0,228	0,405	0,241	0,306
Minimum	-0,235	-0,196	-0,201	-0,211	-0,207	-0,323	-0,182	-0,239	-0,233
Std. Dev.	0,072	0,067	0,072	0,079	0,077	0,071	0,076	0,064	0,072
Skewness	-0,117	-0,072	0,309	0,537	0,840	-0,663	0,960	-0,195	0,073
Kurtosis	4,986	4,405	6,275	5,753	6,686	5,123	7,763	4,965	5,657
Jarque-Bera	37,664	18,795	104,592	82,192	154,550	59,008	248,270	37,783	66,678
Probability	0,0000%	0,0083%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%

Observations	226	226	226	226	226	226	226	226	226

5.3.3. Portfolios with all Sector shares proportionally weighted

Through a visual and numerical analysis in 9 portfolios for both Sectors formed with 5 stocks proportionally weighted, the most important clues are: i) some portfolios have negative mean returns over period, ii) none portfolio's returns do not follow a normal distribution. Information-Technology Portfolios have in average higher monthly returns, lower average St. Errors in their returns and their return's graphical illustration of frequency distribution is presenting a significantly less abnormality.

The period between 2008-2010, returns in Financial Portfolios are presenting bigger deviation and unnormal course in regard with their average course during the whole examination period, which is may due to the American Financial Crisis. Also, in all 9 portfolios the first half of 2008-2010 the returns are negative, especially those that formed by P/S, BV/Shares and TBC/Shares, portfolios formed by P/E in 2008-2010 followed an opposite course with increasing returns the first half and loses in the second half. For the rest portfolios in the second half of this period returns are presenting an average positive course, covering the majority of the previous loses. After that period, it seems to follow a more stable course.

In Information-Technology Portfolios that phenomenon does not seem to be followed. Instead of that, the period 2001-2004 the returns seem to have a more unstable course and in the next period are following a more stable behavior. That means that they did not affected in the same way as Financial Sector by the American Crisis. The only portfolio with a unique course is that formed by ROE with stable course through 2001-2018 and an extremely volatility in 2019.

Comparing with two previous categories, the majority of descriptive statistics appear a lower performance. So, from investing perception is the worst choice.

5.3.3.1. Financial Sector Portfolios

In Figure 7 the monthly yield returns are captured for the 9 Financial Sector Portfolios formed with all stocks proportionally weighted, during the period 1/1/2001-1/10/2019.

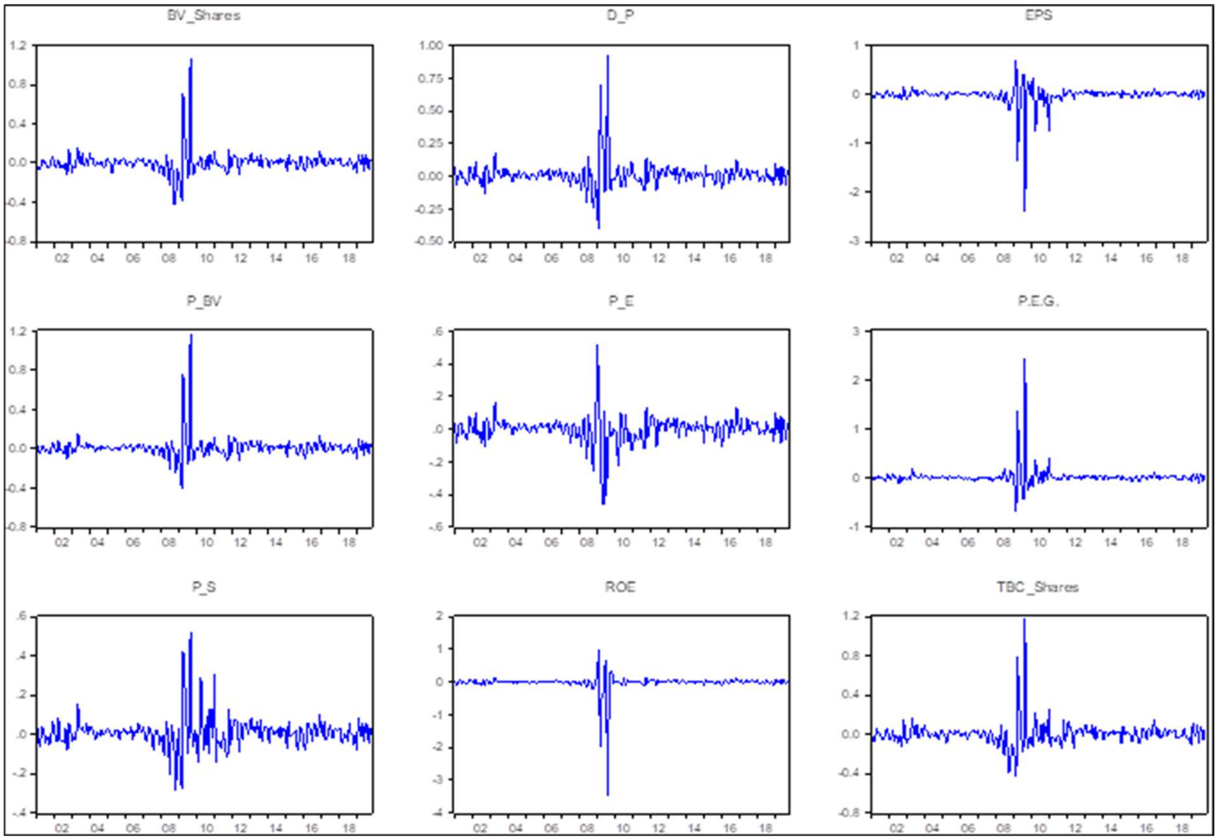

Figure 7: *Financial Sector Portfolios' monthly returns formed with all stocks proportionally weighted.*

In Table 10 the main Descriptive Statistics are listed for the 9 Financial Sector Portfolios' monthly returns formed with 5 stocks proportionally weighted, during the period 1/1/2001-1/10/2019.

Table 10: *Descriptive Statistics for Financial Portfolios' monthly returns formed with all stocks proportionally weighted.*

	Fundamental Ratio as basis in Portfolios' Structure								
	BV/Shares	**D/P**	**EPS**	**P/BV**	**P/E**	**P.E.G.**	**P/S**	**ROE**	**TBC/Shares**
Mean	0,002	0,008	-0,021	0,010	-0,002	0,024	0,009	-0,010	0,003
Median	0,003	0,007	0,005	0,005	0,007	0,009	0,010	0,009	0,004
Maximum	1,060	0,919	0,685	1,164	0,511	2,442	0,524	0,967	1,183
Minimum	-0,422	-0,407	-2,403	-0,409	-0,459	-0,672	-0,283	-3,467	-0,435
Std. Dev.	0,114	0,103	0,220	0,114	0,084	0,207	0,080	0,287	0,127
Skewness	4,076	3,988	-6,794	5,587	-0,727	8,181	1,760	-8,932	4,249
Kurtosis	41,957	38,538	69,035	56,447	15,700	92,493	15,400	104,491	41,603
Jarque-Bera	14916,980	12491,830	42800,940	28074,740	1538,727	77939,080	1564,591	100000,700	14713,020
Probability	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%
Observations	226	226	226	226	226	226	226	226	226

5.3.3.2. Information-Technology Sector Portfolios

In Figure 8 the monthly yield returns are captured for the 9 Information-Technology Sector Portfolios formed with 5 stocks proportionally weighted during the period 1/1/2001-1/10/2019.

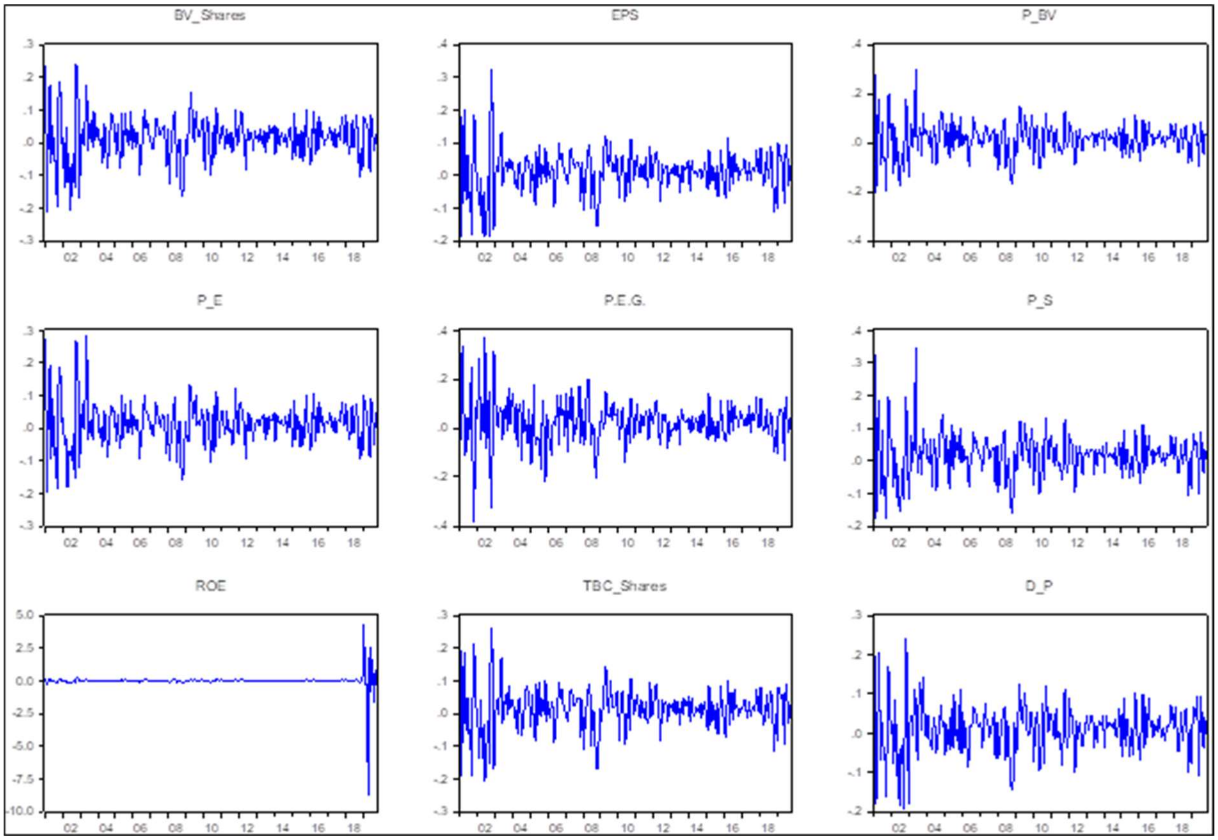

Figure 8: *Information-Technology Sector Portfolios' monthly returns formed with all stocks proportionally weighted.*

In Table 11 the main Descriptive Statistics are listed for the 9 Information-Technology Sector Portfolios' monthly returns formed with 5 stocks proportionally weighted during the period 1/1/2001-1/10/2019.

Table 11: *Descriptive Statistics for Information-Technology Portfolios' monthly returns formed with all stocks proportionally weighted.*

	Fundamental Ratio as basis in Portfolios' Structure								
	BV/Shares	**D/P**	**EPS**	**P/BV**	**P/E**	**P.E.G.**	**P/S**	**ROE**	**TBC/Shares**
Mean	0,014	0,010	0,011	0,016	0,013	0,023	0,016	-0,005	0,014
Median	0,021	0,016	0,015	0,021	0,017	0,024	0,017	0,013	0,019
Maximum	0,241	0,243	0,325	0,301	0,284	0,371	0,346	4,319	0,264
Minimum	-0,211	-0,196	-0,191	-0,204	-0,197	-0,387	-0,177	-8,823	-0,211
Std. Dev.	0,069	0,066	0,069	0,072	0,070	0,095	0,072	0,704	0,069
Skewness	-0,253	-0,073	0,109	0,132	0,369	-0,104	0,536	-7,509	-0,077

Kurtosis	4,821	4,629	6,007	4,785	5,439	6,089	6,071	117,442	5,283
Jarque-Bera	33,650	25,197	85,595	30,673	61,159	90,282	99,596	125452,800	49,307
Probability	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,0003%
Observations	226	226	226	226	226	226	226	226	226

5.3.4. Artificial Sector Capitalization Indexes

In Figure 9 the monthly yield returns are captured for both artificial Financial and Information-Technology Capitalization Index formed, during the period 1/1/2001-1/10/2019.

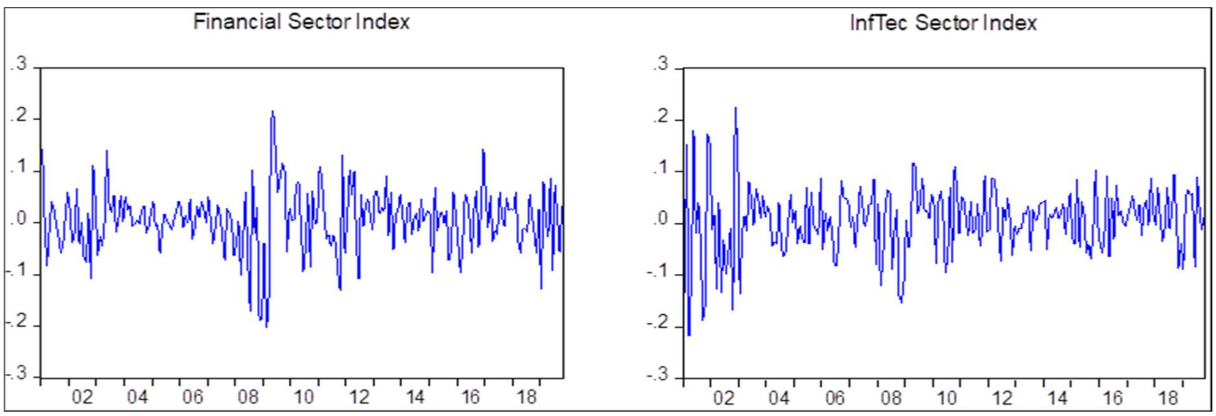

Figure 9: *Financial and Information-Technology Capitalization Sector Indexes monthly returns.*

In Table 12 the main Descriptive Statistics of monthly yield returns are listed for both artificial Financial and Information-Technology Capitalization Index formed, during the period 1/1/2001-1/10/2019.

Table 12: *Descriptive Statistics of monthly yield returns for Financial and Information-Technology Capitalization Indexes.*

	Descriptive Statistics for Sector Capitalization Indexes									
	Mean	**Median**	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**	**Jarque-Bera**	**Probability**	**Observations**
Financial Sector Index	0,005	0,007	0,217	-0,202	0,061	-0,268	4,710	30,223	0,000	226
Information-Technology Sector Index	0,005	0,010	0,225	-0,217	0,065	-0,261	4,204	16,225	0,000	226

5.4. Selection of Interpretive Variables

5.4.1. Collinearity Test

In paragraph 4.9.1.1., the way in which the collinearity test of interpretative variables carried out, was analyzed. After calculating the returns of the two artificial Capitalization Market indices, a correlation matrix is developed including the covariance analysis between all thirty-seven candidate independent variables. (See chapter 9.2., Appendix C, Table 34)

Through this procedure the first group of variables that are excluded from the following tests are summarized in Table 13. These variables are highly correlated with other potential independent variables (covariance>=0,70) and in general have a higher correlation level with the total of variables. The capital letter D declares 1st level differences and D2 declares 2st level differences in data variables.

Table 13: *Excluded Possible Independent Variables from collinearity test.*

No.	Excluded Independent Variables	Symbol
1.	S_P500	X4
2.	DNOMINAL EFFECTIVE_EXCHANGE RATE, TRADE PARTNERS BY CONSUMER PRIC	X7
3.	DREAL EFFECTIVE EXCHANGE RATE BASED ON CONSUMER PRICE INDEX	X8
4.	D DISCOUNT RATE	X10
5.	DTREASURY BILL RATE	X12
6.	DLENDING RATE	X13
7.	DINTERNATIONAL LIQUIDITY, TOTA RESERVES, EXCLUDING GOLD, FOREIGN	X19
8.	INTERNATIONAL LIQUIDITY, GOLD HOLDINGS NATIONAL VALUATION, USD	X20
9.	DPRICES, PRODUCER PRICE INDEX, ALL COMMODITIES INDEX	X21
10.	ECONOMIC ACTIVITY, INDUSTRIAL PRODUCTION INDEX	X26
11.	D2UNEMPLOYMENT PERSONS NUMBER OF	X30
12.	DSILVER	X32
13.	DGASOLINE	X35
14.	DHEATING OIL	X37

5.4.2. Stepwise Forward Regression for all Portfolio returns

The remaining 23 independent variables at this stage are regressed with the returns of all portfolios separately in order to further isolate those that explain better the course of every portfolio returns. For this reason, a stepwise forward regression is executed between every portfolio returns, based on a fundamental indicator for both 3 portfolio structural ways and the 23 variables.

5.4.3. Exclusion of non-significant Variables

After the Stepwise forward regression in every portfolio returns, the variables that explain in the most effective aspect their course are listed, in compare with the total of 23 variables tested. However, it is necessary to test the significance of coefficients of variables in every portfolio returns. That is succeed by executing successive simple linear regressions in every portfolio returns between these particular returns and the independent variables that resulted from stepwise regression and excluding the variable that present the biggest p-value, until the point that all remaining variables are presenting statistically significant beta coefficients, in every portfolio returns. The results for both economic Sector are presenting in Tables 14 & 15:

Table 14 : *Significant Independent Variables for Financial Sector Portfolios.*

Financial Portfolios Succesive Simple Regression Statistics

			Fundamental Ratio as basis in Portofolios' Structure								
Portfolios' Stock Structure Number			P/E	EPS	D/P	P/BV	P.E.G.	BV/Shares	TBC/Share	ROE	P/S
	5 stocks	Statistically significant Variables	X03	X03	X03	X03	X03	X03	X03	X03	X03
			X33	X33	X18	X18	X18	X18	X18	X02	X18
			X27	X11	X36	X27	X31	X05	X31	X16	X06
			X16	X31	X24		X06	X11	X33		X16
1	*equally*		X11	X16	X06		X11	X31	X05		
			X09		X11		X09	X33			
							X27				
		R-squared	0,65	0,75	0,54	0,53	0,60	0,68	0,72	0,72	0,61
	weighted	**F-statistic**	*66,78*	*132,43*	*42,59*	*84,27*	*46,63*	*76,42*	*111,06*	*187,19*	*86,24*
	5 stocks	Statistically significant Variables	X03	X03	X18	X18	X18	X18	X18	X03	X03
			X33	X33	X03	X03	X03	X03	X03	X02	X18
			X27	X16	X11	X05	X05	X05	X05	X16	X33
			X28	X31	X31	X27	X31	X11	X33		X05
2	*proportional*		X29	X15	X36	X11		X33	X31		
				X24	X06	X31		X31			
				X11							
		R-squared	0,596806	0,680008	0,553542	0,590866	0,60404	0,639226	0,631604	0,679167	0,545202
	ly weighted	**F-statistic**	*64,53666*	*65,57373*	*44,84136*	*52,23151*	*83,52139*	*64,0808*	*74,75089*	*155,2383*	*65,63298*
	all stocks	Statistically significant Variables	X18	X18	X03	X18	X18	X03	X03	X18	X03
			X01	X05	X18	X03	X05	X18	X18	X05	X18
			X03		X05	X05	X03	X05	X05		X06
			X15		X31	X31	X31	X11	X33		X33
3	*proportional*		X11		X11			X31	X31		X31
			X14					X33			X11
			X23								X16
		R-squared	0,24	0,48	0,61	0,62	0,59	0,65	0,64	0,57	0,63
	ly weighted	**F-statistic**	*9,80*	*100,95*	*67,86*	*88,43*	*79,29*	*68,62*	*78,74*	*143,81*	*53,55*

Table 15: Significant Independent Variables for Information-Technology Sector Portfolios.

Information-Technology Portfolios Succesive Simple Regression Statistics

Portfolios' Stock Structure Number			P/E	EPS	D/P	P/BV	P.E.G.	BV/Shares	TBC/Shares	ROE	P/S
			Fundamental Ratio as basis in Portofolios' Structure								
1	5 stocks	Statistically significant Variables	X03	X03	X03	X03	X03	X03	X03	X03	X03
			X17	X09	X05	X16	X05	X17	X17	X05	X16
	equally		X05	X17	X09	X05	X34		X16	X29	X05
			X09	X05	X02	X17	X02			X17	X36
			X16	X16	X14		X29			X27	
							X09			X09	
		R-squared	0,61	0,63	0,66	0,56	0,61	0,57	0,57	0,66	0,57
	weighted	**F-statistic**	*69,59*	*72,69*	*83,59*	*70,35*	*55,83*	*147,25*	*97,43*	*70,99*	*71,82*
2	5 stocks	Statistically significant Variables	X03	X03	X03	X03	X03	X03	X03	X03	X03
			X16	X11	X05	X16	X05	X17	X17	X05	X16
	proportional			X05	X02	X17	X34	X05	X09	X29	X36
				X17			X09		X05	X09	
				X15						X34	
		R-squared	0,55	0,62	0,67	0,49	0,59	0,58	0,58	0,65	0,50
	ly weighted	**F-statistic**	*133,55*	*70,53*	*146,97*	*71,40*	*78,14*	*99,91*	*76,36*	*82,47*	*73,84*
3	all stocks	Statistically significant Variables	X03	X03	X03	X03	X34	X03	X03	X24	X03
			X16	X05	X05	X16	X06	X05	X05		X16
	proportional		X17	X11	X02	X17		X17	X17		X17
			X29	X17	X09	X05			X09		
					X14				X02		
									X34		
		R-squared	0,65	0,67	0,70	0,61	0,08	0,66	0,67	0,03	0,59
	ly weighted	**F-statistic**	*100,41*	*111,73*	*102,68*	*86,14*	*9,80*	*140,02*	*73,39*	*60,10*	*104,98*

5.4.4. Final Independent Variables Selection

Following the Methodology explained in 4.9.1.4., the final independent variables for every fundamental indicator in every portfolio category are listed in the Tables 16 & 17:

Table 16: Final Independent Variables for Financial Sector Portfolios.

Final Independent Variables for Financial Sector Portfolios

No.	P_E*	EPS**	D_P	P_BV	P.E.G.	BV Shares	TBC_Shares	ROE***	P_S
1	x03	x03$_{a,b}$	x03	x03	x03	x03	x03	x03$_{a,b}$	x03
2	x11	x11$_{a,b}$	x18	x18	x18	x05	x05	x11$_{a,b}$	x18
3	x16	x16$_{a,b}$			x31	x11	x18	x16$_{a,b}$	
4	x27	x31$_{a,b}$				x18	x31	x05$_{c}$	
5	x33	x33$_{a,b}$				x31	x33	x18$_{c}$	
6		x05$_{c}$				x33			
7		x18$_{c}$							

Notes

* The 3rd portfolio category of P/E fundamental indicator, with all stocks proportionally weighted, is excluded.

** In the first two categories of EPS, consisting of 5 stocks equally and proportionally participating respectively, used as independent variables the X03, X11, X16, X31 and X33. In the last category of EPS proportionally involved all shares, are used as independent the X05 and X18.

*** In the first two categories of ROE, consisting of 5 stocks equally and proportionally participating respectively, used as independent variables the X03, X11 and X16. In the last category of proportionally involved all shares, are used as independent the X05 and X18.

Table 17: *Final Independent Variables for Information-Technology Sector Portfolios.*

Final Independent Variables for Information-Technology Sector Portfolios

No.	P_E	EPS	D_P	P_BV	P.E.G.*	BV Shares	TBC_Shares	ROE**	P_S
1	x03	x03	x02	x03	x03	x03	x03	$x03_{a,b}$	x03
2	x16	x05	x03	x16	x05	x17	x17	$x05_{a,b}$	x16
3		x17	x05	x17	x34			$x29_{a,b}$	
4								$x24_{c}$	

Notes

* Clearly the only common variable between the 3 categories of the PEG indicator is X34. Because of low R^2 that presents, will be introduced for test the X03, X05 and X34, which are common to the first 2 portfolio categories, with each possible combination.

** In the first two categories of ROE the X03, X05 and X29 are used as independent variables. In the last portfolio category of ROE X24 is used as independent variable.

5.4.5. Betas Time Variability & Rolling Regression

Using the variables that emerged as independent separately in every case of portfolio returns formed by a specific fundamental indicator, a 5-year window Rolling Regression Process (explained in 4.9.2.) is performed between every portfolio monthly yields and variables from Tables 16 and 17 respectively. The purpose is both to calculate the beta coefficients of the examined factors and their t-statistics. Depending on the t-statistics of Rolling Regressions that calculated, finally is determined whether the values of beta coefficients are statistically significant, therefore their calculated values represent their true values, or are statistically non-significant, thus equivalent to zero.

6. RESULTS

6.1. Macroeconomic Influence in Portfolio Returns

6.1.1 Final Selection of Interpretive Variables through Rolling Regression

From the results of the Rolling Regression Process, in the only case where almost all the individual monthly beta coefficients calculated are statistically significant, is when as independent variable is used the monthly yields of the S&P100 in a 5-year window.

Therefore, any influence of macroeconomic variables on portfolio returns, beyond the returns of the Market that all stocks consist the various portfolios are belonging, is not significant, following in a sense the beliefs of the CAPM model. These are the only beta coefficients that are examined for the probable existence of time-variability in their course.

6.2. T-statistics of beta coefficients from Rolling Regression

Aiming to prove the final selection of S&P100 returns as the only independent variable the t-statistics graphs for all factors in Table 16 & 17 that used in Rolling Regression are presented for all portfolios in every fundamental indicator. For the acceptance of independent variables used in every individual Rolling Regression, 2 basic rules are followed: a) All the common independent variables that are imported in Rolling Regression should present statistically significant beta coefficients in the simple linear regression with portfolio returns formed by the fundamental indicator examined, b) R^2 of this linear regression should be better than random walk (0,5).

6.2.1. Portfolio Returns formed by P/E

6.2.1.1. Financial Sector Portfolios

As mentioned in Table 16, the 3rd category of portfolio returns consisted by all stocks is excluded, because of low R^2 that presents in a simple linear regression with its independent Variables (Table 14). So, the common variables of the first 2 categories are tested, i.e., X03, X11, X16, X27 and X33. In a simple linear regression with the portfolio returns formed by P/E in the first two categories and the above independent variables, the beta coefficients produced are all statistically significant. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.1.1.1. Portfolios consisted of 5 stocks equally weighted

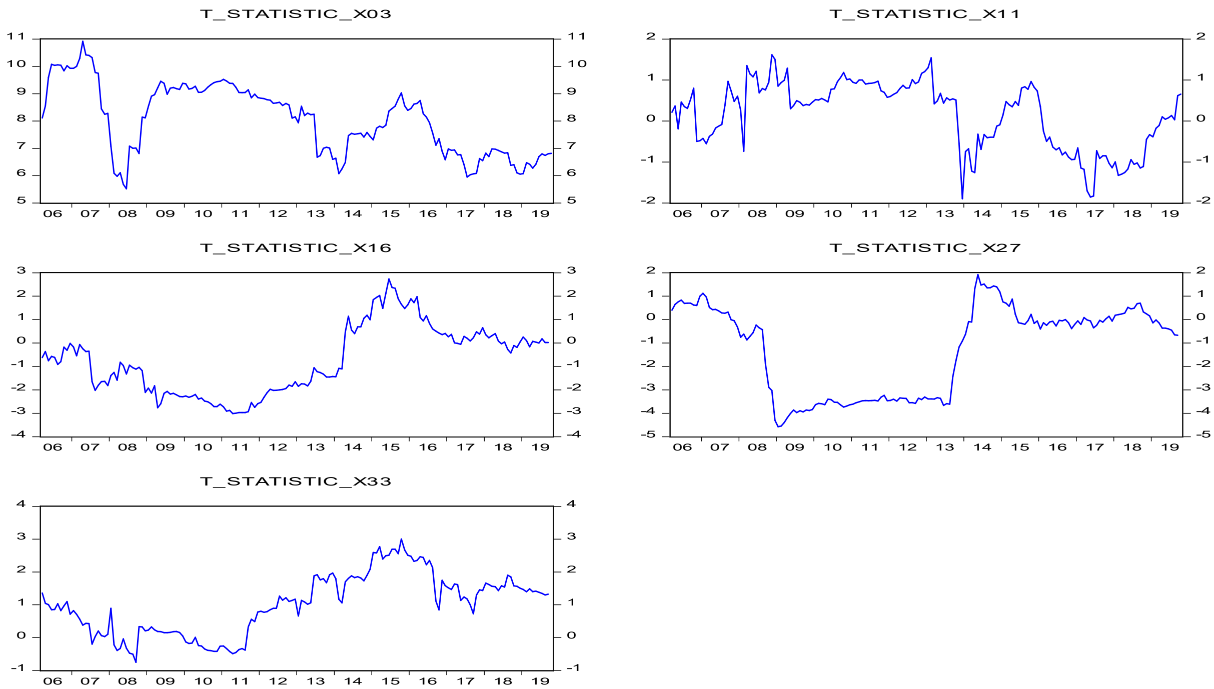

Figure 10: *T-statistics for 5 stocks equally weighted formed by P/E for Financial Sector from Rolling Regression.*

6.2.1.1.2. Portfolios consisted of 5 stocks proportionally weighted

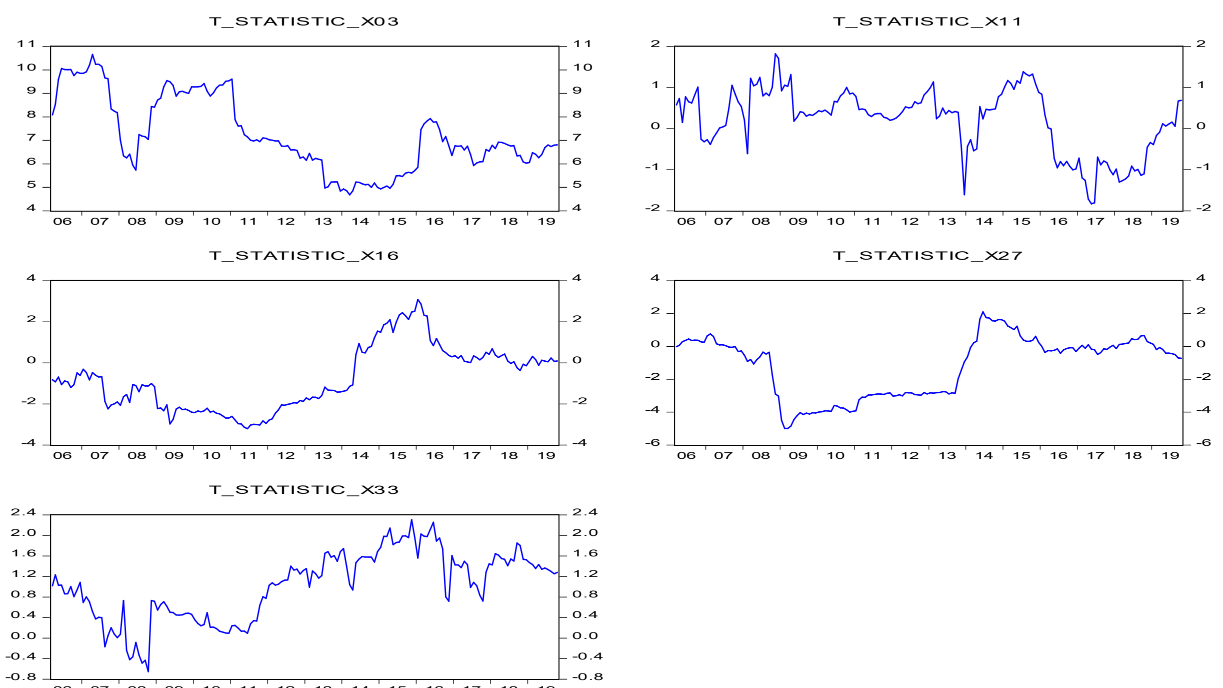

Figure 11: *T-statistics for 5 stocks proportionally weighted formed by P/E for Financial Sector from Rolling Regression.*

6.2.1.2. Information-Technology Sector Portfolios

The common variables for all 3 categories that tested are X03 and X16. In a simple linear regression with the portfolio returns formed by P/E and the above independent variables, the beta coefficients are statistically significant in all categories. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.1.2.1. Portfolios consisted of 5 stocks equally weighted

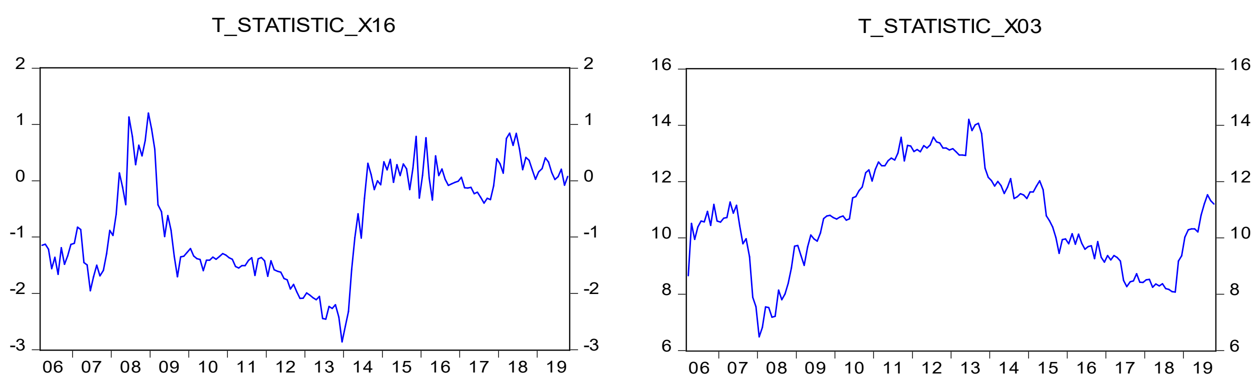

Figure 12: *T-statistics for 5 stocks equally weighted formed by P/E for Information-Technology Sector from Rolling Regression.*

6.2.1.2.2. Portfolios consisted of 5 stocks proportionally weighted

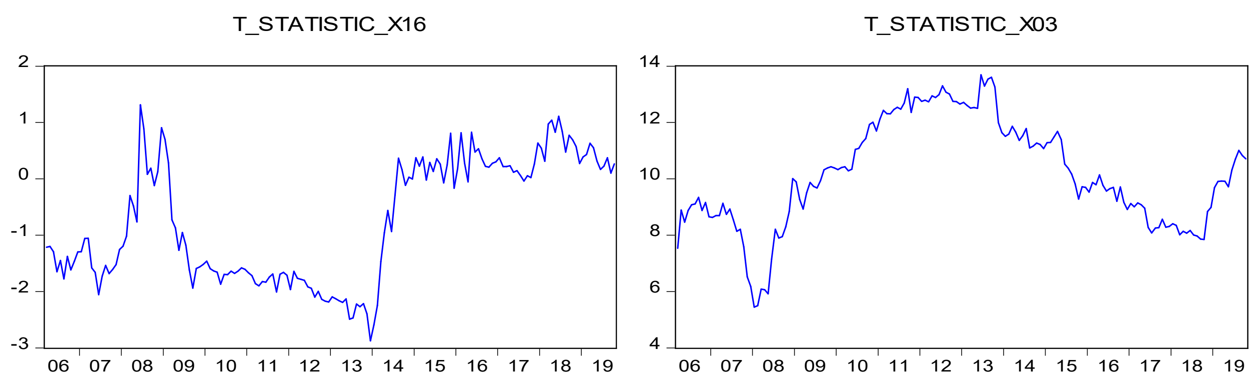

Figure 13: *T-statistics for 5 stocks proportionally weighted formed by P/E for Information-Technology Sector from Rolling Regression.*

6.2.1.2.3. Portfolios consisted of all Sector stocks proportionally weighted

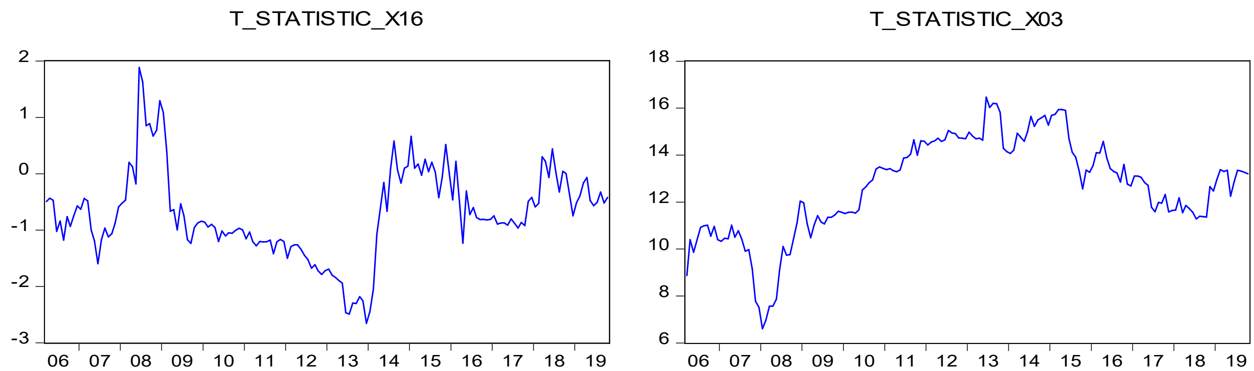

Figure 14: *T-statistics for all stocks proportionally weighted formed by P/E for Information-Technology Sector from Rolling Regression.*

6.2.2. Portfolio Returns formed by EPS

6.2.2.1. Financial Sector Portfolios

In this fundamental indicator in Financial Sector is clearly that in the 3rd category of portfolio returns there are no common variables with the other two (Table 16) but the R^2 is lower than 0,5 in a simple linear regression between portfolio returns formed by EPS, so is excluded. Therefore, a Rolling Regression with independent variables the X03, X11, X16, X31 and X33 are executed for the first two categories. At the same time the beta coefficients from the above variables in a simple linear regression with EPS portfolio returns are statistically significant. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns for the first two categories.

6.2.2.1.1. Portfolios consisted of 5 stocks equally weighted

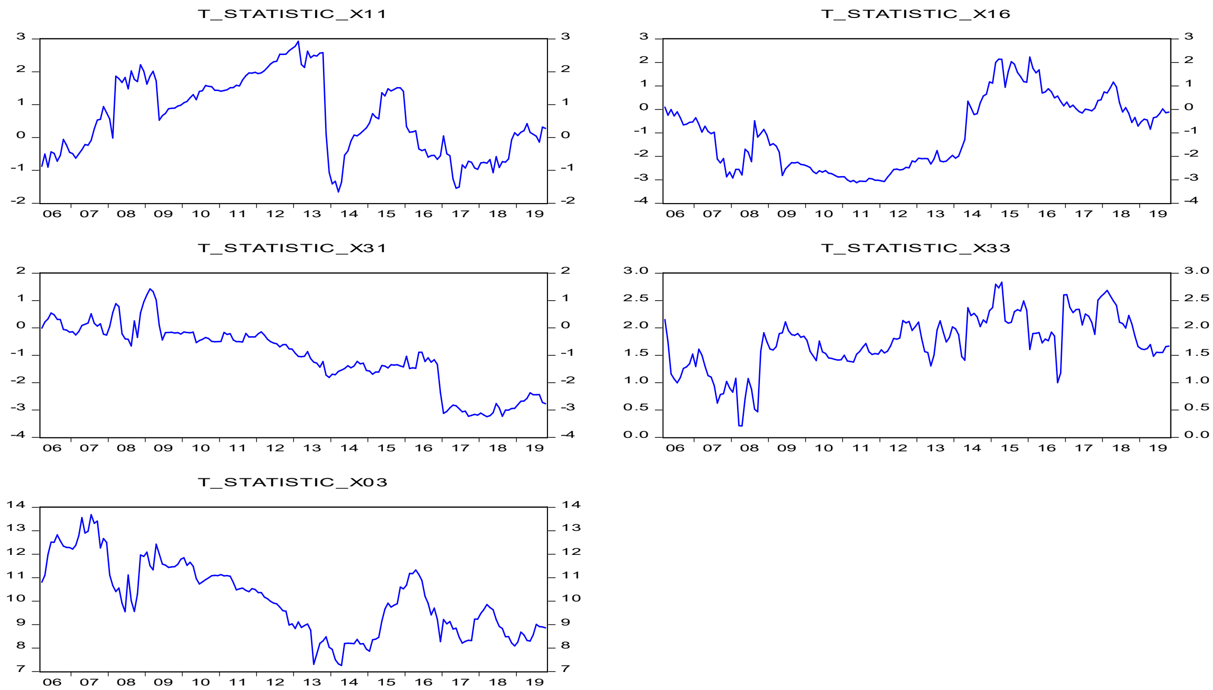

Figure 15: *T-statistics for 5 stocks equally weighted formed by EPS for Financial Sector from Rolling Regression.*

6.2.2.1.2. Portfolios consisted of 5 stocks proportionally weighted

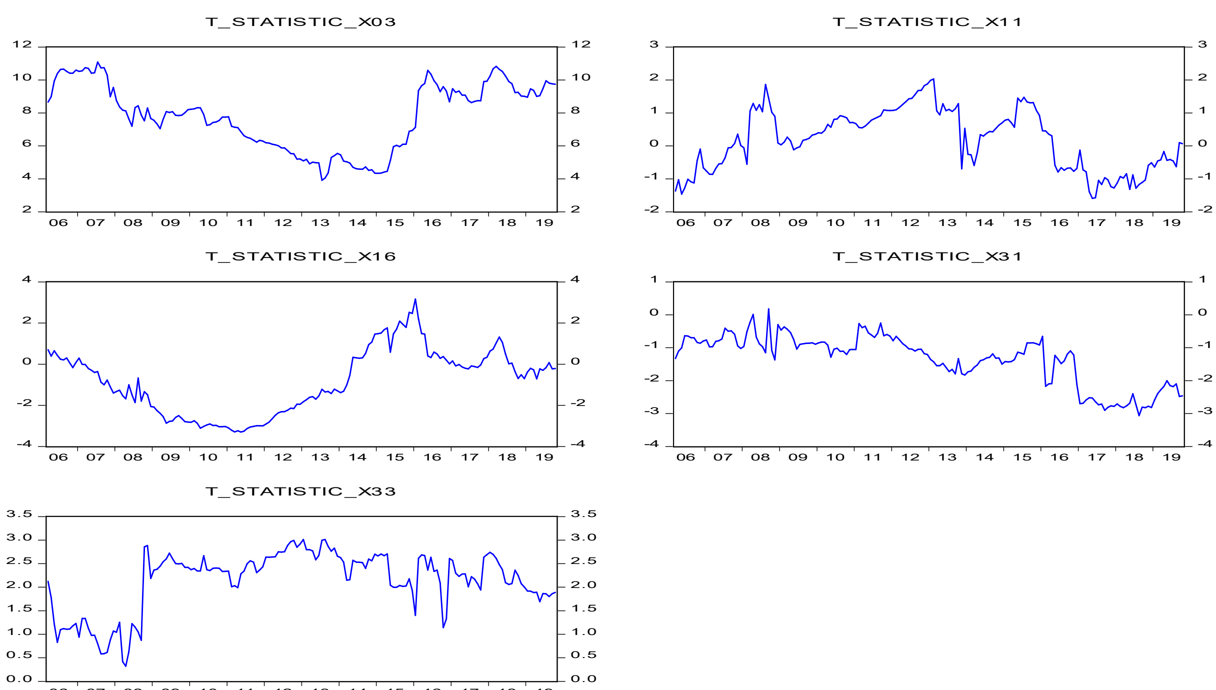

Figure 16: *T-statistics for 5 stocks proportionally weighted formed by EPS for Financial Sector from Rolling Regression.*

6.2.2.2. Information-Technology Sector Portfolios

The common variables for all the 3 categories that tested are X03, X05 and X17. In a simple linear regression with the portfolio returns formed by EPS and the above independent variables all beta coefficients that produced are statistically significant. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.2.2.1. Portfolios consisted of 5 stocks equally weighted

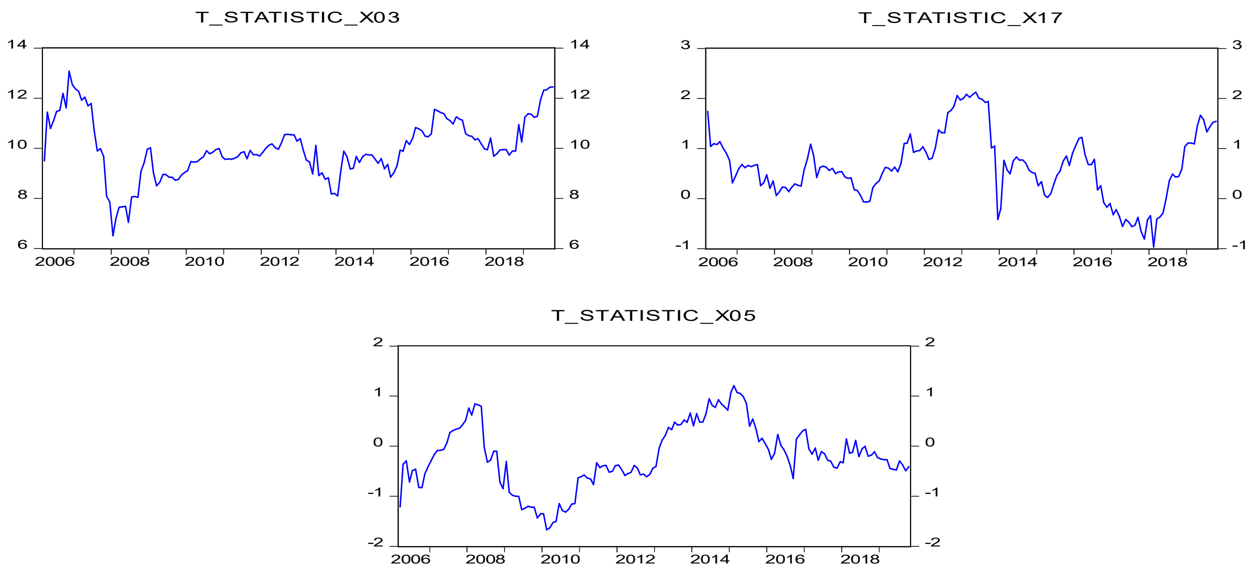

Figure 17: *T-statistics for 5 stocks equally weighted formed by EPS for Information-Technology Sector from Rolling Regression.*

6.2.2.2.2. Portfolios consisted of 5 stocks proportionally weighted

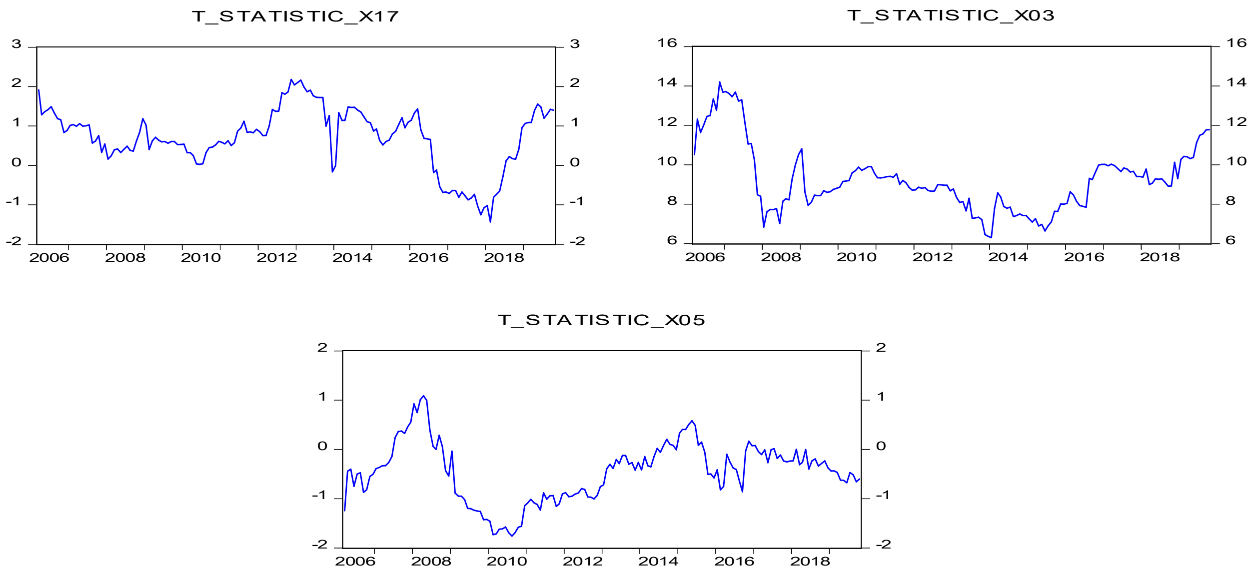

Figure 18: *T-statistics for 5 stocks proportionally weighted formed by EPS for Information-Technology Sector from Rolling Regression.*

6.2.2.2.3. Portfolios consisted of all Sector stocks proportionally weighted

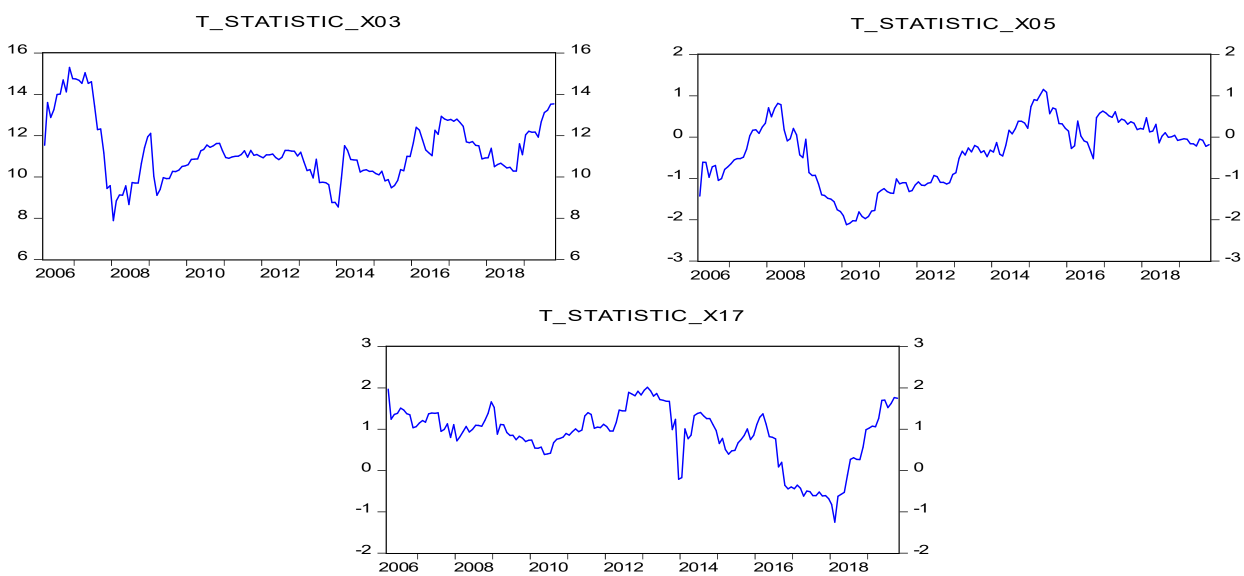

Figure 19: *T-statistics for all stocks proportionally weighted formed by EPS for Information-Technology Sector from Rolling Regression.*

6.2.3. Portfolio Returns formed by D/P

The common variables for all portfolio categories are X03, X11 and X18. But in a simple linear regression with D/P portfolio returns X11 does not present statistically significant beta coefficients, so X03 and X18 are chosen. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.3.1. Financial Sector Portfolios

6.2.3.1.1. Portfolios consisted of 5 stocks equally weighted

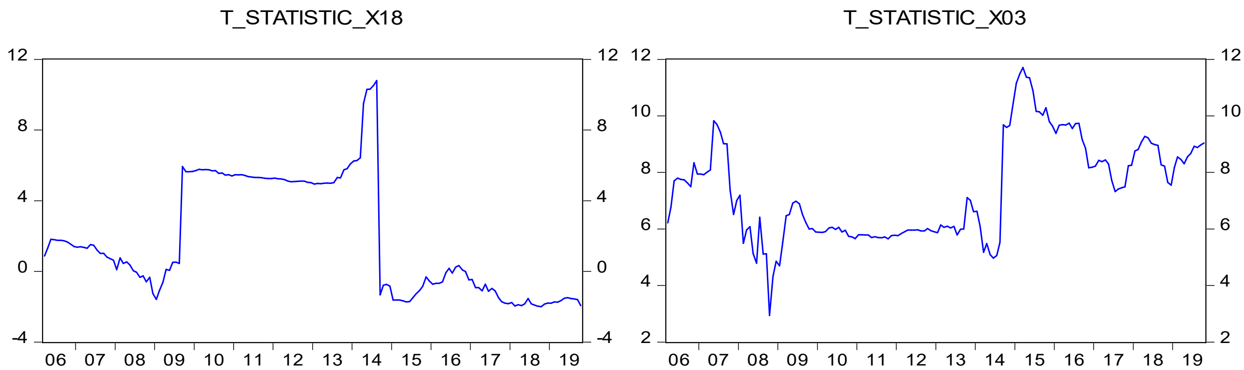

Figure 20: *T-statistics for 5 stocks equally weighted formed by D/P for Financial Sector from Rolling Regression.*

6.2.3.1.2. Portfolios consisted of 5 stocks proportionally weighted

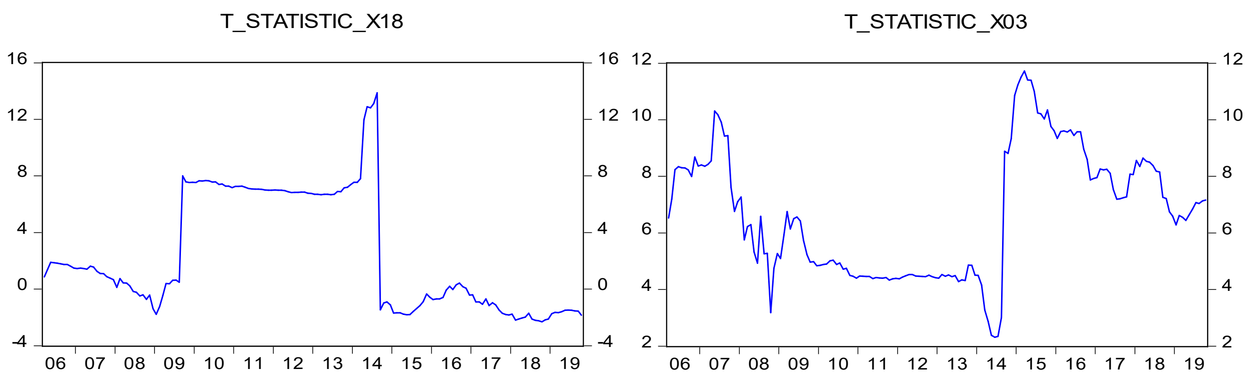

Figure 21: *T-statistics for 5 stocks proportionally weighted formed by D/P for Financial Sector from Rolling Regression.*

6.2.3.1.3. Portfolios consisted of all Sector stocks proportionally weighted

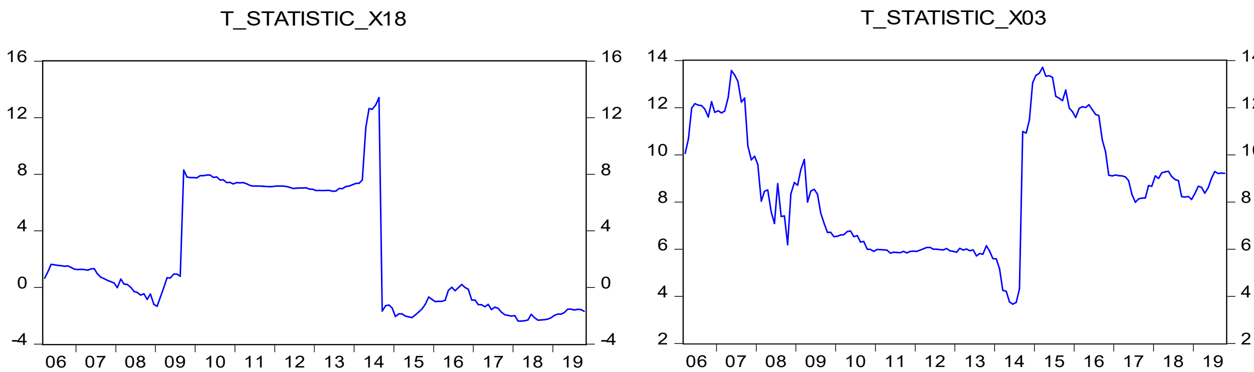

__Figure 22:__ T-statistics for all stocks proportionally weighted formed by D/P for Financial Sector from Rolling Regression.

6.2.3.2. Information-Technology Sector Portfolios

The common variables for all 3 portfolio categories are X03, X02 and X05. All of them present statistically significant beta coefficients in a simple linear regression with D/P portfolio returns. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.3.2.1. Portfolios consisted of 5 stocks equally weighted

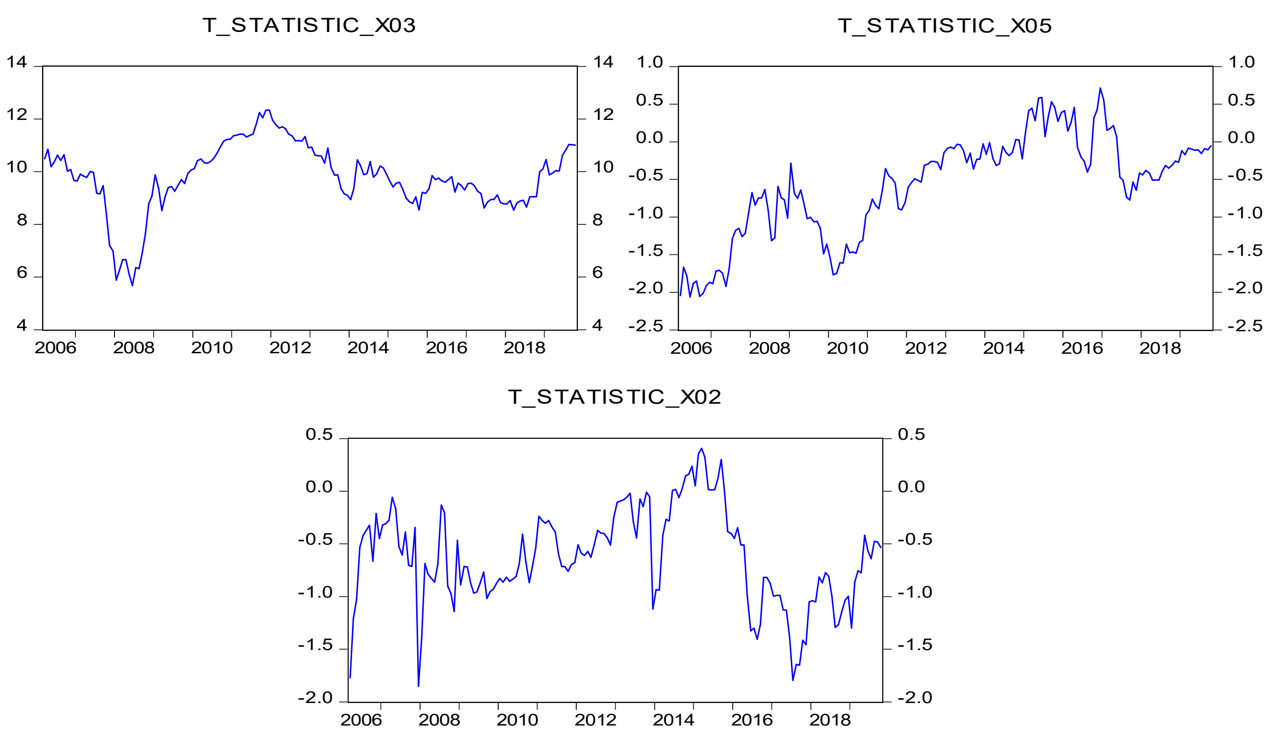

__Figure 23:__ T-statistics for 5 stocks equally weighted formed by D/P for Information-Technology Sector from Rolling Regression.

6.2.3.2.2. Portfolios consisted of 5 stocks proportionally weighted

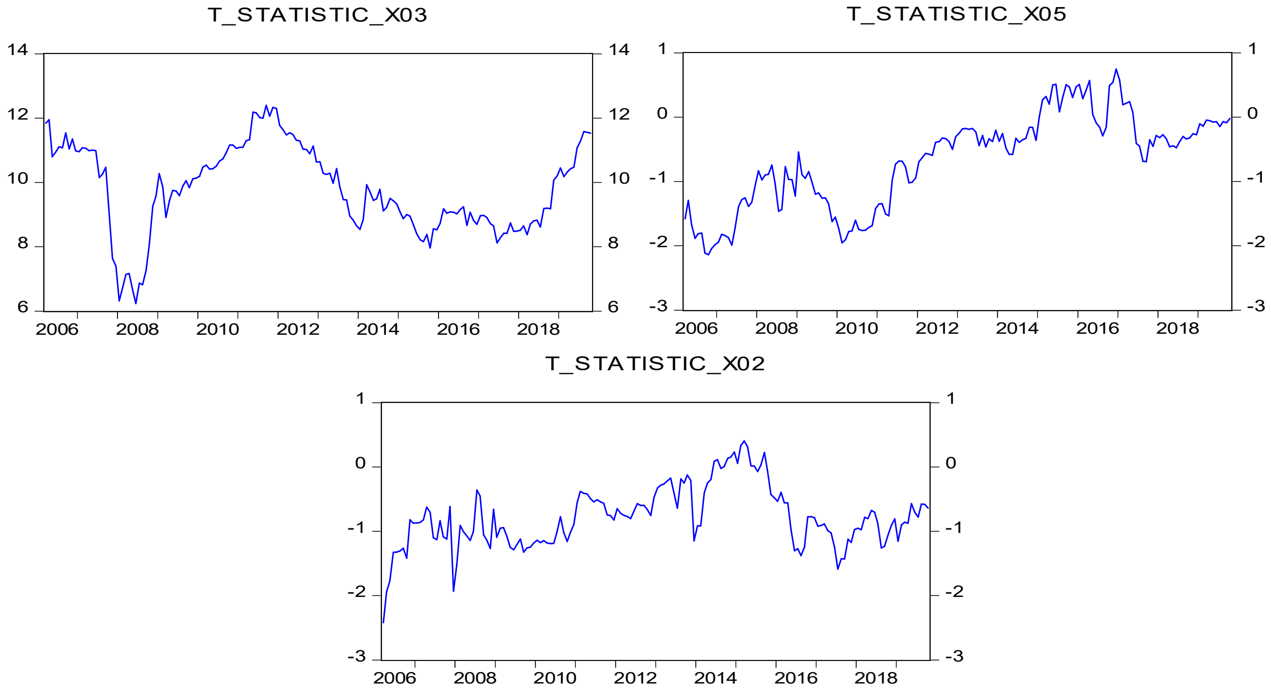

Figure 24: *T-statistics for 5 stocks proportionally weighted formed by D/P for Information-Technology Sector from Rolling Regression.*

6.2.3.2.3. Portfolios consisted of all Sector stocks proportionally weighted

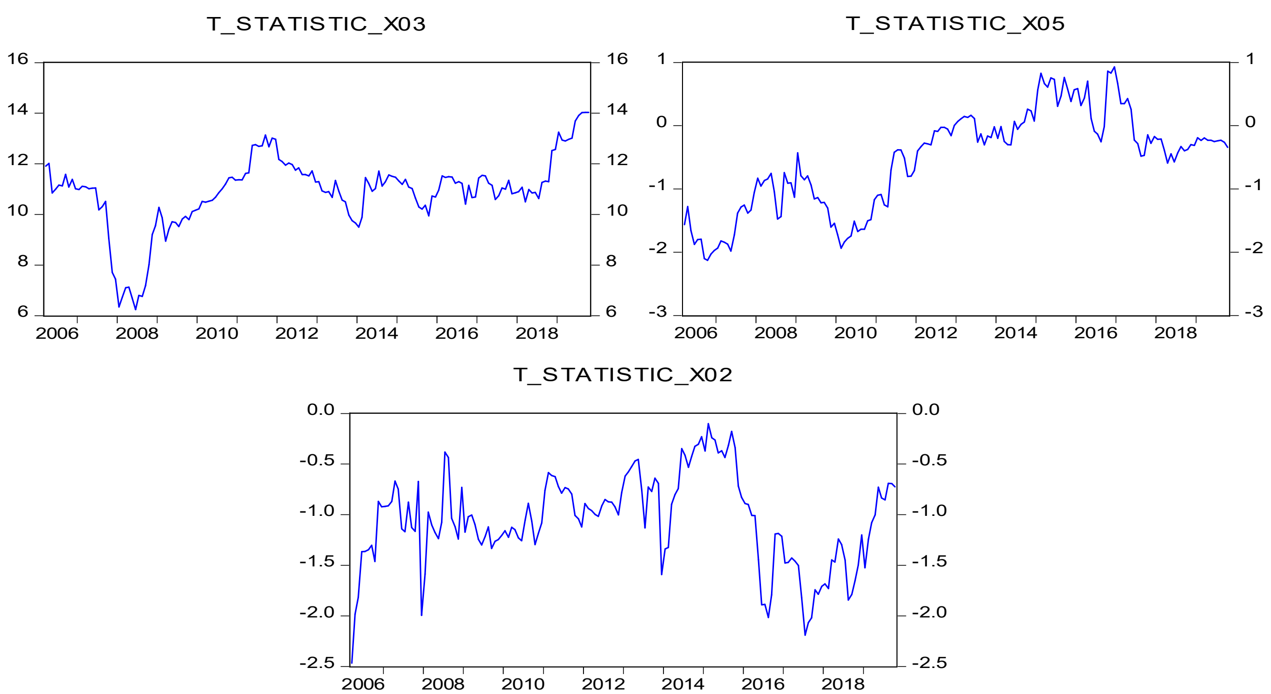

Figure 25: *T-statistics for all stocks proportionally weighted formed by D/P for Information-Technology Sector from Rolling Regression.*

6.2.4. Portfolio Returns formed by P/BV

6.2.4.1. Financial Sector Portfolios

The common variables for all portfolio categories are X03 and X18. Both of them present statistically significant beta coefficients in a simple linear regression with P/BV portfolio returns. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.4.1.1. Portfolios consisted of 5 stocks equally weighted

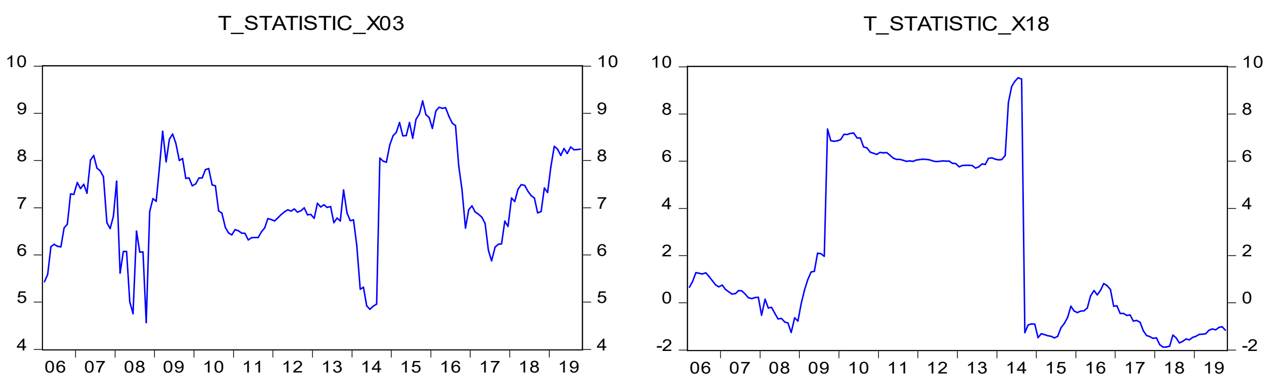

Figure 26: *T-statistics for 5 stocks equally weighted formed by P/BV for Financial Sector from Rolling Regression.*

6.2.4.1.2. Portfolios consisted of 5 stocks proportionally weighted

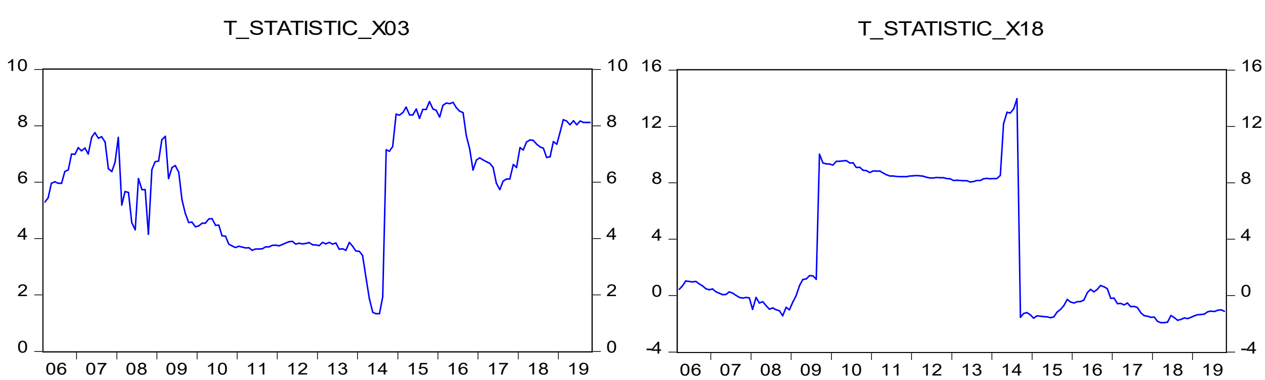

Figure 27: *T-statistics for 5 stocks proportionally weighted formed by P/BV for Financial Sector from Rolling Regression.*

6.2.4.1.3. Portfolios consisted of all Sector stocks proportionally weighted

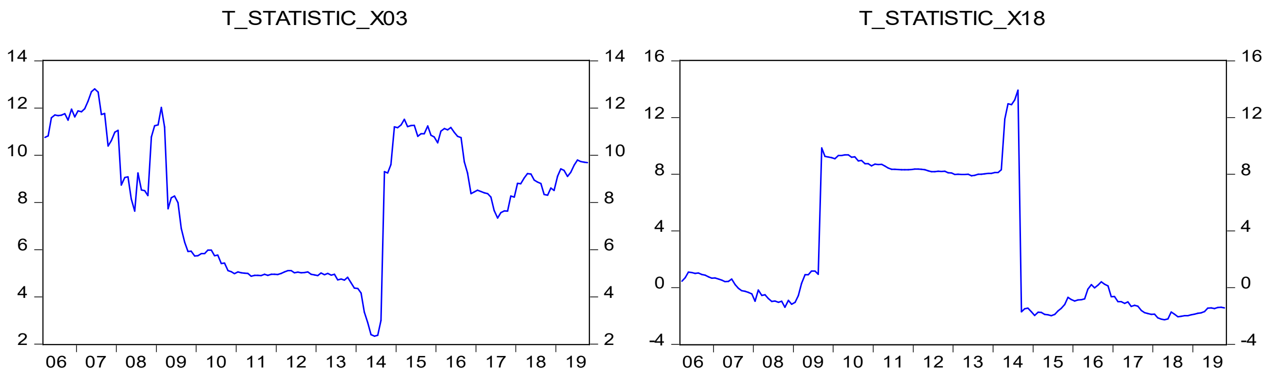

Figure 28: *T-statistics for all stocks proportionally weighted formed by P/BV for Financial Sector from Rolling Regression.*

6.2.4.2. Information-Technology Sector Portfolios

The common variables for all portfolio categories are X03, X16 and X17. All of them present statistically significant beta coefficients in a simple linear regression with P/BV portfolio returns. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.4.2.1. Portfolios consisted of 5 stocks equally weighted

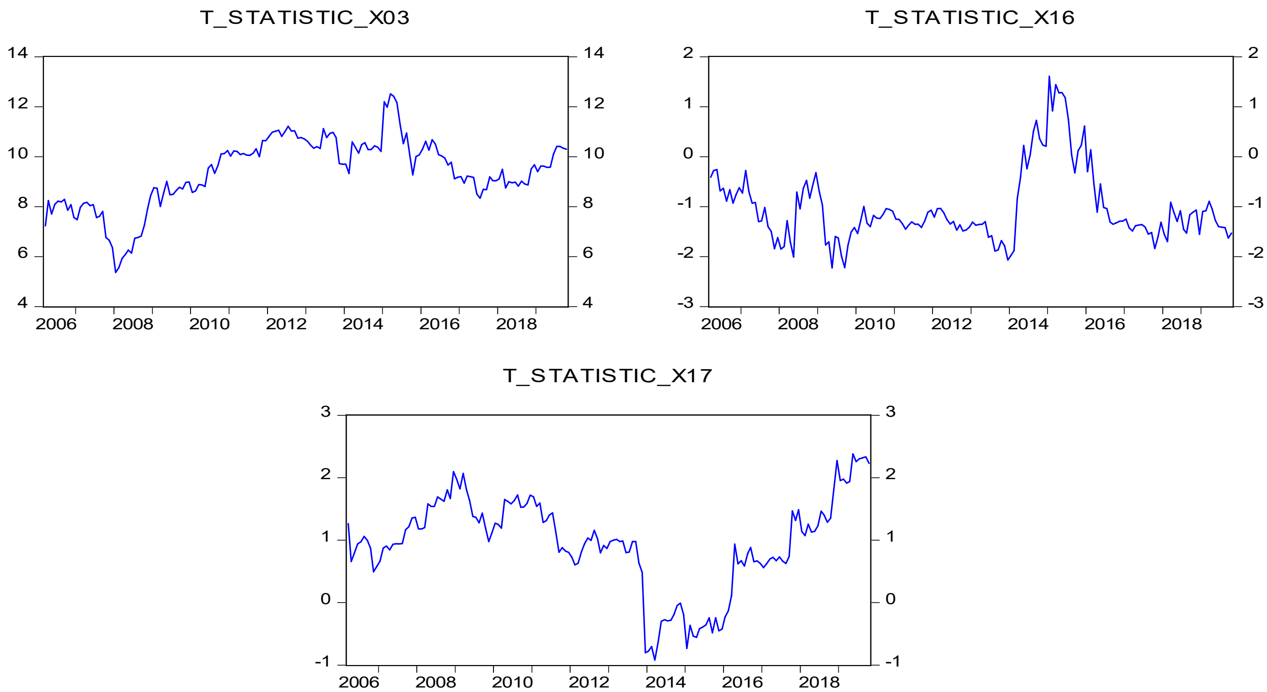

Figure 29: *T-statistics for 5 stocks equally weighted formed by P/BV for Information-Technology Sector from Rolling Regression.*

6.2.4.2.2. Portfolios consisted of 5 stocks proportionally weighted

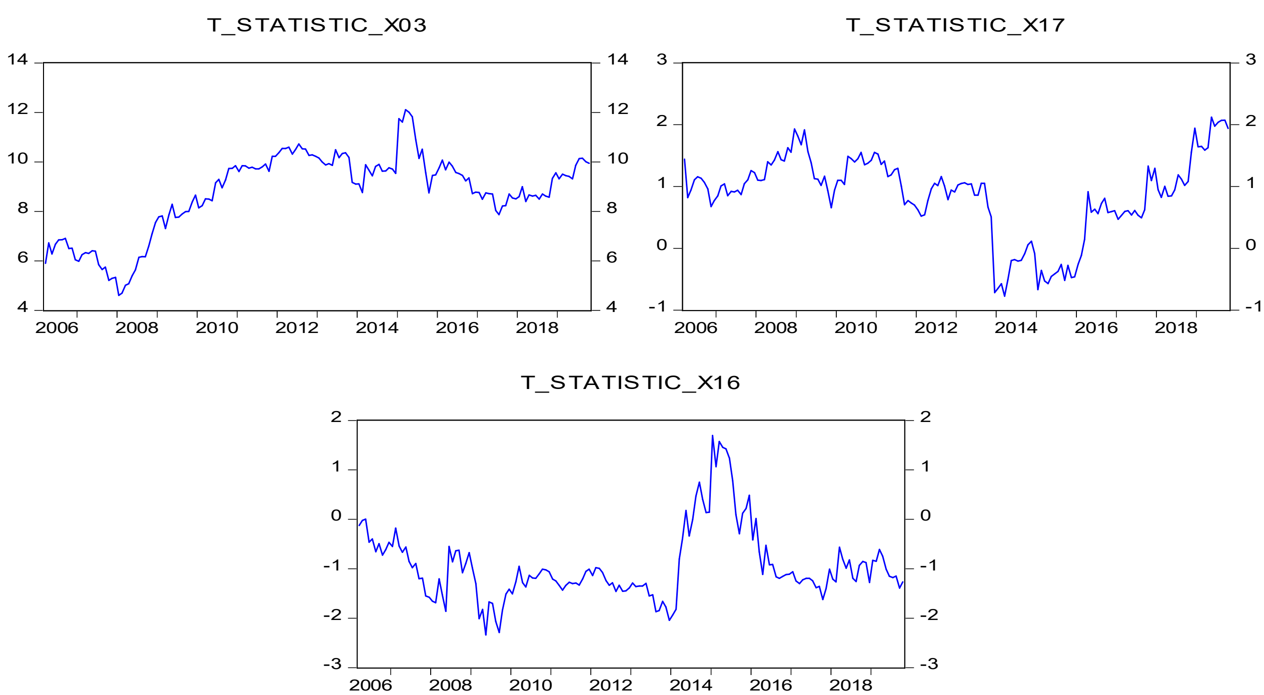

Figure 30: *T-statistics for 5 stocks proportionally weighted formed by P/BV for Information-Technology Sector from Rolling Regression.*

6.2.4.2.3. Portfolios consisted of all Sector stocks proportionally weighted

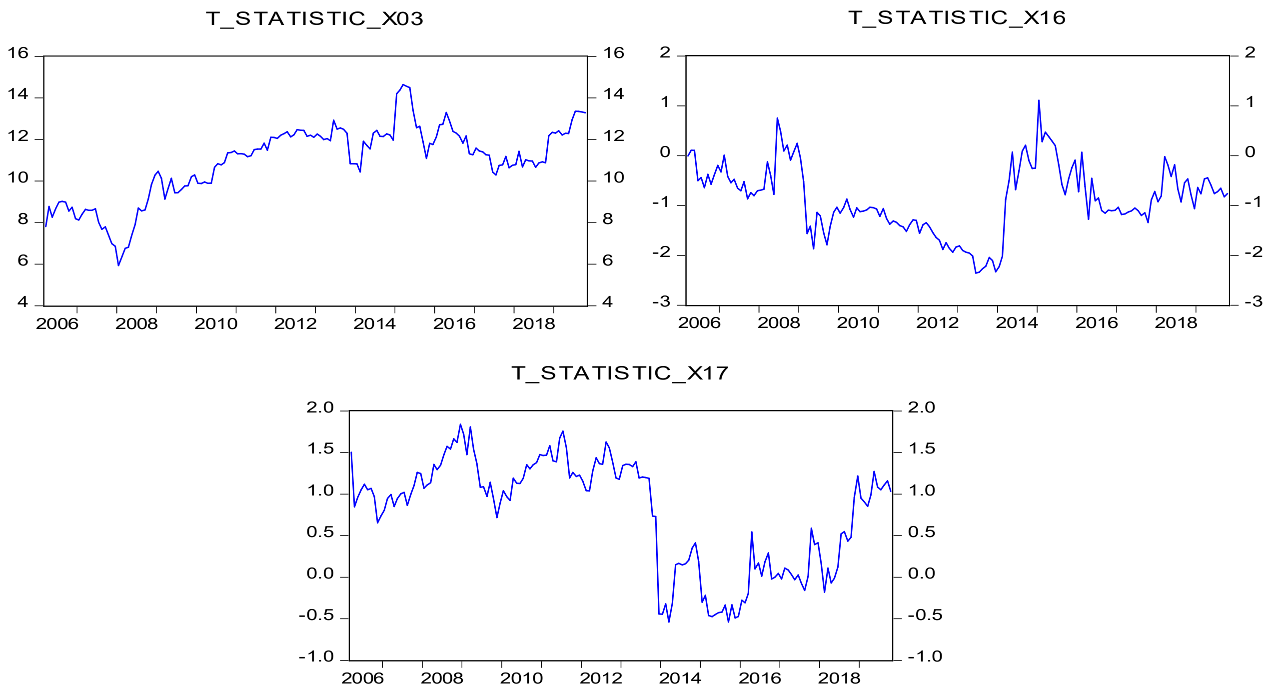

Figure 31: *T-statistics for 5 stocks proportionally weighted formed by P/BV for Information-Technology Sector from Rolling Regression.*

6.2.5. Portfolio Returns formed by P.E.G.

6.2.5.1. Financial Sector Portfolios

The common variables for all portfolio categories are X03, X18 and X31. All of them present statistically significant beta coefficients in a simple linear regression with P.E.G. portfolio returns. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns, but that phenomenon is presenting in the first two categories (except of 6 monthly observations from 1/3/2014 to 1/8/2014 in the 2nd category). In the 3rd portfolio category, none of the variables produce statistically significant beta coefficients.

6.2.5.1.1. Portfolios consisted of 5 stocks equally weighted

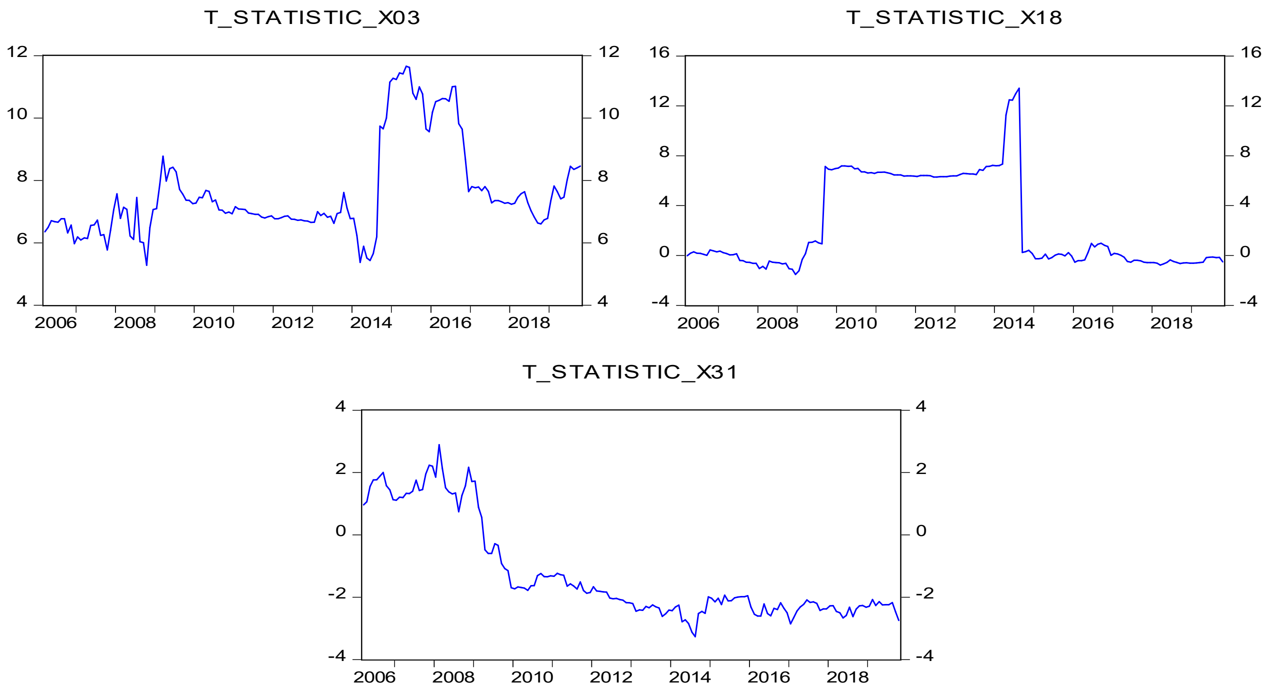

Figure 32: *T-statistics for 5 stocks equally weighted formed by P.E.G. for Financial Sector from Rolling Regression.*

6.2.5.1.2. Portfolios consisted of 5 stocks proportionally weighted

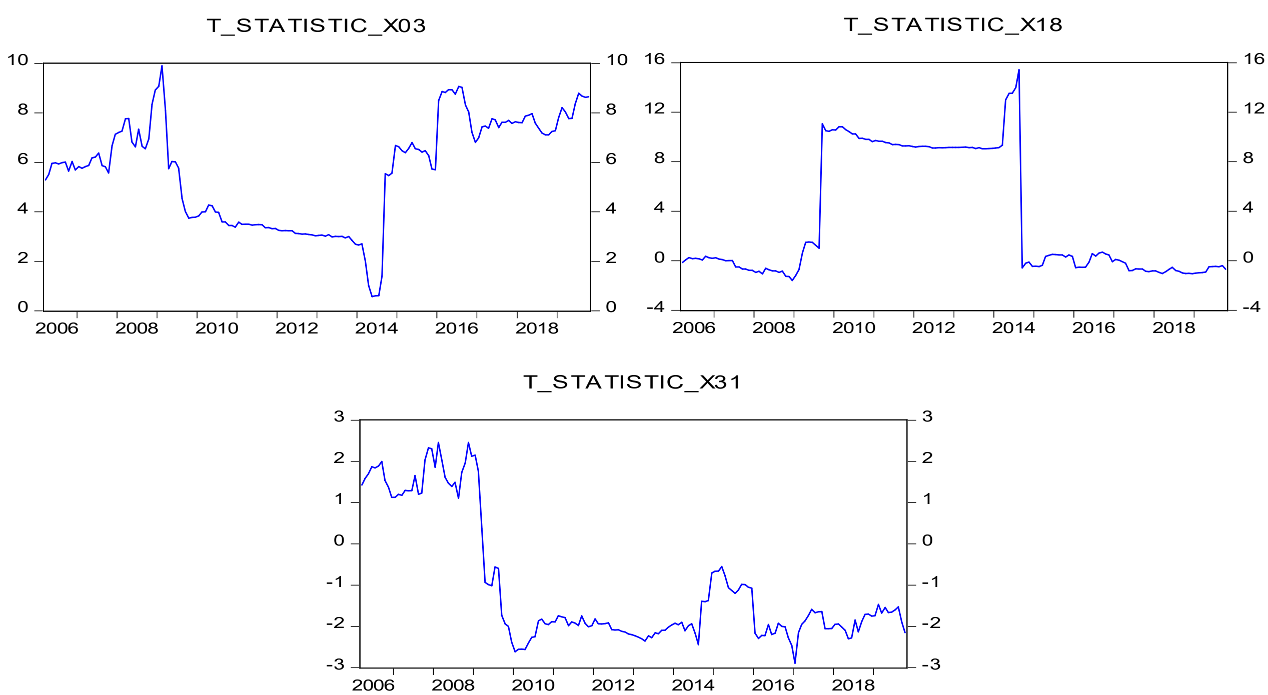

Figure 33: *T-statistics for 5 stocks proportionally weighted formed by P.E.G. for Financial Sector from Rolling Regression.*

6.2.5.1.3. Portfolios consisted of all Sector stocks proportionally weighted

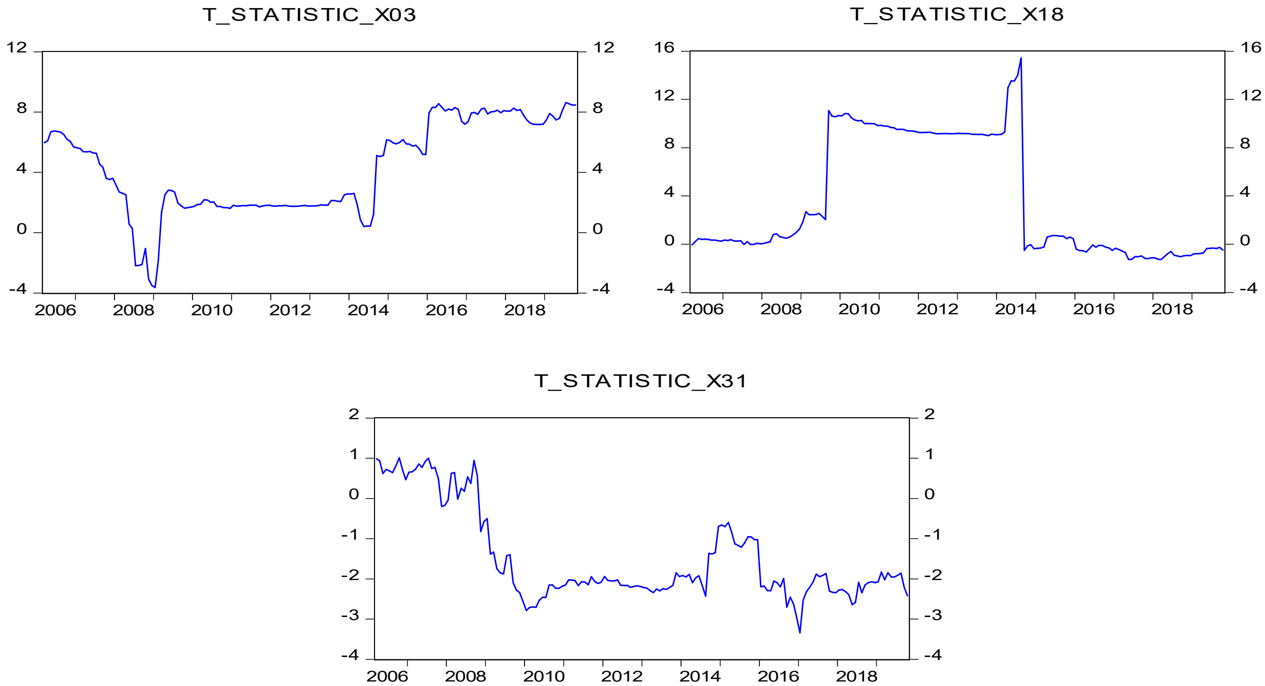

Figure 34: *T-statistics for all stocks proportionally weighted formed by P.E.G. for Financial Sector from Rolling Regression.*

6.2.5.2. Information-Technology Sector Portfolios

In this fundamental indicator is clearly that in the 3rd category of portfolio returns there are no common variables with the other two except of X34 (Table 16), but the R^2 is lower than 0,1 in a simple linear regression between portfolio returns formed by P.E.G., so is excluded. Therefore, as independent variables will be used the X03, X05, X09, X34 for the first two categories. But a collinearity issue is rising in executing Rolling Regression, so X09 is excluded too. So, the final independent variables are X03, X05 and X34. At the same time the beta coefficients from the above variables in a simple linear regression with EPS portfolio returns are statistically significant. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns for the first two categories.

6.2.5.2.1. Portfolios consisted of 5 stocks equally weighted

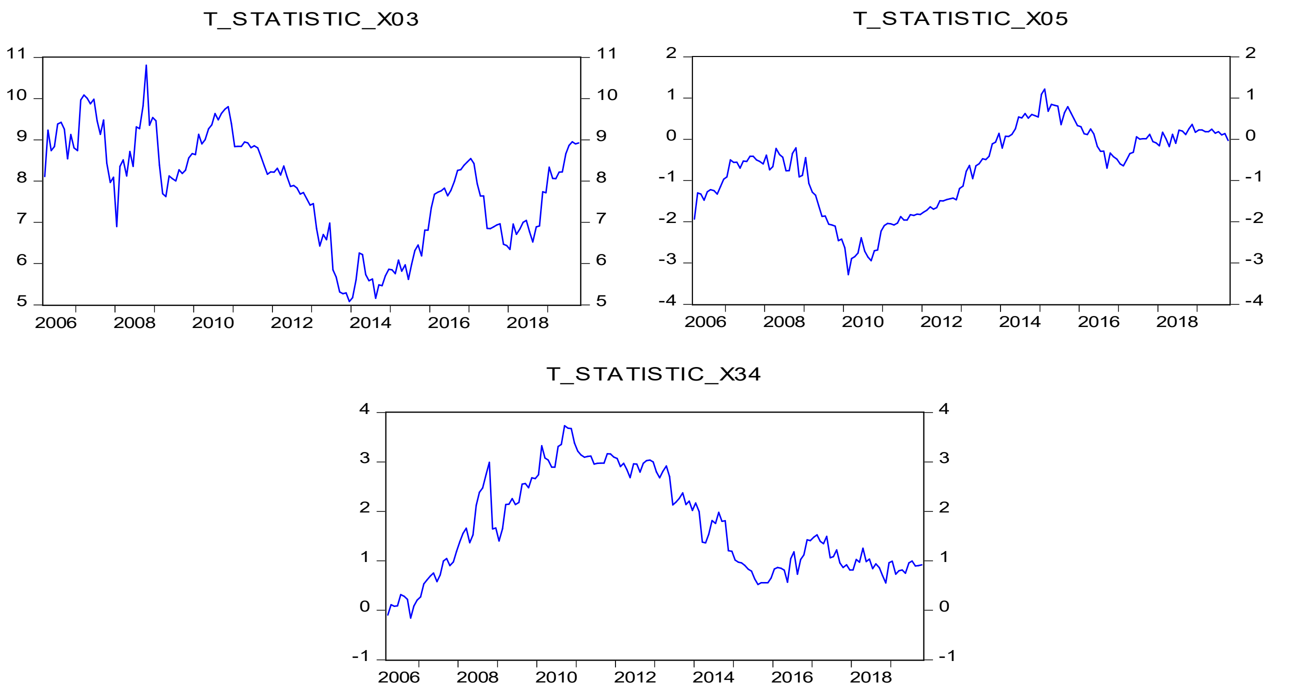

Figure 35: *T-statistics for 5 stocks equally weighted formed by P.E.G. for Information-Technology Sector from Rolling Regression.*

6.2.5.2.2. Portfolios consisted of 5 stocks proportionally weighted

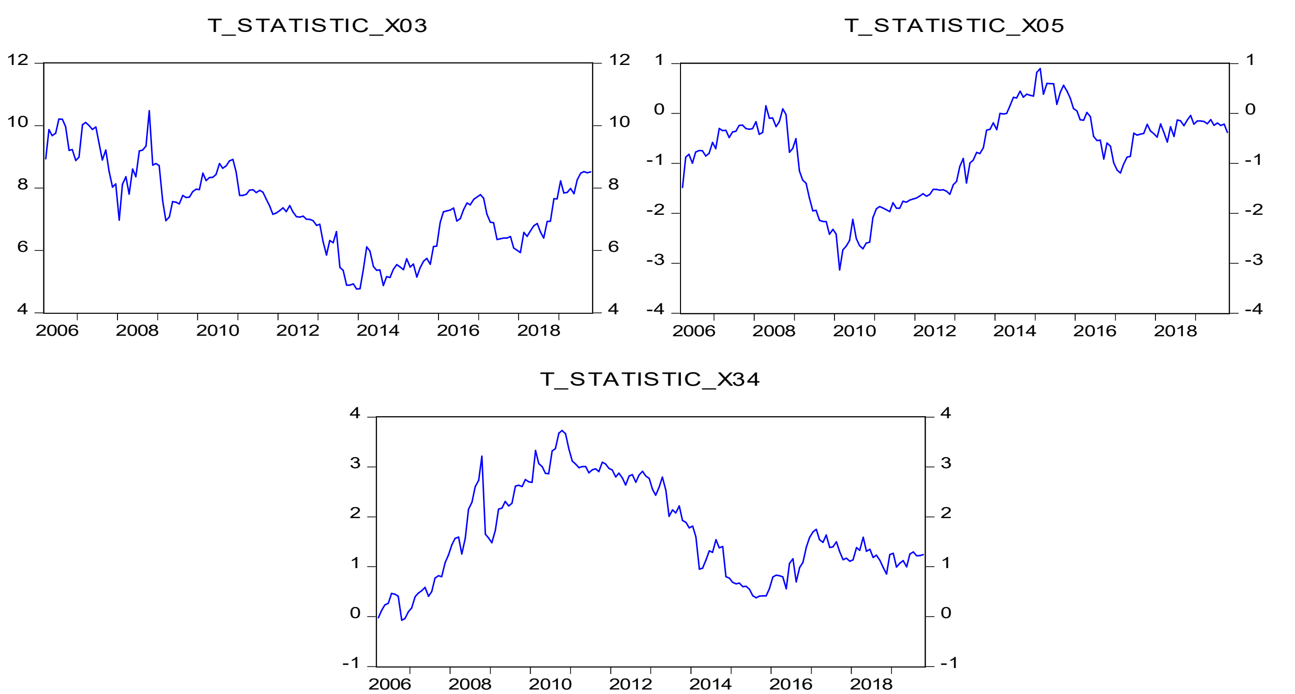

Figure 36: *T-statistics for 5 stocks proportionally weighted formed by P.E.G. for Information-Technology Sector from Rolling Regression.*

6.2.6. Portfolio Returns formed by BV/Shares

6.2.6.1. Financial Sector Portfolios

The common variables for all portfolio categories are X03, X05, X11, X18, X31 and X13. All of them present statistically significant beta coefficients in a simple linear regression with BV/Shares portfolio returns. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.6.1.1. Portfolios consisted of 5 stocks equally weighted

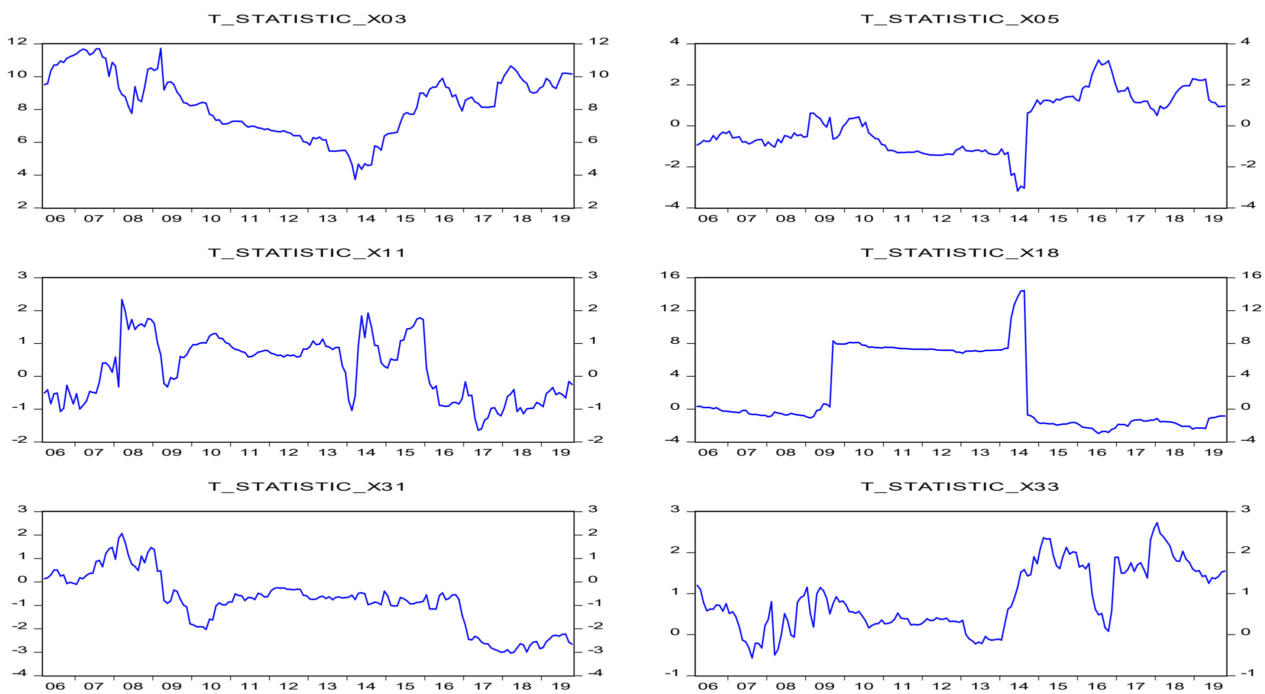

Figure 37: *T-statistics for 5 stocks equally weighted formed by BV/Shares for Financial Sector from Rolling Regression.*

6.2.6.1.2. Portfolios consisted of 5 stocks proportionally weighted

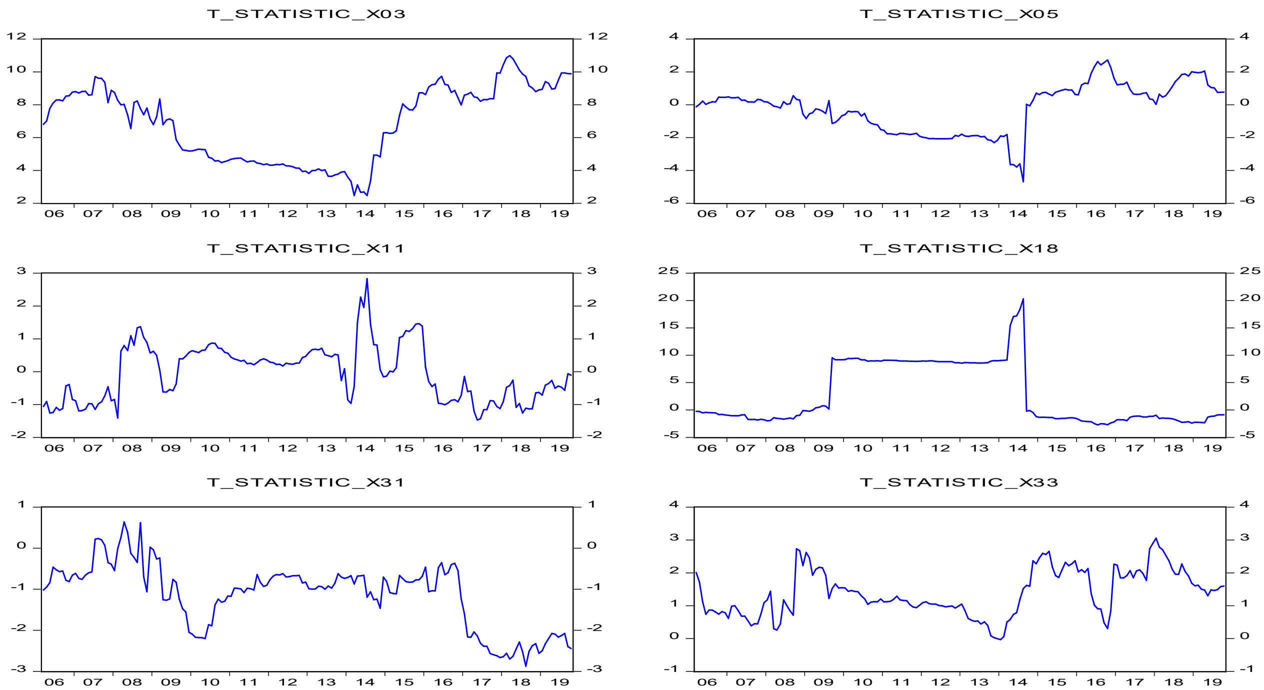

Figure 38: *T-statistics for 5 stocks proportionally weighted formed by BV/Shares for Financial Sector from Rolling Regression.*

6.2.6.1.3. Portfolios consisted of all Sector stocks proportionally weighted

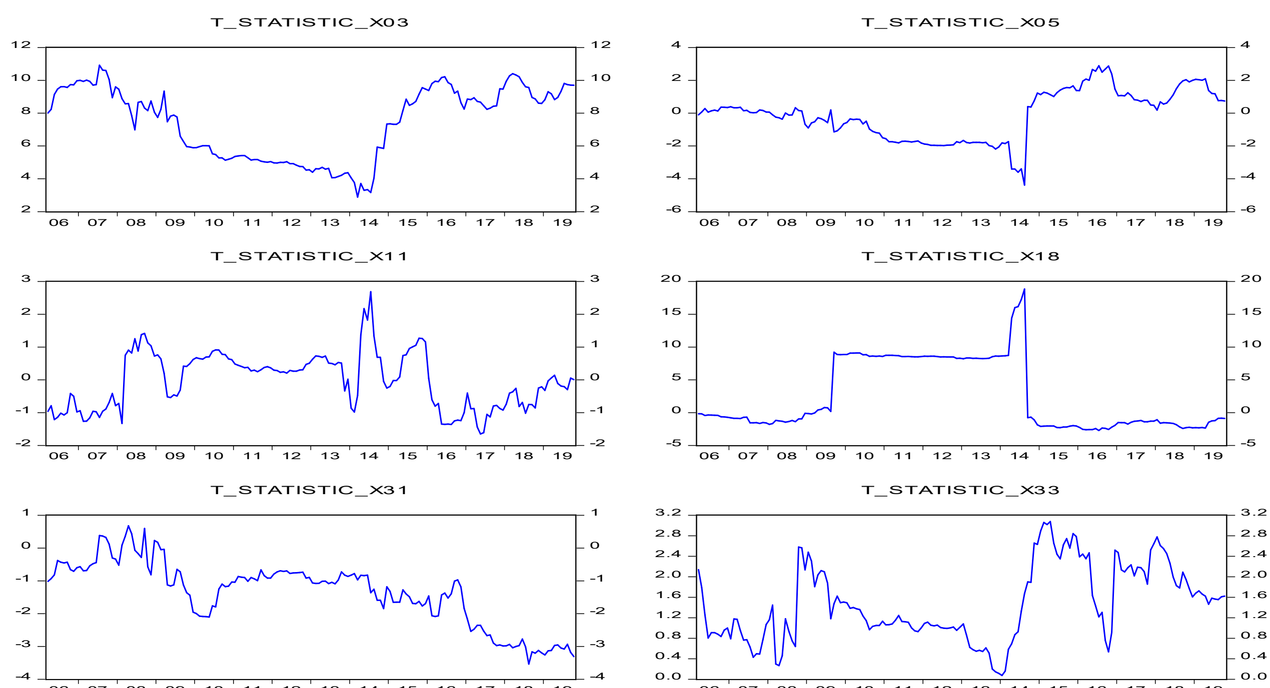

Figure 39: *T-statistics for all stocks proportionally weighted formed by BV/Shares for Financial Sector from Rolling Regression.*

6.2.6.2. Information-Technology Sector Portfolios

The common variables for all portfolio categories are X03 and X17. Both of them present statistically significant beta coefficients in a simple linear regression with BV/Shares portfolio returns. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.6.2.1. Portfolios consisted of 5 stocks equally weighted

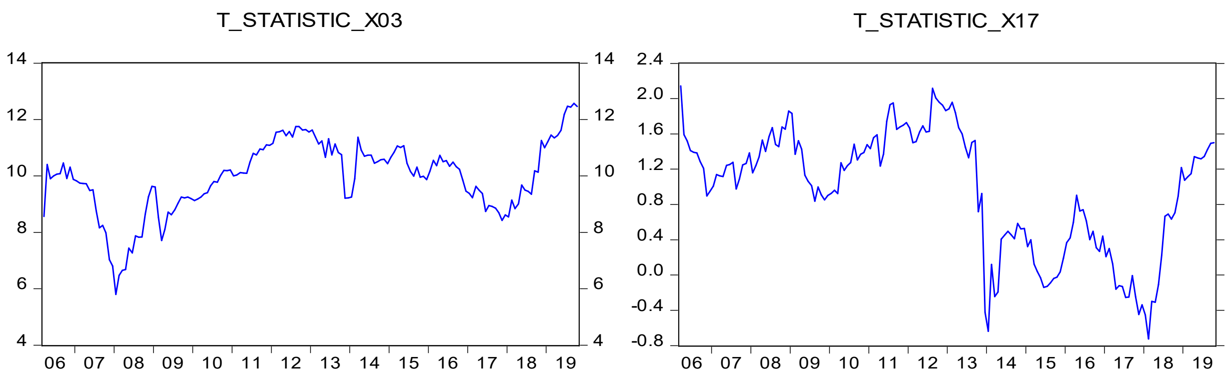

Figure 40: *T-statistics for 5 stocks equally weighted formed by BV/Shares for Information-Technology Sector from Rolling Regression.*

6.2.6.2.2. Portfolios consisted of 5 stocks proportionally weighted

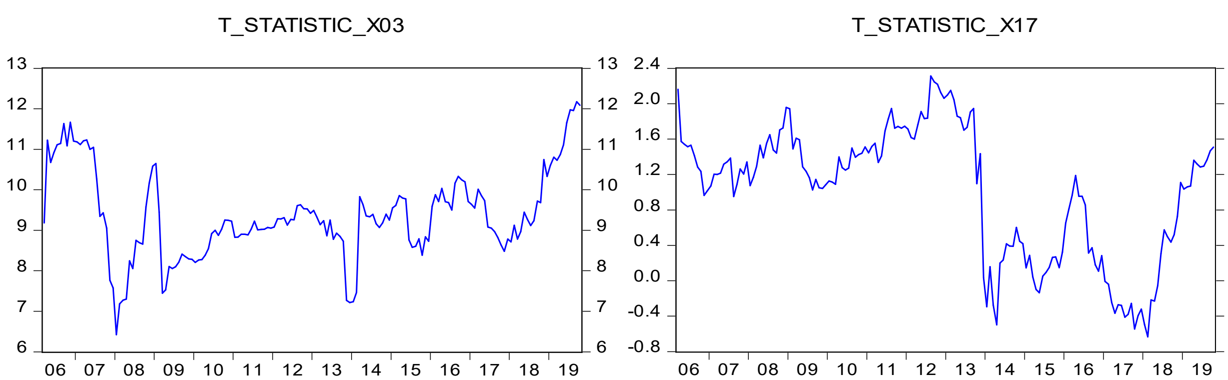

Figure 41: *T-statistics for 5 stocks proportionally weighted formed by BV/Shares for Information-Technology Sector from Rolling Regression.*

6.2.6.2.3. Portfolios consisted of all Sector stocks proportionally weighted

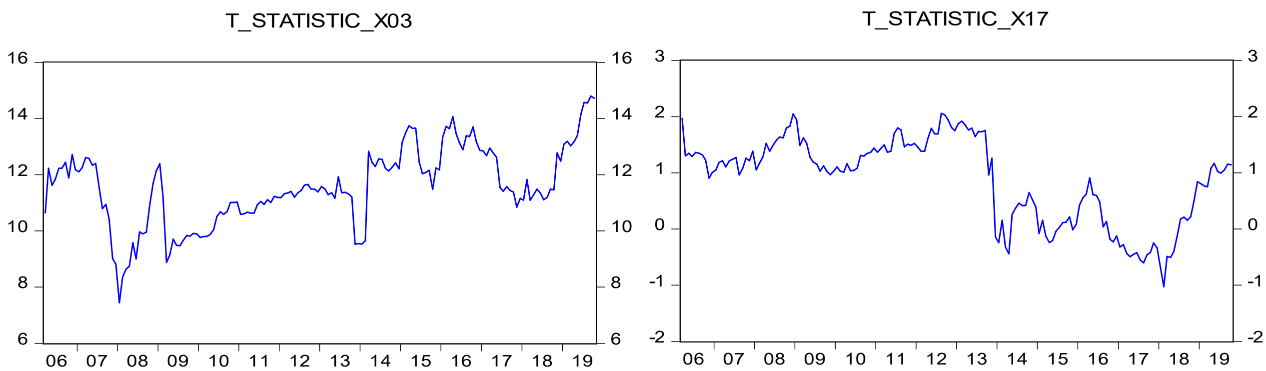

Figure 42: *T-statistics for all stocks proportionally weighted formed by BV/Shares for Information-Technology Sector from Rolling Regression.*

6.2.7. Portfolio Returns formed by TBC/Shares

6.2.7.1. Financial Sector Portfolios

The common variables for all portfolio categories are X03, X05, X18, X31 and X13. All of them present statistically significant beta coefficients in a simple linear regression with TBC/Shares portfolio returns. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.7.1.1. Portfolios consisted of 5 stocks equally weighted

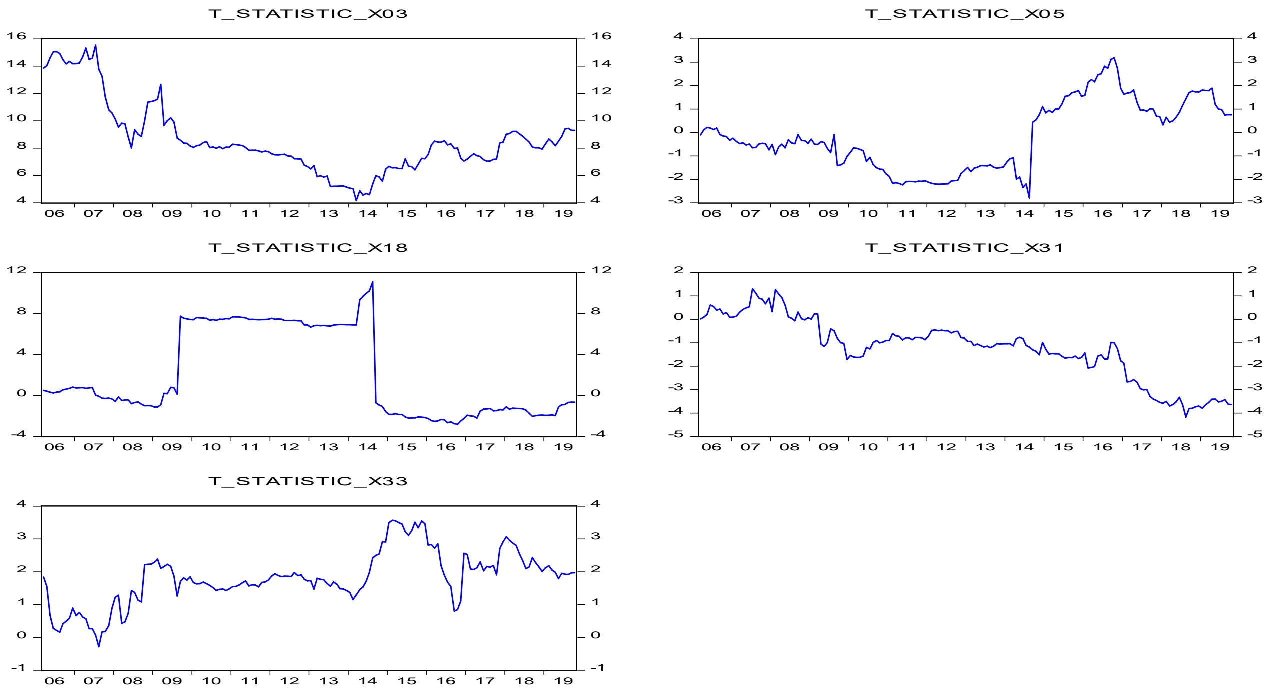

Figure 43: *T-statistics for 5 stocks equally weighted formed by TBC/Shares for Financial Sector from Rolling Regression.*

6.2.7.1.2. Portfolios consisted of 5 stocks proportionally weighted

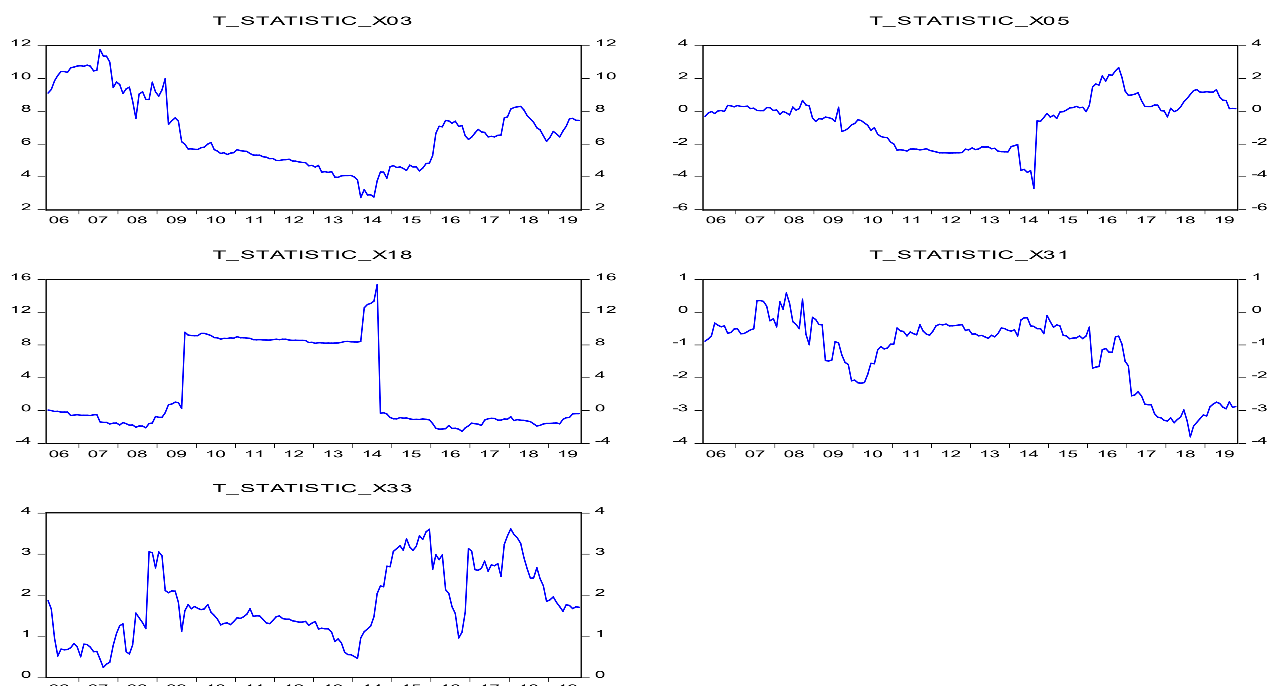

Figure 44: *T-statistics for 5 stocks proportionally weighted formed by TBC/Shares for Financial Sector from Rolling Regression.*

6.2.7.1.3. Portfolios consisted of all Sector stocks proportionally weighted

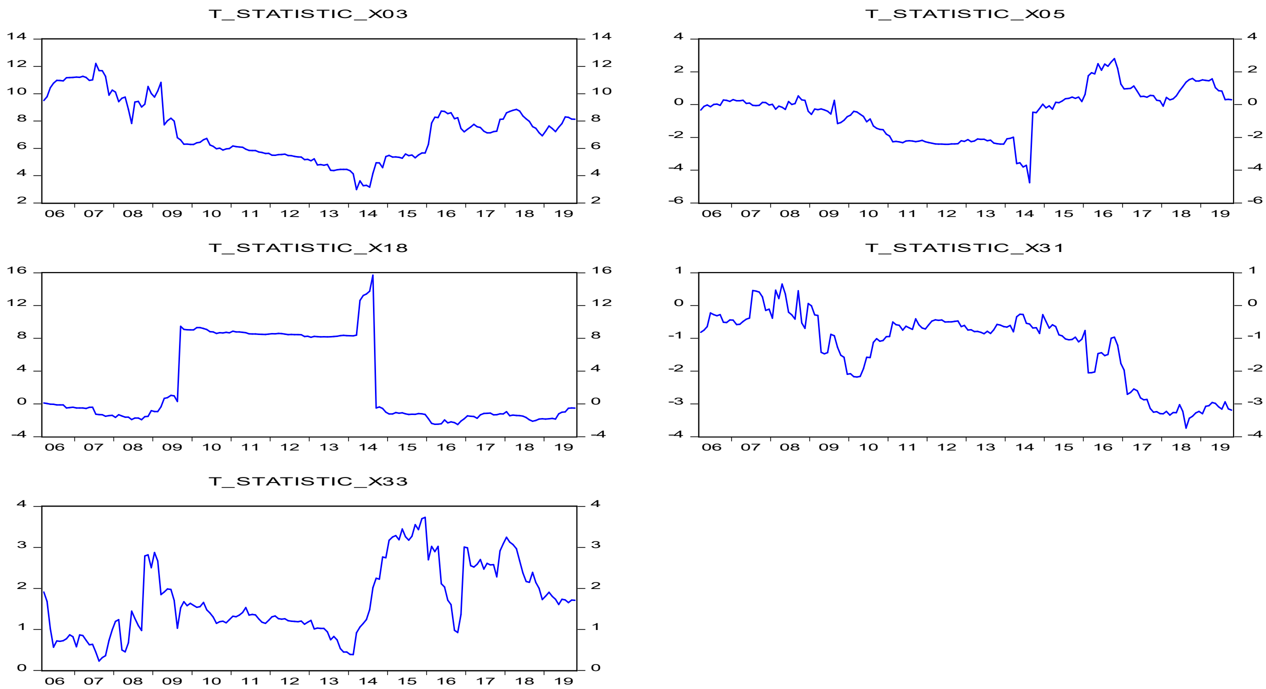

Figure 45: *T-statistics for all stocks proportionally weighted formed by TBC/Shares for Financial Sector from Rolling Regression.*

6.2.7.2. Information-Technology Sector Portfolios

The common variables for all portfolio categories are X03 and X17. Both of them present statistically significant beta coefficients in a simple linear regression with TBC/Shares portfolio returns. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.7.2.1. Portfolios consisted of 5 stocks equally weighted

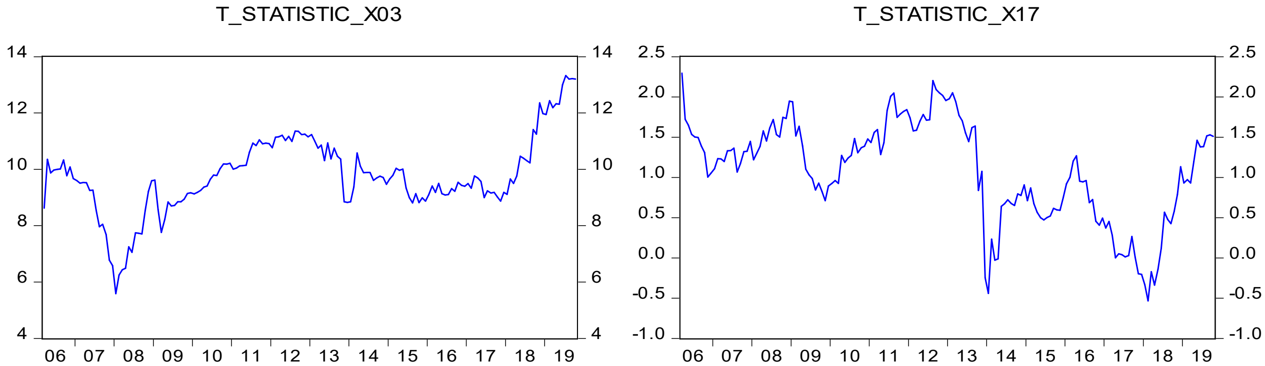

Figure 46: *T-statistics for 5 stocks equally weighted formed by TBC/Shares for Information-Technology Sector from Rolling Regression.*

6.2.7.2.2. Portfolios consisted of 5 stocks proportionally weighted

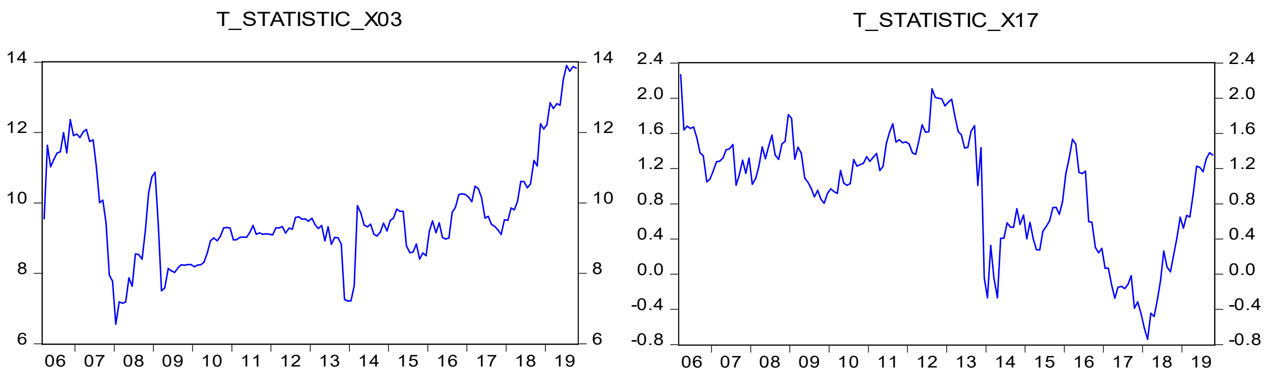

Figure 47: *T-statistics for 5 stocks proportionally weighted formed by TBC/Shares for Information-Technology Sector from Rolling Regression.*

6.2.7.2.3. Portfolios consisted of all Sector stocks proportionally weighted

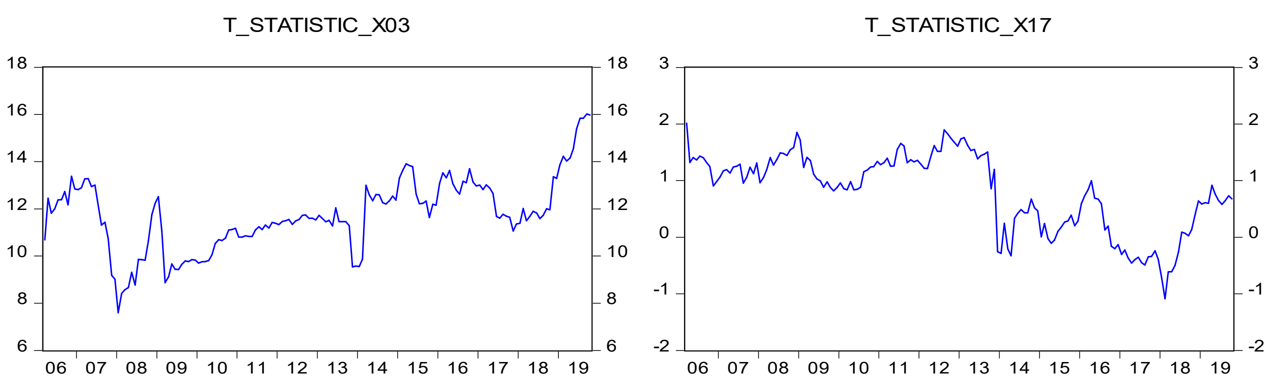

Figure 48: *T-statistics for all stocks proportionally weighted formed by TBC/Shares for Information-Technology Sector from Rolling Regression.*

6.2.8. Portfolio Returns formed by ROE

6.2.8.1. Financial Sector Portfolios

In this fundamental indicator is clearly that in the 3rd category of portfolio returns there are no common variables (Table 16). Therefore, as independent variables will be used the X03, X02 and X16 for the first two categories, X05 and X18 for the 3rd category. At the same time the beta coefficients from the above variables in a simple linear regression with ROE portfolio returns are statistically significant separately and R^2 is bigger than 0,5. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns for the first two categories and for the 3rd category none of them. As result of that, the 3rd category of portfolio returns is excluded.

6.2.8.1.1. Portfolios consisted of 5 stocks equally weighted

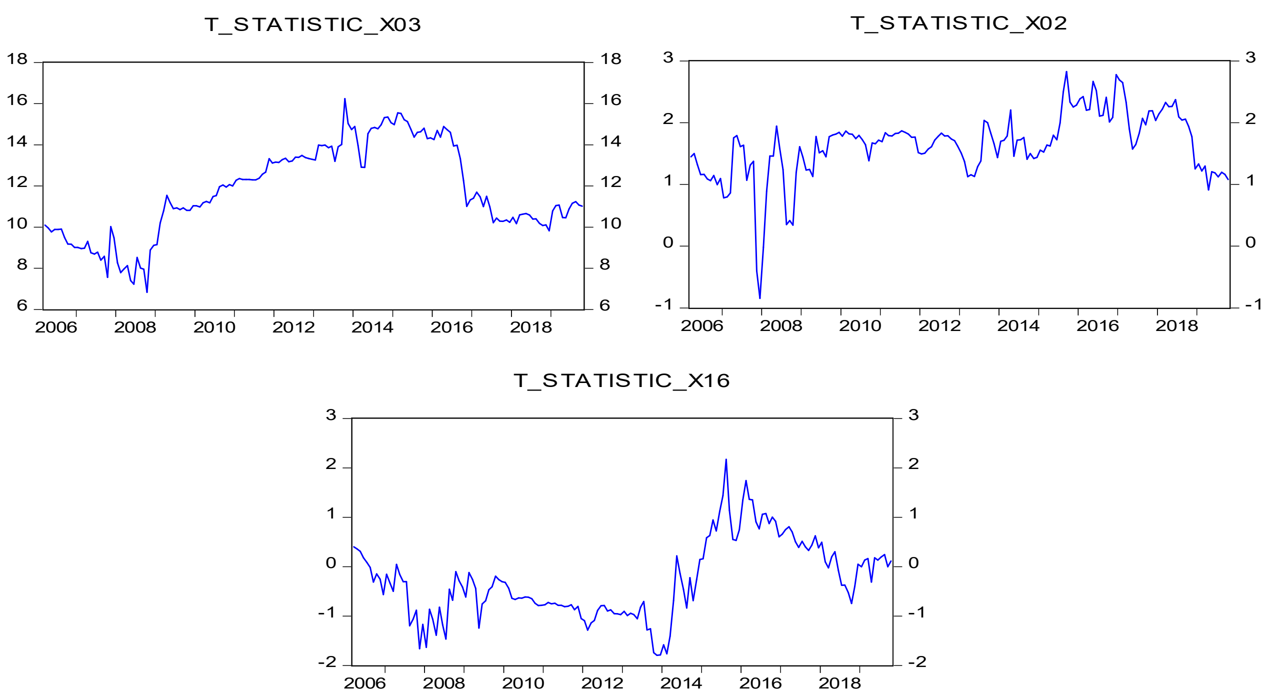

Figure 49: *T-statistics for 5 stocks equally weighted formed by ROE for Financial Sector from Rolling Regression.*

6.2.8.1.2. Portfolios consisted of 5 stocks proportionally weighted

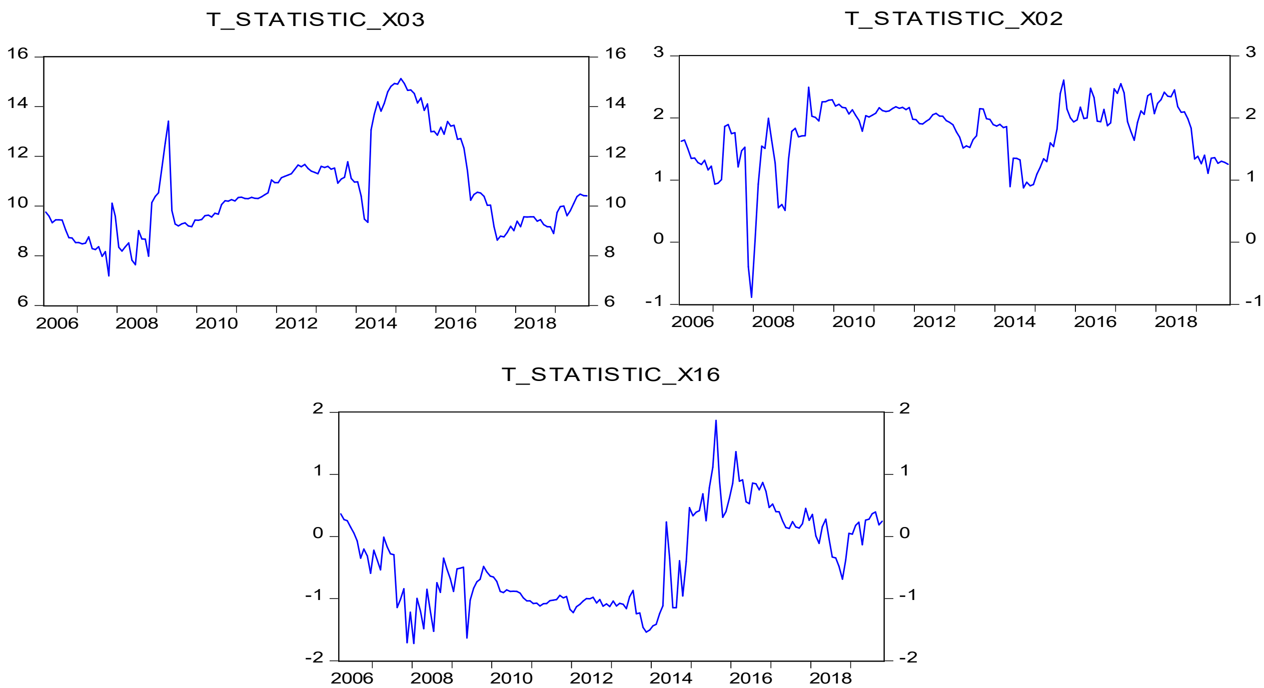

Figure 50: T-statistics for 5 stocks proportionally weighted formed by ROE for Financial Sector from Rolling Regression.

6.2.8.1.3. Portfolios consisted of all Sector stocks proportionally weighted

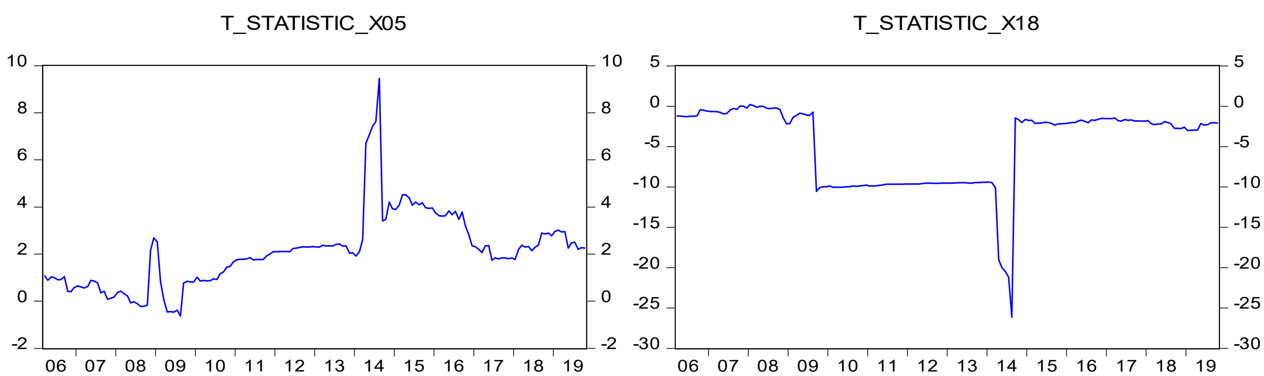

Figure 51: T-statistics for all stocks proportionally weighted formed by ROE for Financial Sector from Rolling Regression.

6.2.8.2. Information-Technology Sector Portfolios

In this fundamental indicator is clearly that in the 3rd category of portfolio returns there are no common variables with the others (Table 16). Therefore, as independent variables will be used the X03, X02 and X16 for the first two categories, X05 and X18 for the 3rd category. At the same time the beta coefficients from the first two categories of the above variables in a simple linear regression with ROE portfolio returns are presenting a collinearity issue, so X09 needed to be removed in order to overcome the problem. After that all the remaining variables (X03, X05, X29) are presenting beta coefficients statistically significant in the same linear regression for the first two categories. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns for the first two categories. For the 3rd category after Rolling Regression none variable shows statistically significant beta coefficients. As a result of that the 3rd category of portfolio returns is excluded.

6.2.8.2.1. Portfolios consisted of 5 stocks equally weighted

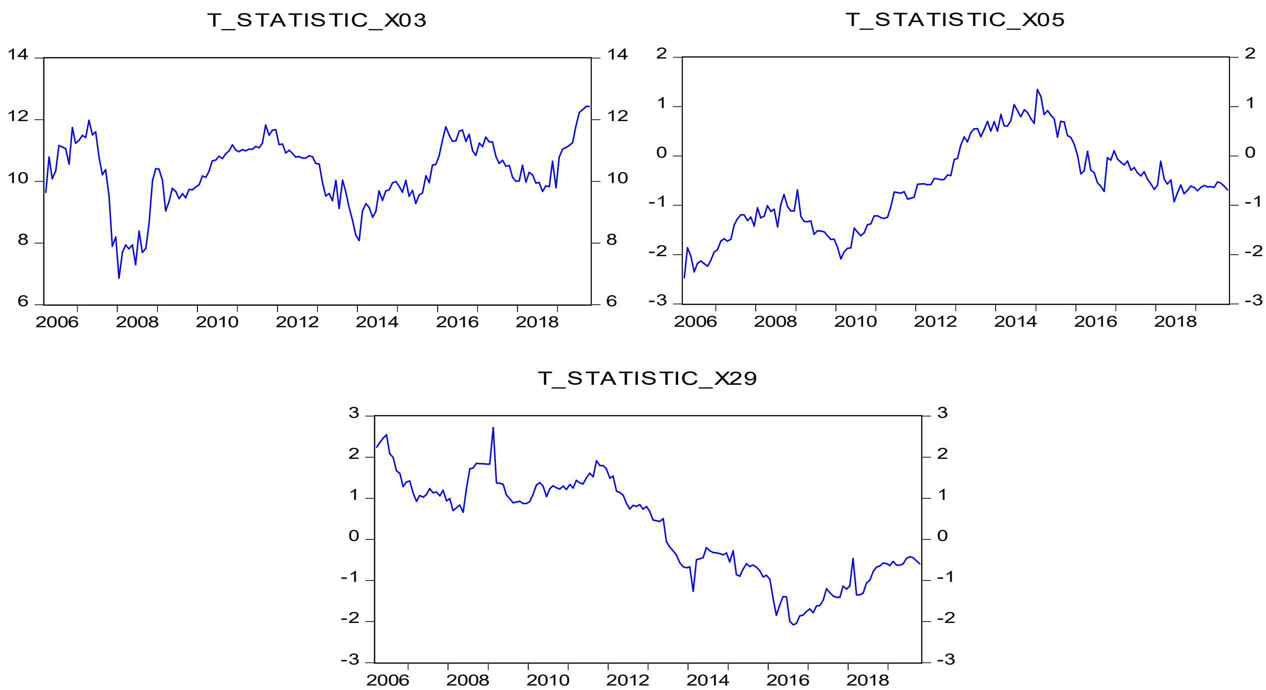

Figure 52: *T-statistics for 5 stocks equally weighted formed by ROE for Information-Technology Sector from Rolling Regression.*

6.2.8.2.2. Portfolios consisted of 5 stocks proportionally weighted

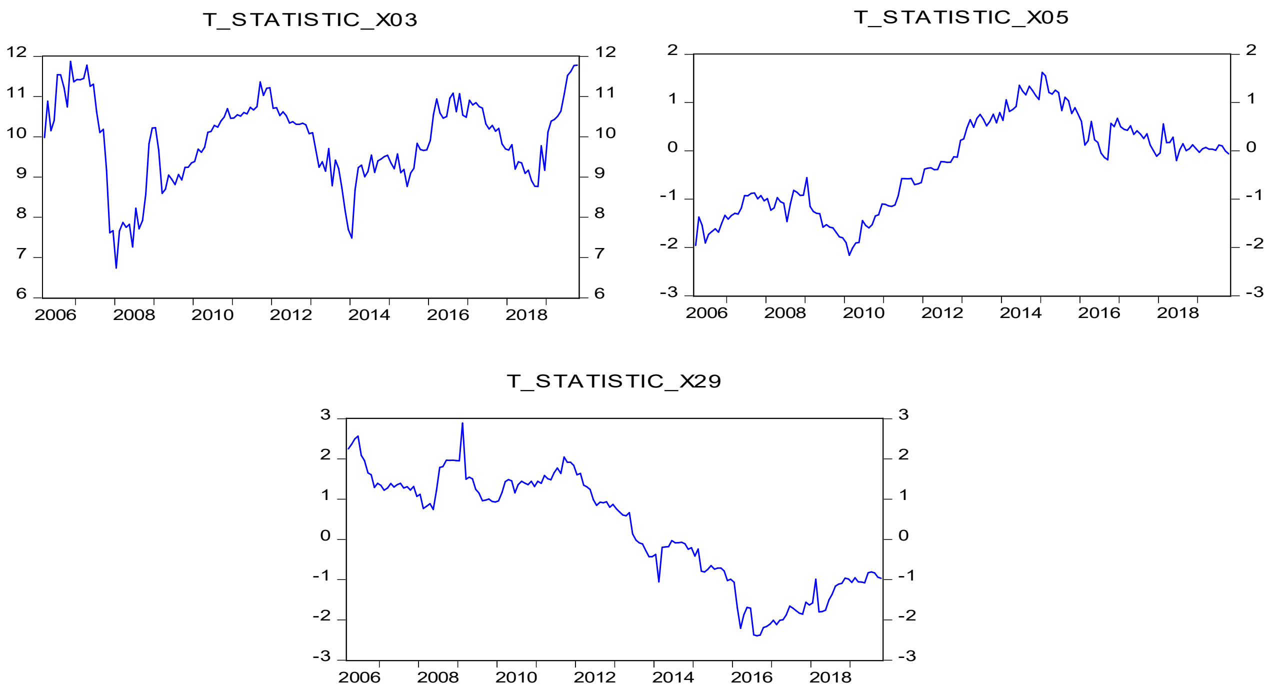

Figure 53: *T-statistics for 5 stocks proportionally weighted formed by ROE for Information-Technology Sector from Rolling Regression.*

6.2.9. Portfolio Returns formed by P/S

6.2.9.1. Financial Sector Portfolios

The common variables for all portfolio categories are X03 and X18. Both of them present statistically significant beta coefficients in a simple linear regression with P/S portfolio returns. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.9.1.1. Portfolios consisted of 5 stocks equally weighted

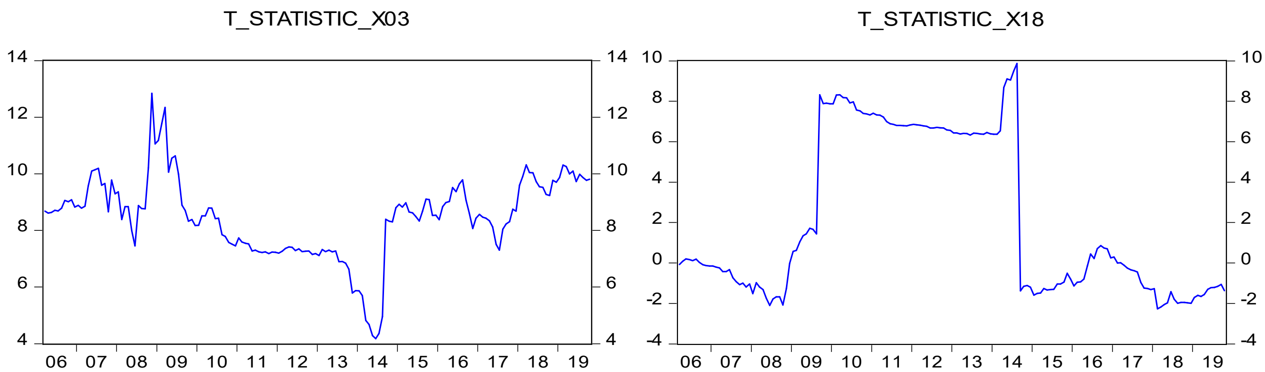

Figure 54: *T-statistics for 5 stocks equally weighted formed by P/S for Financial Sector from Rolling Regression.*

6.2.9.1.2. Portfolios consisted of 5 stocks proportionally weighted

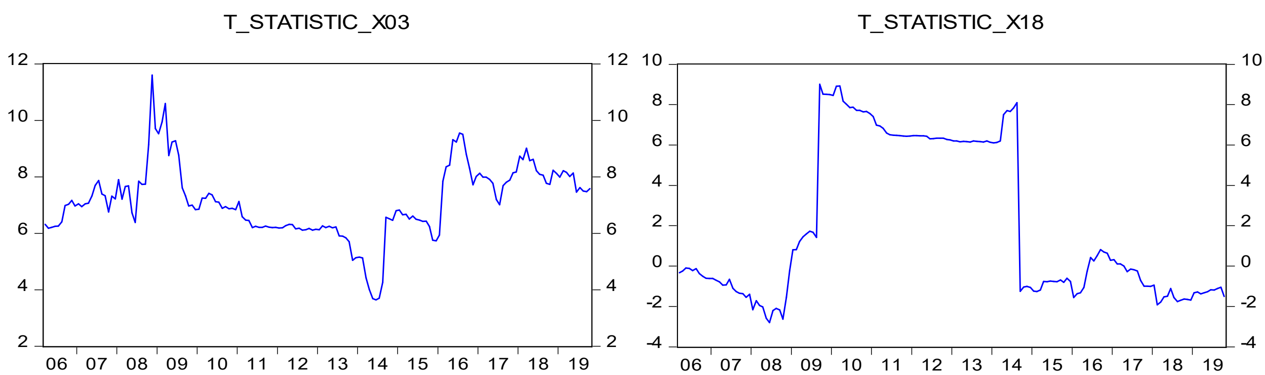

Figure 55: *T-statistics for 5 stocks proportionally weighted formed by P/S for Financial Sector from Rolling Regression.*

6.2.9.1.3. Portfolios consisted of all Sector stocks proportionally weighted

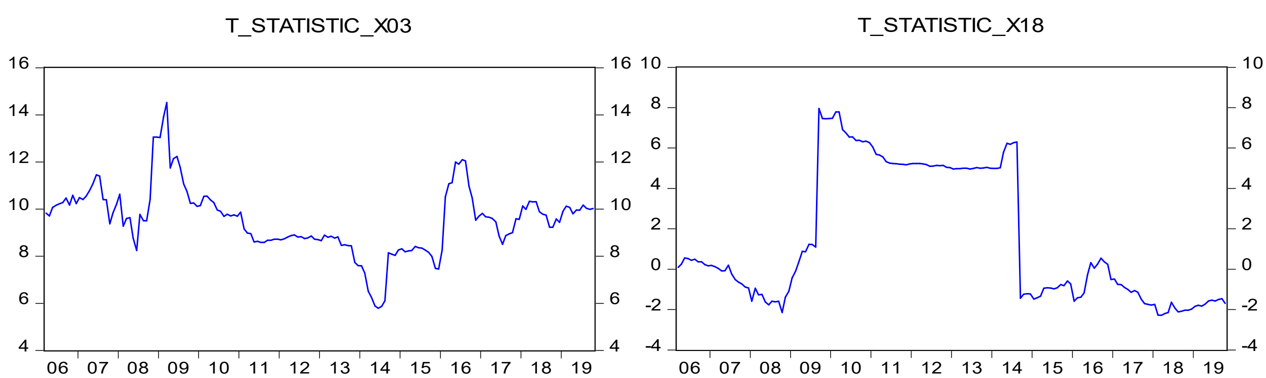

Figure 56: *T-statistics for all stocks proportionally weighted formed by P/S for Financial Sector from Rolling Regression.*

6.2.9.2. Information-Technology Sector Portfolios

The common variables for all portfolio categories are X03 and X16. Both of them present statistically significant beta coefficients in a simple linear regression with P/S portfolio returns. The only variable that presents |t-statistic|>=2 after Rolling Regression is X03 or S&P100 returns.

6.2.9.2.1. Portfolios consisted of 5 stocks equally weighted

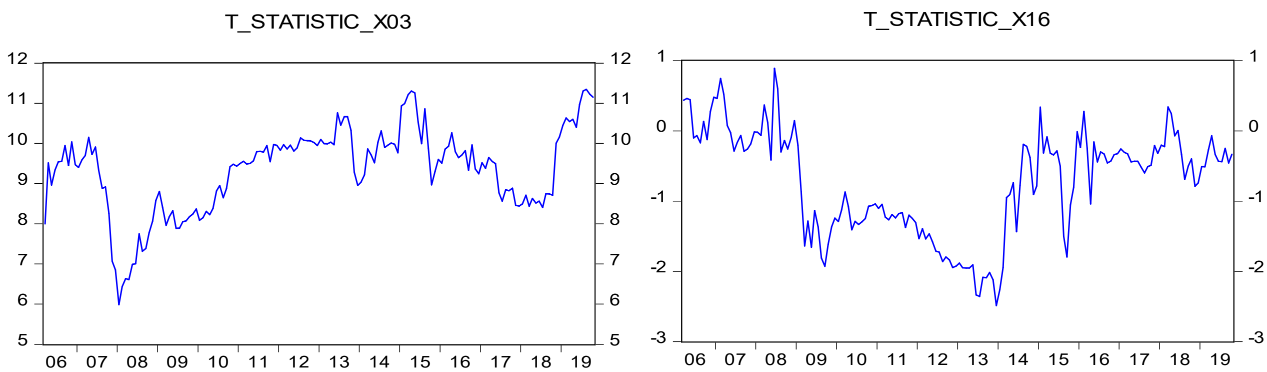

Figure 57: *T-statistics for 5 stocks equally weighted formed by P/S for Information-Technology Sector from Rolling Regression.*

6.2.9.2.2. Portfolios consisted of 5 stocks proportionally weighted

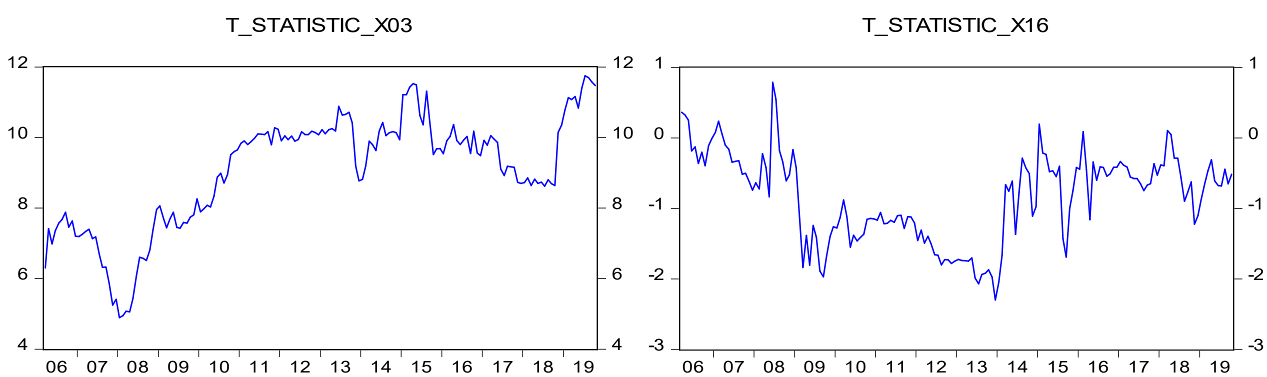

Figure 58: *T-statistics for 5 stocks proportionally weighted formed by P/S for Information-Technology Sector from Rolling Regression.*

6.2.9.2.3. Portfolios consisted of all Sector stocks proportionally weighted

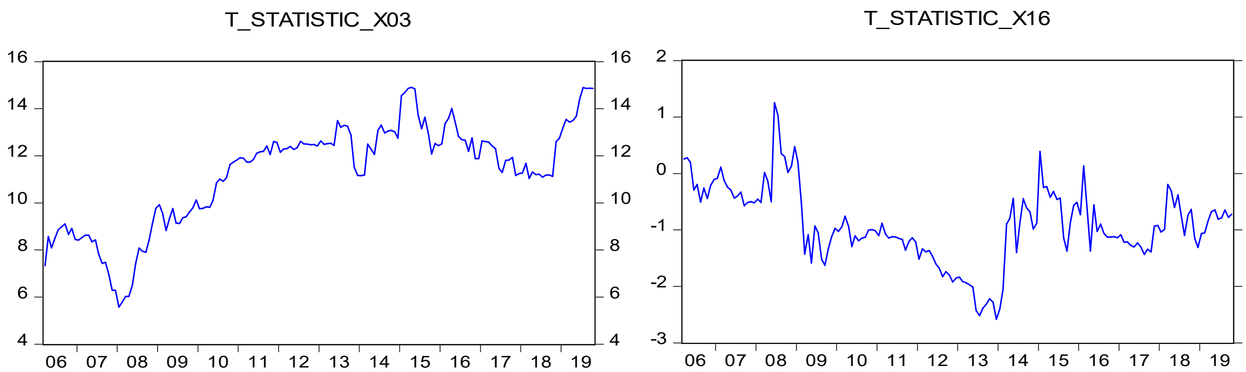

Figure 59: *T-statistics for all stocks proportionally weighted formed by P/S for Information-Technology Sector from Rolling Regression.*

6.3. Beta coefficients from Rolling Regression & Time Variability

In this point a visual examination of 5-year beta coefficients of all portfolio categories returns with S&P100 returns resulting from Rolling Regression are given, following by the most important descriptive statistics, starting from 1/1/2001 to 1/10/2019 with the first beta coefficient of this procedure resulting on 1/3/2006 and a total of 164 observations of beta coefficients for both Sector portfolios. From the previous step, through examination of t-statistics, obviously the 5-year beta coefficients of S&P100 monthly returns from Rolling Regression are statistically significant and simultaneously are time-varying.

Financial Portfolios are presenting bigger average betas than the Information-Technology Portfolios therefore and higher risk exposure, confirming the initial data. Especially through 2008-2014 due to 2009 Crisis, this period consists the point with the highest exposure in S&P100 monthly course for Financial Sector and at the opposite in Information-Technology Sector betas are decreased, making them a safer investment solution. After that period, both Sectors are returning in their normal profile, i.e., Financial Sector seems to has a great decrease in beta levels and on the contrary Information-Technology Sector has a slight average increase in beta levels.

None of them are following Normal Distribution, with mean upper than 1, meaning that these portfolios are highly-risk investments. Furthermore, betas distribution in Financial Portfolios are shown lower Skewness and Kurtosis levels than Information-Technology and closer to normal distribution. For Financial Sector the portfolios that present higher beta prices are these that formed by BV/Shares and TBC/Shares and these that present lower beta prices are formed by P/E fundamental indicator. Respectively, in Information-Technology Sector higher beta prices present the portfolios formed by P/BV and lower these that formed by P.E.G, ROE and D/P fundamental in each category.

Analyzing the graphs, obviously there are two different course patterns in betas for two Sectors, Financial Sector are shown a form of concave curve and Information Technology Sector a form of convex curve.

6.3.1. Financial Sector Portfolios

6.3.1.1. Portfolios with 5 stocks equally weighted

In Figure 60 the 5-year window beta coefficients of S&P100 monthly returns with Financial Sector Portfolios structured by 5 stocks equally weighted, are given in individual graphs for every fundamental indicator.

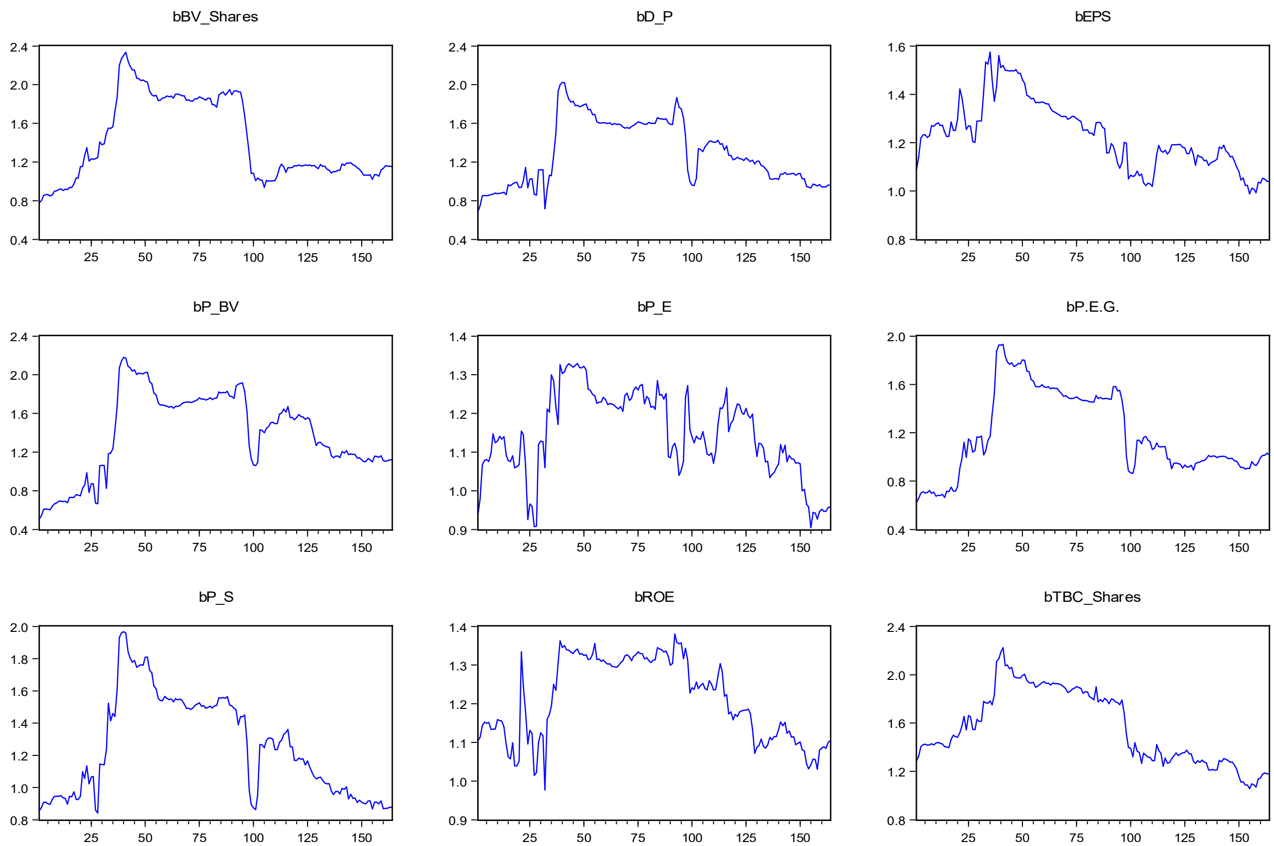

Figure 60: *5-year beta coefficients of S&P100 monthly returns with 5 stocks equally weighted Financial portfolios returns, from Rolling Regression.*

In Table 18 the most important Descriptive Statistics for 5-year window beta coefficients of S&P100 monthly returns with Financial Sector Portfolios structured by 5 stocks equally weighted are presented.

Table 18: *Descriptive Statistics of 5-year beta coefficients of S&P100 monthly returns with 5 stocks equally weighted Financial portfolios returns.*

	Fundamental Ratio as basis in Portfolios' Structure								
	BV/Shares	**D/P**	**EPS**	**P/BV**	**P/E**	**P.E.G.**	**P/S**	**ROE**	**TBC/Shares**
Mean	1,418	1,298	1,232	1,389	1,146	1,190	1,251	1,210	1,562

Median	1,177	1,230	1,223	1,451	1,140	1,077	1,208	1,222	1,453
Maximum	2,336	2,024	1,575	2,180	1,329	1,932	1,967	1,380	2,223
Minimum	0,781	0,690	0,988	0,511	0,904	0,625	0,842	0,978	1,058
Std. Dev.	0,424	0,333	0,140	0,428	0,109	0,345	0,310	0,106	0,304
Skewness	0,434	0,255	0,427	-0,238	-0,322	0,370	0,392	-0,141	0,223
Kurtosis	1,691	1,831	2,527	2,063	2,354	1,972	1,962	1,605	1,706
Jarque-Bera	16,873	11,117	6,520	7,541	5,698	10,969	11,560	13,838	12,801
Probability	0,0217%	0,3855%	3,8385%	2,3046%	5,7898%	0,4150%	0,3089%	0,0989%	0,1661%
Observations	164	164	164	164	164	164	164	164	164

6.3.1.1. Portfolios with 5 stocks proportionally weighted

In Figure 61 the 5-year window beta coefficients of S&P100 monthly returns with Financial Sector Portfolios structured by 5 stocks proportionally weighted, are given in individual graphs for every fundamental indicator.

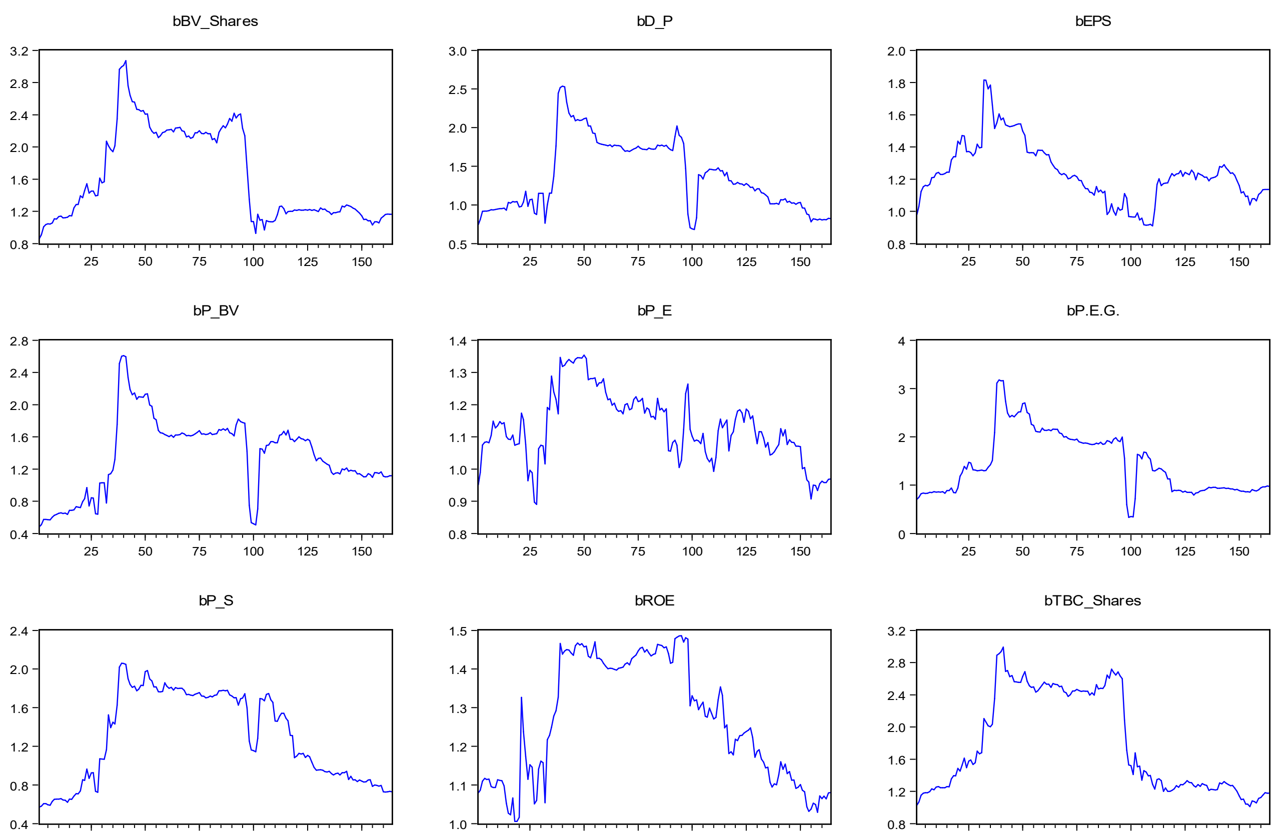

Figure 61: *5-year beta coefficients of S&P100 monthly returns with 5 stocks proportionally weighted Financial portfolios returns, from Rolling Regression.*

In Table 19 the most important Descriptive Statistics for 5-year window beta coefficients of S&P100 monthly returns with Financial Sector Portfolios structured by 5 stocks proportionally weighted are presented.

Table 19: *Descriptive Statistics of 5-year beta coefficients of S&P100 monthly returns with 5 stocks proportionally weighted Financial portfolios returns.*

	Fundamental Ratio as basis in Portfolios' Structure								
	BV/Shares	**D/P**	**EPS**	**P/BV**	**P/E**	**P.E.G.**	**P/S**	**ROE**	**TBC/Shares**
Mean	1,630	1,373	1,239	1,363	1,130	1,446	1,291	1,263	1,785
Median	1,274	1,270	1,223	1,463	1,123	1,304	1,269	1,248	1,490
Maximum	3,072	2,535	1,815	2,610	1,354	3,179	2,059	1,486	2,993
Minimum	0,863	0,680	0,909	0,482	0,890	0,333	0,571	1,006	1,010
Std. Dev.	0,569	0,450	0,184	0,475	0,106	0,638	0,463	0,155	0,619
Skewness	0,574	0,514	0,733	0,087	0,129	0,637	-0,034	-0,004	0,397
Kurtosis	1,938	2,327	3,759	2,749	2,637	2,570	1,414	1,469	1,431
Jarque-Bera	16,700	10,308	18,611	0,636	1,358	12,351	17,217	16,008	21,123
Probability	0,0236%	0,5776%	0,0091%	72,7426%	50,7176%	0,2080%	0,0183%	0,0334%	0,0026%
Observations	164	164	164	164	164	164	164	164	164

6.3.1.1. Portfolios with all stocks equally weighted

In Figure 62 the 5-year window beta coefficients of S&P100 monthly returns with Financial Sector Portfolios structured by all stocks proportionally weighted, are given in individual graphs for every fundamental indicator, with the excluded portfolios form the previous chapter out of this presentation.

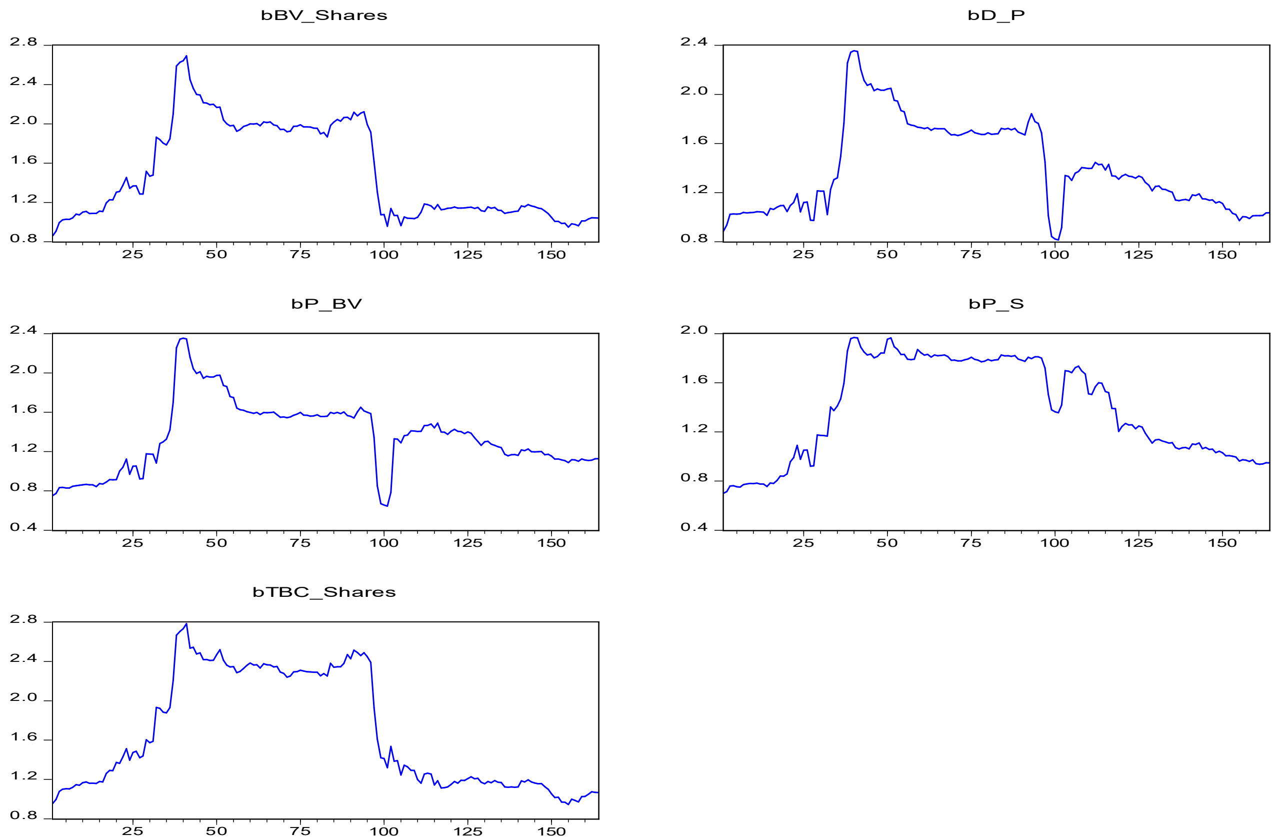

Figure 62: *5-year beta coefficients of S&P100 monthly returns with all stocks proportionally weighted Financial portfolios returns, from Rolling Regression.*

In Table 20 the most important Descriptive Statistics for 5-year window beta coefficients of S&P100 monthly returns with Financial Sector Portfolios structured by 5 stocks proportionally weighted are presented.

Table 20: *Descriptive Statistics of 5-year beta coefficients of S&P100 monthly returns with all stocks proportionally weighted Financial portfolios returns.*

	Fundamental Ratio as basis in Portfolios' Structure								
	BV/Shares	**D/P**	**EPS**	**P/BV**	**P/E**	**P.E.G.**	**P/S**	**ROE**	**TBC/Shares**
Mean	1,499	1,402	excluded	1,352	excluded	excluded	1,385	excluded	1,664
Median	1,190	1,327		1,353			1,385		1,379
Maximum	2,691	2,355		2,353			1,968		2,784
Minimum	0,861	0,814		0,645			0,700		0,945
Std. Dev.	0,483	0,365		0,357			0,401		0,586
Skewness	0,537	0,597		0,399			-0,113		0,388
Kurtosis	1,845	2,445		3,096			1,466		1,407
Jarque-Bera	17,011	11,850		4,425			16,424		21,450
Probability	0,0202%	0,2672%		10,9426%			0,0271%		0,0022%
Observations	164	164		164			164		164

6.3.2. Information-Technology Portfolios

6.3.2.1. Portfolios with 5 stocks equally weighted

In Figure 63 the 5-year window beta coefficients of S&P100 monthly returns with Information-Technology Sector Portfolios structured by 5 stocks equally weighted, are given in individual graphs for every fundamental indicator.

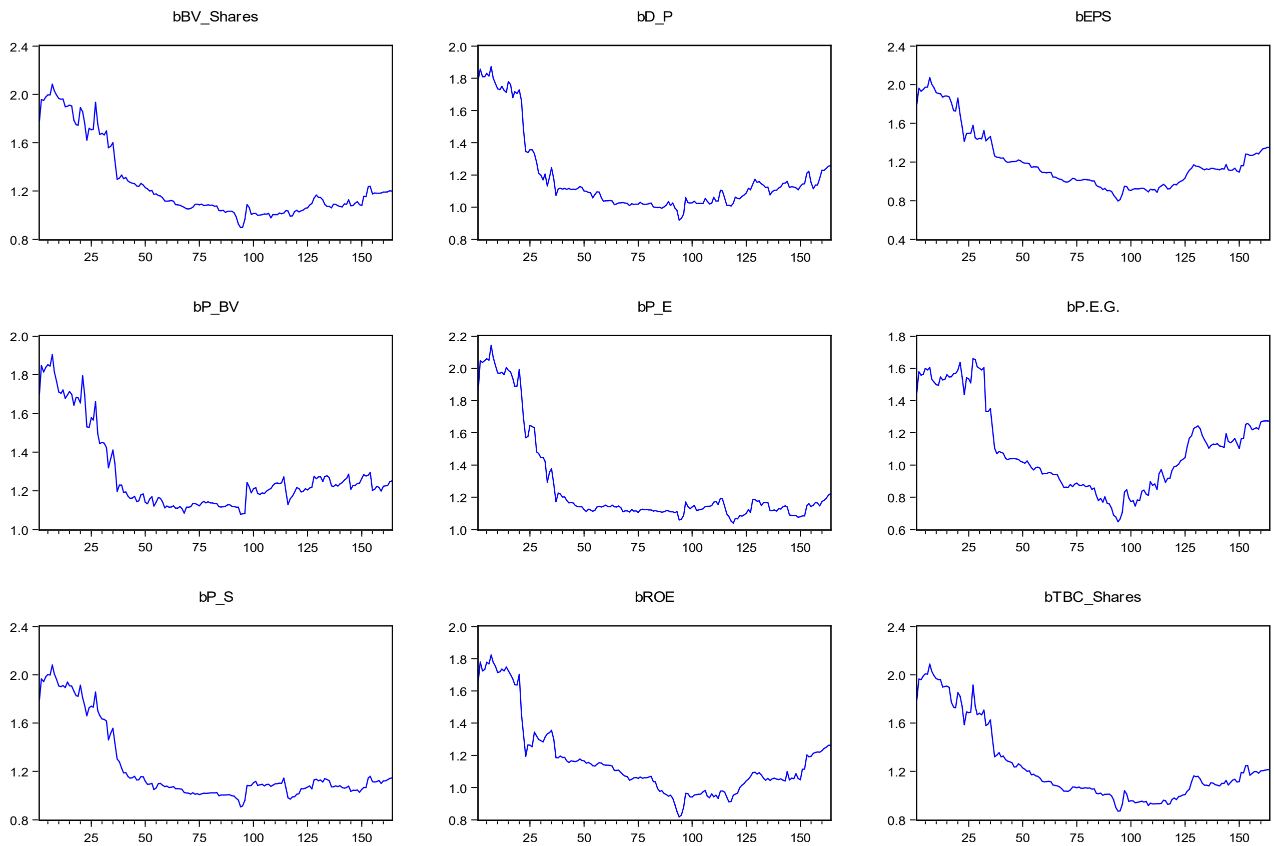

Figure 63: *5-year beta coefficients of S&P100 monthly returns with 5 stocks equally weighted Information-Technology portfolios returns, from Rolling Regression.*

In Table 21 the most important Descriptive Statistics for 5-year window beta coefficients of S&P100 monthly returns with Information-Technology Sector Portfolios structured by 5 stocks equally weighted are presented.

Table 21: *Descriptive Statistics of 5-year beta coefficients of S&P100 monthly returns with 5 stocks equally weighted Information-Technology portfolios returns.*

	Fundamental Ratio as basis in Portfolios' Structure								
	BV/Shares	**D/P**	**EPS**	**P/BV**	**P/E**	**P.E.G.**	**P/S**	**ROE**	**TBC/Shares**

Mean	1,259	1,182	1,213	1,285	1,274	1,108	1,235	1,167	1,247
Median	1,115	1,108	1,130	1,215	1,143	1,041	1,093	1,094	1,115
Maximum	2,085	1,872	2,074	1,904	2,142	1,660	2,081	1,823	2,089
Minimum	0,897	0,920	0,796	1,078	1,039	0,647	0,906	0,817	0,871
Std. Dev.	0,315	0,240	0,310	0,209	0,298	0,270	0,318	0,239	0,326
Skewness	1,315	1,778	1,230	1,537	1,795	0,533	1,433	1,395	1,202
Kurtosis	3,278	4,845	3,611	4,107	4,652	2,215	3,450	4,133	3,132
Jarque-Bera	47,760	109,692	43,895	72,914	106,684	11,972	57,513	61,970	39,599
Probability	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,2514%	0,0000%	0,0000%	0,0000%
Observations	164	164	164	164	164	164	164	164	164

6.3.2.1. Portfolios with 5 stocks proportionally weighted

In Figure 64 the 5-year window beta coefficients of S&P100 monthly returns with Information-Technology Sector Portfolios structured by 5 stocks proportionally weighted, are given in individual graphs for every fundamental indicator.

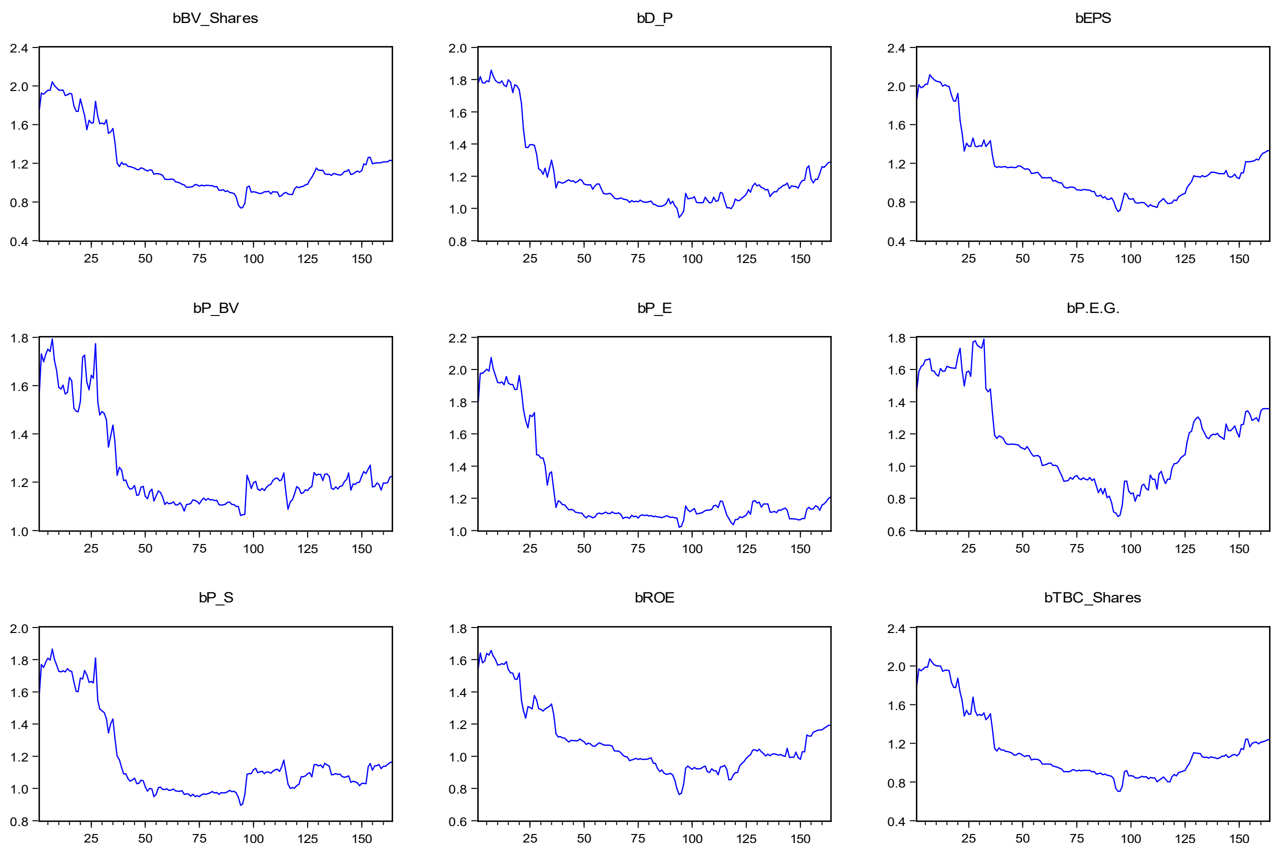

Figure 64: *5-year beta coefficients of S&P100 monthly returns with 5 stocks proportionally weighted Information-Technology portfolios returns, from Rolling Regression.*

In Table 22 the most important Descriptive Statistics for 5-year window beta coefficients of S&P100 monthly returns with Information-Technology Sector Portfolios structured by 5 stocks proportionally weighted are presented.

Table 22: *Descriptive Statistics of 5-year beta coefficients of S&P100 monthly returns with 5 stocks proportionally weighted Information-Technology portfolios returns.*

	Fundamental Ratio as basis in Portfolios' Structure								
	BV/Shares	**D/P**	**EPS**	**P/BV**	**P/E**	**P.E.G.**	**P/S**	**ROE**	**TBC/Shares**
Mean	1,194	1,205	1,158	1,259	1,255	1,172	1,181	1,101	1,156
Median	1,091	1,128	1,074	1,184	1,125	1,136	1,090	1,032	1,056
Maximum	2,043	1,858	2,115	1,793	2,074	1,788	1,865	1,657	2,075
Minimum	0,738	0,944	0,702	1,062	1,020	0,686	0,895	0,761	0,702
Std. Dev.	0,339	0,238	0,364	0,189	0,294	0,283	0,266	0,213	0,356
Skewness	1,179	1,691	1,291	1,455	1,697	0,495	1,350	1,166	1,286
Kurtosis	3,161	4,564	3,838	3,772	4,233	2,238	3,333	3,481	3,525
Jarque-Bera	38,179	94,867	50,347	61,914	89,094	10,657	50,546	38,764	47,059
Probability	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%	0,4852%	0,0000%	0,0000%	0,0000%
Observations	164	164	164	164	164	164	164	164	164

6.3.2.1. Portfolios with all stocks equally weighted

In Figure 65 the 5-year window beta coefficients of S&P100 monthly returns with Information-Technology Sector Portfolios structured by all stocks proportionally weighted, are given in individual graphs for every fundamental indicator, with the excluded portfolios form the previous chapter out of this presentation.

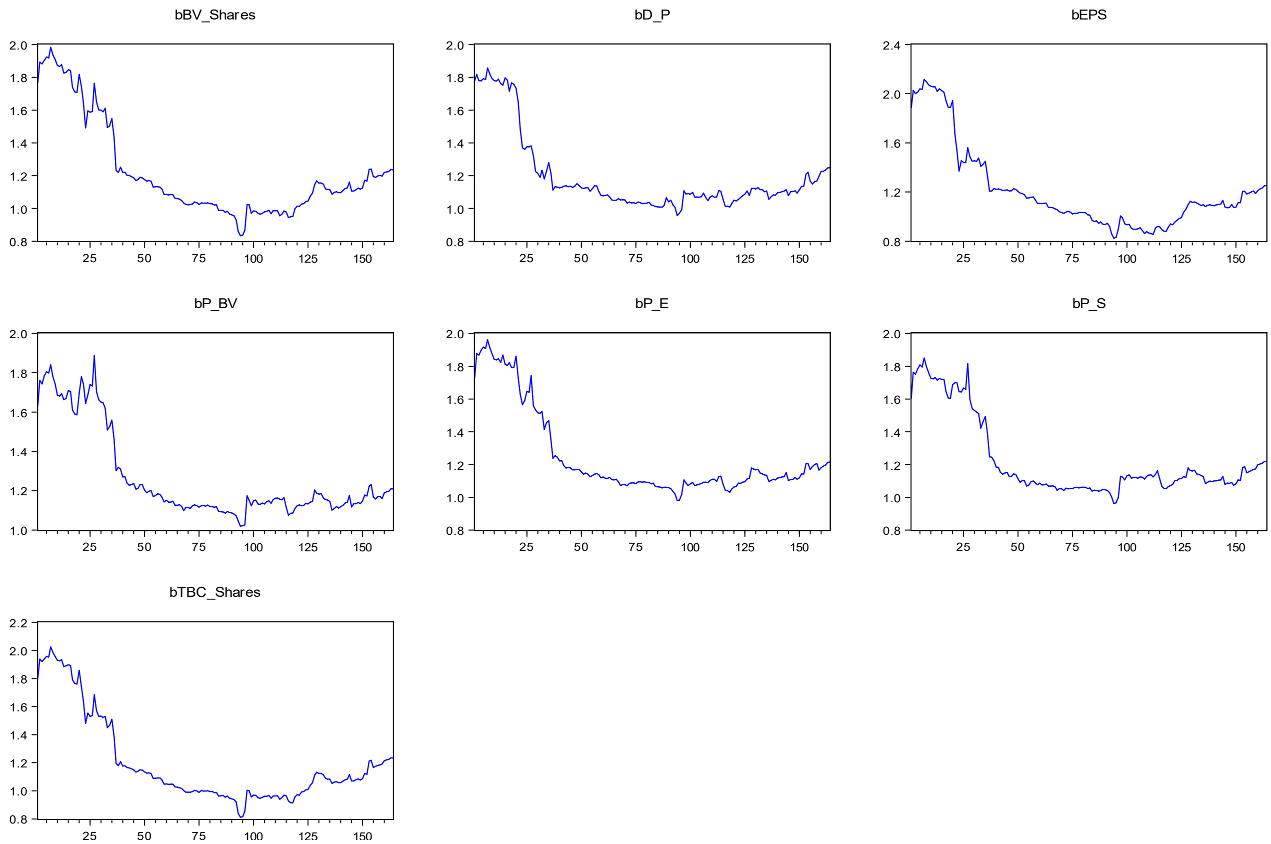

Figure 65: *5-year beta coefficients of S&P100 monthly returns with all stocks proportionally weighted Information-Technology portfolios returns, from Rolling Regression.*

In Table 23 the most important Descriptive Statistics for 5-year window beta coefficients of S&P100 monthly returns with Information-Technology Sector Portfolios structured by all stocks proportionally weighted are presented.

Table 23: *Descriptive Statistics of 5-year beta coefficients of S&P100 monthly returns with all stocks proportionally weighted Information-Technology portfolios returns.*

	Fundamental Ratio as basis in Portfolios' Structure								
	BV/Shares	**D/P**	**EPS**	**P/BV**	**P/E**	**P.E.G.**	**P/S**	**ROE**	**TBC/Shares**
Mean	1,221	1,195	1,212	1,267	1,249		1,226		1,199
Median	1,119	1,106	1,103	1,157	1,126		1,122		1,083
Maximum	1,982	1,856	2,115	1,886	1,961		1,850		2,024
Minimum	0,832	0,956	0,824	1,019	0,979		0,962		0,812
Std. Dev.	0,296	0,238	0,339	0,232	0,267	**excluded**	0,242	**excluded**	0,314
Skewness	1,251	1,797	1,481	1,335	1,515		1,383		1,382
Kurtosis	3,281	4,805	4,164	3,157	3,764		3,324		3,629
Jarque-Bera	43,317	110,539	69,184	48,863	66,697		53,009		54,887
Probability	0,0000%	0,0000%	0,0000%	0,0000%	0,0000%		0,0000%		0,0000%
Observations	164	164	164	164	164		164		164

6.4. Modelling Betas Time-Variability

Having concluded with visual data that the monthly returns of the S&P100 produce time-varying 5-year beta coefficients from Rolling Regression, at the same time the question considering time-variability in betas has been proven.

Also, from the time structure of the beta coefficients produced, two different patterns are apparent that are followed, as mentioned in 6.3., the first for all Financial Portfolios and the second for all Information-Technology Portfolios. This element helps, on the one hand, in the hypothesis of a non-linear relationship with time as the beta coefficients do not relate in a linear course with time, on the other hand in the attempt to create a model by selecting an appropriate functional relation known from the mathematical literature.

Despite the graphical representation of the time-variability of beta coefficients, for a complete research is also needed to develop a relationship between numerical size with time. Therefore, two different models are being shaped which attempt to reflect the course of beta coefficients in relation with time, as described in paragraph 4.9.3. As the only independent variable that has emerged is S&P100 monthly returns, regressions focus on the research for possible time-variable beta coefficients produced as a regression between the monthly S&P100 simple returns and all portfolio categories returns formed by a specific fundamental indicator, are executed.

6.4.1. 5-year beta coefficients from Rolling Regression Modelling

Results from the two examined Sectors are presented separately. All Regressions are executed based on equation (8), as analyzed in 4.9.3.1.

6.4.1.1. Financial Sector Portfolios

Regressions of 5-year window beta coefficients changing every month were carried out in three different ways (Linear, Quadratic & Cubic Regression), the results of them are set out in Table 24. With red color are highlighted the non-statistically significant beta coefficients of regressions.

Table 24: *5-year beta coefficients from Financial Sector Portfolios Model Estimation Results*

1. Linear Regression with time

	Portfolios Structure	Coefficients	P/E	EPS	D/P	P/BV	P.E.G.	BV/Shares	TBC/Shares	ROE	P/S
			Fundamental Ratio as basis in Portofolios' Structure								
1	*5 stocks equally*	c	1,20	1,40	1,35	1,28	1,28	1,59	1,86	1,25	1,40
		α_y	-0,001	-0,002	-0,001	0,001	-0,001	-0,002	-0,004	0,000	-0,002
	weighted	R-squared	*0,08*	*0,47*	*0,01*	*0,02*	*0,02*	*0,06*	*0,33*	*0,05*	*0,08*
2	*5 stocks*	c	1,20	1,39	1,55	1,26	1,81	1,97	2,17	1,31	1,38
	proportionally	α_y	-0,001	-0,002	-0,002	0,001	-0,004	-0,004	-0,005	-0,001	-0,001
	weighted	R-squared	*0,13*	*0,22*	*0,05*	*0,01*	*0,11*	*0,12*	*0,13*	*0,02*	*0,01*
3	*all stocks*	c	excluded	excluded	1,54	1,37	excluded	1,82	2,04	excluded	1,42
	proportionally	α_y			-0,002	-0,0002		-0,004	-0,005		-0,0004
	weighted	R-squared			*0,04*	*0,00*		*0,14*	*0,14*		*0,00*

2. Quadratic Regression with time

	Portfolios Structure	Coefficients	P/E	EPS	D/P	P/BV	P.E.G.	BV/Shares	TBC/Shares	ROE	P/S
			Fundamental Ratio as basis in Portofolios' Structure								
1	*5 stocks equally weighted*	c	1,03	1,31	0,76	0,52	0,74	0,97	1,44	1,06	0,89
		α_y	0,005	0,001	0,021	0,029	0,018	0,020	0,011	0,006	0,017
		γ_y	-0,000037	-0,000020	-0,000128	-0,000167	-0,000118	-0,000136	-0,000092	-0,000042	-0,000112
		R-squared	*0,55*	*0,55*	*0,61*	*0,64*	*0,49*	*0,47*	*0,70*	*0,67*	*0,60*
2	*5 stocks proportionally weighted*	c	1,07	1,40	0,83	0,56	0,95	1,20	1,20	1,00	0,47
		α_y	0,004	-0,002	0,024	0,027	0,027	0,024	0,031	0,010	0,032
		γ_y	-0,000029	0,000002	-0,000157	-0,000154	-0,000189	-0,000170	-0,000214	-0,000067	-0,000199
		R-squared	*0,42*	*0,22*	*0,54*	*0,44*	*0,46*	*0,48*	*0,61*	*0,76*	*0,76*
3	*all stocks proportionally weighted*	c	excluded	excluded	0,98	0,86	excluded	1,14	1,11	excluded	0,61
		α_y			0,019	0,018		0,021	0,029		0,029
		γ_y			-0,000122	-0,000111		-0,000148	-0,000203		-0,000177
		R-squared			*0,50*	*0,39*		*0,52*	*0,62*		*0,79*

3. Cubic Regression with time

	Portfolios Structure	Coefficients	P/E	EPS	D/P	P/BV	P.E.G.	BV/Shares	TBC/Shares	ROE	P/S
			Fundamental Ratio as basis in Portofolios' Structure								
1	*5 stocks equally weighted*	c	1,00	1,16	0,48	0,15	0,23	0,33	1,10	1,02	0,58
		α_y	0,007	0,012	0,040	0,055	0,055	0,066	0,036	0,009	0,039
		γ_y	-0,000067	-0,000185	-0,000428	-0,000560	-0,000669	-0,000829	-0,000468	-0,000084	-0,000451
		δ_y	0,0000001	0,0000007	0,0000012	0,0000016	0,0000022	0,0000028	0,0000015	0,0000002	0,0000014
		R-squared	*0,56*	*0,71*	*0,70*	*0,73*	*0,78*	*0,78*	*0,87*	*0,69*	*0,74*
2	*5 stocks proportionally weighted*	c	1,01	1,15	0,46	0,12	0,08	0,39	0,44	0,93	0,10
		α_y	0,008	0,016	0,051	0,058	0,089	0,082	0,085	0,016	0,059
		γ_y	-0,000093	-0,000265	-0,000564	-0,000634	-0,001124	-0,001042	-0,001033	-0,000149	-0,000604
		δ_y	0,0000003	0,0000011	0,0000016	0,0000019	0,0000038	0,0000035	0,0000033	0,0000003	0,0000016
		R-squared	*0,47*	*0,46*	*0,64*	*0,55*	*0,71*	*0,75*	*0,81*	*0,80*	*0,85*
3	*all stocks proportionally weighted*	c	excluded	excluded	0,62	0,46	excluded	0,48	0,40	excluded	0,29
		α_y			0,045	0,047		0,068	0,080		0,051
		γ_y			-0,000515	-0,000542		-0,000862	-0,000976		-0,000519
		δ_y			0,0000016	0,0000017		0,0000029	0,0000031		0,0000014
		R-squared			*0,63*	*0,56*		*0,77*	*0,82*		*0,87*

Looking at the data in Table 24 concerning Financial Portfolios, it is understood that time factor is an element that acts in the course of the under-examination 5-year beta coefficients, improving the accuracy of the model at all points that statistically significant α, γ and δ factors are produced.

In all portfolio categories in every fundamental indicator, a non-linear relation with time is noticed and the precise of the models are up to 50% in the majority of them. Especially in the cubic regression models in all categories, except of P/E portfolios consisted of 5 stocks equally weighted, statistically significant coefficients are presented and R^2 in average more than 60%. The only two cases that have R^2 lower than random walk are P/E and EPS portfolios consisted of 5 stocks proportionally weighted. This may happen because of false fraction model estimation option, since as it is clear from graphs these two portfolio categories follow a different time course and with more suitable fraction selection an improved result is possible.

6.4.1.2. Information-Technology Sector Portfolios

Regressions of 5-year beta coefficients changing every month were carried out in three different ways (Linear, Quadratic & Cubic Regression), the results of them are set out in Table 25. With red color are highlighted the non-statistically significant beta coefficients of regressions.

__Table 25:__ 5-year beta coefficients from Information-Technology Sector Portfolios Model Estimation Results

1. Linear Regression with time

	Portfolios Structure	Coefficients	P/E	EPS	D/P	P/BV	P.E.G.	BV/Shares	TBC/Shares	ROE	P/S
			Fundamental Ratio as basis in Portofolios' Structure								
1	*5 stocks equally*	c	1,63	1,54	1,42	1,49	1,31	1,66	1,66	1,44	1,63
		α_y	-0,004	-0,004	-0,003	-0,003	-0,002	-0,005	-0,005	-0,003	-0,005
	weighted	R-squared	*0,48*	*0,38*	*0,32*	*0,32*	*0,18*	*0,54*	*0,52*	*0,42*	*0,51*
2	*5 stocks*	c	1,60	1,55	1,45	1,46	1,38	1,57	1,54	1,35	1,46
	proportionally	α_y	-0,004	-0,005	-0,003	-0,002	-0,003	-0,005	-0,005	-0,003	-0,003
	weighted	R-squared	*0,46*	*0,38*	*0,36*	*0,38*	*0,19*	*0,41*	*0,39*	*0,43*	*0,38*
3	*all stocks*	c	1,57	1,61	1,45	1,56		1,57	1,56		1,51
	proportionally	α_y	-0,004	-0,005	-0,003	-0,004	excluded	-0,004	-0,004	excluded	-0,003
	weighted	R-squared	*0,49*	*0,46*	*0,37*	*0,53*		*0,45*	*0,44*		*0,45*

2. Quadratic Regression with time

	Portfolios Structure	Coefficients	P/E	EPS	D/P	P/BV	P.E.G.	BV/Shares	TBC/Shares	ROE	P/S
			Fundamental Ratio as basis in Portofolios' Structure								
1	*5 stocks equally weighted*	c	2,04	2,08	1,82	1,82	1,01	2,11	2,14	1,82	2,07
		α_y	-0,019	-0,023	-0,017	-0,014	-0,020	-0,021	-0,022	-0,017	-0,021
		γ_y	0,000090	0,000117	0,000088	0,000072	0,000109	0,000099	0,000106	0,000083	0,000097
		R-squared	*0,85*	*0,96*	*0,86*	*0,81*	*0,83*	*0,94*	*0,95*	*0,92*	*0,89*
2	*5 stocks proportionally weighted*	c	2,01	2,17	1,85	1,74	1,89	2,13	2,14	1,69	1,86
		α_y	-0,019	-0,027	-0,017	-0,013	-0,021	-0,025	-0,026	-0,016	-0,018
		γ_y	0,000090	0,000136	0,000086	0,000061	0,000112	0,000122	0,000132	0,000076	0,000087
		R-squared	*0,84*	*0,94*	*0,89*	*0,81*	*0,82*	*0,94*	*0,94*	*0,95*	*0,81*
3	*all stocks proportionally weighted*	c	1,97	2,14	1,83	1,87		2,04	2,06		1,86
		α_y	-0,018	-0,024	-0,017	-0,015	excluded	-0,021	-0,023	excluded	-0,016
		γ_y	0,000086	0,000117	0,000083	0,000068		0,000103	0,000110		0,000077
		R-squared	*0,91*	*0,94*	*0,87*	*0,88*		*0,94*	*0,94*		*0,86*

3. Cubic Regression with time

	Portfolios Structure	Coefficients	P/E	EPS	D/P	P/BV	P.E.G.	BV/Shares	TBC/Shares	ROE	P/S
			Fundamental Ratio as basis in Portofolios' Structure								
1	*5 stocks equally weighted*	c	2,28	2,13	1,99	2,01	1,79	2,18	2,17	1,85	2,24
		α_y	-0,036	-0,027	-0,030	-0,028	-0,020	-0,026	-0,025	-0,019	-0,033
		γ_y	0,000341	0,000167	0,000278	0,000280	0,000101	0,000175	0,000140	0,000119	0,000280
		δ_y	-0,0000010	-0,0000002	-0,0000008	-0,0000008	0,0000000	-0,0000003	-0,0000001	-0,0000001	-0,0000007
		R-squared	*0,93*	*0,96*	*0,93*	*0,92*	*0,83*	*0,95*	*0,95*	*0,92*	*0,93*
2	*5 stocks proportionally weighted*	c	2,24	2,21	1,97	1,87	1,84	2,19	2,23	1,71	2,04
		α_y	-0,035	-0,030	-0,026	-0,022	-0,017	-0,029	-0,032	-0,016	-0,031
		γ_y	0,000336	0,000181	0,000221	0,000198	0,000048	0,000183	0,000221	0,000090	0,000285
		δ_y	-0,0000010	-0,0000002	-0,0000005	-0,0000006	0,0000003	-0,0000002	-0,0000004	-0,0000001	-0,0000008
		R-squared	*0,92*	*0,94*	*0,93*	*0,87*	*0,82*	*0,94*	*0,95*	*0,95*	*0,87*
3	*all stocks proportionally weighted*	c	2,10	2,23	1,98	1,94		2,10	2,16		1,98
		α_y	-0,027	-0,030	-0,028	-0,020		-0,026	-0,030		-0,025
		γ_y	0,000227	0,000213	0,000250	0,000143	excluded	0,000174	0,000217	excluded	0,000208
		δ_y	-0,0000006	-0,0000004	-0,0000007	-0,0000003		-0,0000003	-0,0000004		-0,0000005
		R-squared	*0,94*	*0,94*	*0,92*	*0,89*		*0,95*	*0,96*		*0,90*

Information-Technology Sector Portfolios are shown an even stronger relationship between the 5-year beta coefficients and time. Almost in the majority of portfolios formed, the time factor in regressions has statistically significant α, γ or δ factors. Also, the quadratic relation seems to fit perfectly with the portfolio return courses with precise in average up to 90%. In P/E, D/P, P/BV and P/S portfolio returns in all categories cubic regression is even more efficient than quadratic. In total time factor not only presented to affect Information-Technology 5-year beta coefficients, but is clearly the major reason for their course. In this occasion the function selection on equation (8) really suits with the portfolio courses, as is observed in graphs.

6.4.2. Monthly beta coefficients Modeling

Results from the two examined Sectors are presented separately. All Regressions are executed based on equation (10), as analyzed in 4.9.3.1.

6.4.2.1. Financial Sector Portfolios

Regressions of monthly beta coefficients were carried out in four different ways (OLS, Linear, Quadratic & Cubic Regression), the results of them are set out in Table 26. With red color are highlighted the non-statistically significant beta coefficients of regressions.

***Table 26:** Monthly beta coefficients from Financial Sector Portfolios Model Estimation Results*

1. OLS

			Fundamental Ratio as basis in Portofolios' Structure								
	Portfolios Structure	**Coefficients**	**P/E**	**EPS**	**D/P**	**P/BV**	**P.E.G.**	**BV/Shares**	**TBC/Shares**	**ROE**	**P/S**
1	*5 stocks equally*	**c**	0,005	-0,002	0,003	0,004	0,008	-0,001	-0,003	0,003	0,004
		$\beta_{i,y}$	1,16	1,35	1,29	1,34	1,22	1,49	1,72	1,21	1,29
	weighted	**R-squared**	*0,60*	*0,71*	*0,34*	*0,34*	*0,37*	*0,48*	*0,55*	*0,70*	*0,41*
2	*5 stocks*	**c**	0,004	-0,007	0,004	0,007	0,016	-0,005	-0,005	0,003	0,005
	proportionally	**$\beta_{i,y}$**	1,16	1,41	1,45	1,47	1,75	1,80	1,96	1,26	1,30
	weighted	**R-squared**	*0,55*	*0,60*	*0,22*	*0,16*	*0,12*	*0,28*	*0,30*	*0,65*	*0,30*
3	*all stocks*	**c**	-0,003	-0,020	0,002	0,004	0,019	-0,004	-0,004	-0,010	0,003
	proportionally	**$\beta_{i,y}$**	0,29	-0,10	1,46	1,44	1,31	1,63	1,80	-0,04	1,34
	weighted	**R-squared**	*0,02*	*0,00*	*0,34*	*0,26*	*0,07*	*0,34*	*0,33*	*0,00*	*0,47*

2. Linear Regression with time

			Fundamental Ratio as basis in Portofolios' Structure								
	Portfolios Structure	**Coefficients**	**P/E**	**EPS**	**D/P**	**P/BV**	**P.E.G.**	**BV/Shares**	**TBC/Shares**	**ROE**	**P/S**
1	*5 stocks equally*	**c**	0,005	-0,002	0,002	0,003	0,007	-0,002	-0,003	0,003	0,003
		$\beta_{i,y}$	1,13	1,36	1,10	0,99	0,99	1,55	1,70	1,23	1,28
		$\alpha_{i,y}$	0,000	0,000	0,002	0,004	0,002	0,002	0,000	0,000	0,000
	weighted	**R-squared**	*0,60*	*0,71*	*0,34*	*0,35*	*0,37*	*0,48*	*0,55*	*0,70*	*0,41*
2	*5 stocks*	**c**	0,004	-0,007	0,004	0,006	0,015	-0,006	-0,006	0,003	0,005
	proportionally	**$\beta_{i,y}$**	1,12	1,30	1,37	1,13	1,62	1,65	1,82	1,28	1,20
		$\alpha_{i,y}$	0,000	0,001	0,001	0,003	0,001	0,002	0,001	0,000	0,001
	weighted	**R-squared**	*0,55*	*0,60*	*0,22*	*0,17*	*0,12*	*0,28*	*0,30*	*0,65*	*0,30*
3	*all stocks*	**c**	-0,003	-0,020	0,002	0,003	0,018	-0,004	-0,004	-0,011	0,003
	proportionally	**$\beta_{i,y}$**	0,20	-0,15	1,37	1,25	1,07	1,53	1,69	-0,26	1,19
		$\alpha_{i,y}$	0,001	0,005	0,001	0,002	0,002	0,001	0,001	0,002	0,002
	weighted	**R-squared**	*0,02*	*0,00*	*0,34*	*0,27*	*0,07*	*0,34*	*0,33*	*0,00*	*0,47*

3. Quadratic Regression with time

			Fundamental Ratio as basis in Portofolios' Structure								
	Portfolios Structure	**Coefficients**	**P/E**	**EPS**	**D/P**	**P/BV**	**P.E.G.**	**BV/Shares**	**TBC/Shares**	**ROE**	**P/S**
1		**c**	0,004	-0,002	0,002	0,002	0,007	-0,002	-0,004	0,003	0,003
		$\beta_{i,y}$	0,86	1,08	0,29	0,04	0,40	0,53	1,14	1,07	0,60
	5 stocks equally	**$\alpha_{i,y}$**	0,0084	0,0084	0,0265	0,0323	0,0204	0,0244	0,0170	0,0049	0,0206
	weighted	**$\gamma_{i,y}$**	-0,00004	-0,00004	-0,0001	-0,0001	-0,0001	-0,0001	-0,0001	0,0000	-0,0001
		R-squared	*0,61*	*0,73*	*0,39*	*0,42*	*0,41*	*0,53*	*0,58*	*0,71*	*0,46*
2		**c**	0,004	-0,007	0,004	0,006	0,015	-0,006	-0,006	0,003	0,005
	5 stocks	**$\beta_{i,y}$**	0,86	0,93	0,25	-0,05	0,20	0,57	0,66	1,00	0,14
	proportionally	**$\alpha_{i,y}$**	0,0082	0,0124	0,0348	0,0392	0,0443	0,0340	0,0366	0,0083	0,0331
	weighted	**$\gamma_{i,y}$**	0,0000	-0,0001	-0,0002	-0,0002	-0,0002	-0,0002	-0,0002	0,0000	-0,0002
		R-squared	*0,56*	*0,62*	*0,27*	*0,21*	*0,15*	*0,32*	*0,34*	*0,67*	*0,37*
3		**c**	-0,003	-0,020	0,002	0,003	0,018	-0,004	-0,004	-0,010	0,002
	all stocks	**$\beta_{i,y}$**	1,22	1,74	0,53	0,39	0,14	0,61	0,61	1,35	0,32
	proportionally	**$\alpha_{i,y}$**	-0,0298	-0,0566	0,0263	0,0278	0,031	0,0288	0,0336	-0,046	0,0278
	weighted	**$\gamma_{i,y}$**	0,0001	0,0003	-0,0001	-0,0001	0,000	-0,0001	-0,0002	0,000	-0,0001
		R-squared	*0,12*	*0,05*	*0,38*	*0,30*	*0,08*	*0,38*	*0,38*	*0,02*	*0,55*

3. Cubic Regression with time

			Fundamental Ratio as basis in Portofolios' Structure								
	Portfolios Structure	**Coefficients**	**P/E**	**EPS**	**D/P**	**P/BV**	**P.E.G.**	**BV/Shares**	**TBC/Shares**	**ROE**	**P/S**
1		**c**	0,005	-0,002	0,002	0,003	0,007	-0,002	-0,003	0,003	0,004
		$\beta_{i,y}$	0,79	0,83	-0,08	-0,33	-0,09	-0,01	0,85	0,93	0,28
	5 stocks equally	**$\alpha_{i,y}$**	0,014	0,027	0,054	0,060	0,056	0,064	0,039	0,015	0,044
	weighted	**$\gamma_{i,y}$**	0,000	-0,0003	-0,0004	-0,0005	-0,001	-0,001	0,000	0,000	-0,0004
		$\delta_{i,y}$	0,000	0,000001	0,000	0,000	0,000001	0,000001	0,000	0,000	0,000
		R-squared	*0,61*	*0,73*	*0,40*	*0,43*	*0,42*	*0,55*	*0,58*	*0,71*	*0,46*
2		**c**	0,004	-0,007	0,004	0,006	0,016	-0,005	-0,005	0,003	0,005
	5 stocks	**$\beta_{i,y}$**	0,73	0,57	-0,25	-0,53	-0,75	-0,23	-0,01	0,86	-0,17
	proportionally	**$\alpha_{i,y}$**	0,018	0,039	0,072	0,075	0,115	0,093	0,086	0,019	0,056
	weighted	**$\gamma_{i,y}$**	0,000	-0,0004	-0,001	-0,001	-0,001	-0,001	-0,001	0,000	0,000
		$\delta_{i,y}$	0,000	0,000001	0,000	0,000	0,000	0,000002	0,000	0,000	0,000
		R-squared	*0,56*	*0,63*	*0,28*	*0,21*	*0,16*	*0,33*	*0,35*	*0,67*	*0,38*
3		**c**	-0,003	-0,020	0,002	0,004	0,018	-0,004	-0,004	-0,011	0,003
	all stocks	**$\beta_{i,y}$**	1,54	2,09	0,08	-0,03	-0,17	-0,03	-0,01	2,34	0,05
	proportionally	**$\alpha_{i,y}$**	-0,054	-0,082	0,060	0,059	0,054	0,076	0,080	-0,119	0,048
	weighted	**$\gamma_{i,y}$**	0,000	0,001	-0,001	0,000	0,000	-0,001	-0,001	0,001	-0,0004
		$\delta_{i,y}$	0,000	0,000	0,000	0,000	0,000	0,000002	0,000002	0,000	0,000
		R-squared	*0,12*	*0,05*	*0,39*	*0,31*	*0,08*	*0,40*	*0,39*	*0,03*	*0,55*

Attempting to test the relation between time factor and monthly beta coefficients in general, is observed that the results are not in the same direction as 5-year beta coefficients in Financial Portfolios. Most of the cases do not present statistically significant α, γ or δ factors. Starting from the OLS method, in a monthly basis it seems as S&P 100 monthly returns are not the best independent variable or in some cases not even a factor which affect portfolio returns, especially in 2nd category of P/BV and P.E.G. portfolios and 3rd category of P/E, EPS P.E.G. and ROE portfolios. Inevitably, the interpretive power of monthly S&P100 returns in these portfolio categories are not so influential in short-term period, on the contrary in mid-term or long-term periods like the 5-year window in 6.4.1.1. Nevertheless, in regressions that present statistically significant α, γ or δ time factors a minor improvement in the results is occurred, so even in a close time set (month), time factor would be able to interfere in the upcoming results.

6.4.2.2. Information-Technology Sector Portfolios

Regressions of monthly beta coefficients were carried out in four different ways (OLS, Linear, Quadratic & Cubic Regression), the results of them are set out in Table 27. With red color are highlighted the non-statistically significant beta coefficients of regressions.

Table 27: *Monthly beta coefficients from Information-Technology Sector Portfolios Model Estimation Results*

1. OLS

	Portfolios Structure	Coefficients	P/E	EPS	D/P	P/BV	P.E.G.	BV/Shares	TBC/Shares	ROE	P/S
			Fundamental Ratio as basis in Portofolios' Structure								
1	*5 stocks equally*	c	0,004	0,007	0,004	0,011	0,013	0,009	0,009	0,006	0,008
		$\beta_{i,y}$	1,34	1,29	1,26	1,30	1,18	1,29	1,28	1,27	1,28
	weighted	R-squared	*0,58*	*0,59*	*0,62*	*0,52*	*0,55*	*0,55*	*0,54*	*0,61*	*0,53*
2	*5 stocks*	c	0,004	0,005	0,005	0,012	0,013	0,009	0,008	0,005	0,010
	proportionally	$\beta_{i,y}$	1,30	1,26	1,27	1,25	1,23	1,25	1,23	1,19	1,20
	weighted	R-squared	*0,53*	*0,58*	*0,64*	*0,46*	*0,56*	*0,55*	*0,55*	*0,62*	*0,47*
3	*all stocks*	c	0,007	0,006	0,005	0,011	0,021	0,009	0,008	-0,007	0,011
	proportionally	$\beta_{i,y}$	1,29	1,30	1,26	1,28	0,26	1,28	1,27	0,48	1,25
	weighted	R-squared	*0,63*	*0,64*	*0,66*	*0,59*	*0,01*	*0,63*	*0,63*	*0,00*	*0,57*

2. Linear Regression with time

	Portfolios Structure	Coefficients	P/E	EPS	D/P	P/BV	P.E.G.	BV/Shares	TBC/Shares	ROE	P/S
			Fundamental Ratio as basis in Portofolios' Structure								
1	*5 stocks equally*	c	0,005	0,008	0,005	0,012	0,013	0,010	0,010	0,007	0,010
		$\beta_{i,y}$	1,71	1,61	1,58	1,58	1,30	1,65	1,66	1,57	1,67
		$\alpha_{i,y}$	-0,004	-0,003	-0,003	-0,003	-0,001	-0,004	-0,004	-0,003	-0,004
	weighted	R-squared	*0,60*	*0,60*	*0,63*	*0,53*	*0,56*	*0,57*	*0,56*	*0,63*	*0,56*
2	*5 stocks*	c	0,005	0,006	0,006	0,013	0,013	0,010	0,009	0,006	0,011
		$\beta_{i,y}$	1,63	1,64	1,56	1,47	1,33	1,60	1,61	1,45	1,45
	proportionally	$\alpha_{i,y}$	-0,003	-0,004	-0,003	-0,002	-0,001	-0,004	-0,004	-0,003	-0,003
	weighted	R-squared	*0,55*	*0,60*	*0,66*	*0,47*	*0,56*	*0,57*	*0,57*	*0,63*	*0,48*
3	*all stocks*	c	0,008	0,007	0,006	0,011	0,015	0,010	0,009	0,002	0,011
		$\beta_{i,y}$	1,60	1,70	1,56	1,55	-1,43	1,63	1,64	3,00	1,49
	proportionally	$\alpha_{i,y}$	-0,003	-0,004	-0,003	-0,003	0,017	-0,004	-0,004	-0,025	-0,002
	weighted	R-squared	*0,64*	*0,67*	*0,68*	*0,60*	*0,25*	*0,65*	*0,65*	*0,01*	*0,58*

3. Quadratic Regression with time

	Portfolios Structure	Coefficients	P/E	EPS	D/P	P/BV	P.E.G.	BV/Shares	TBC/Shares	ROE	P/S
			Fundamental Ratio as basis in Portofolios' Structure								
1		c	0,005	0,008	0,006	0,012	0,013	0,010	0,010	0,007	0,010
	5 stocks equally	$\beta_{i,y}$	1,94	1,99	1,95	1,69	1,58	1,85	1,87	1,93	1,91
	weighted	$\alpha_{i,y}$	-0,011	-0,015	-0,014	-0,006	-0,010	-0,010	-0,010	-0,014	-0,011
		$\gamma_{i,y}$	0,00003	0,0001	0,0001	0,000	0,00004	0,00003	0,000	0,0001	0,000
		R-squared	*0,61*	*0,62*	*0,65*	*0,54*	*0,57*	*0,58*	*0,57*	*0,65*	*0,56*
2		c	0,006	0,007	0,006	0,013	0,013	0,010	0,009	0,006	0,011
	5 stocks	$\beta_{i,y}$	1,84	2,13	1,91	1,52	1,61	1,87	1,96	1,80	1,63
	proportionally	$\alpha_{i,y}$	-0,010	-0,019	-0,014	-0,004	-0,010	-0,012	-0,014	-0,013	-0,008
	weighted	$\gamma_{i,y}$	0,000	0,0001	0,0001	0,000	0,00004	0,00004	0,00005	0,00005	0,000
		R-squared	*0,55*	*0,63*	*0,67*	*0,47*	*0,57*	*0,58*	*0,59*	*0,65*	*0,49*
3		c	0,008	0,007	0,006	0,012	0,015	0,010	0,009	0,002	0,011
	all stocks	$\beta_{i,y}$	1,81	2,09	1,90	1,66	-2,52	1,91	1,96	0,59	1,66
	proportionally	$\alpha_{i,y}$	-0,010	-0,016	-0,013	-0,006	0,050	-0,012	-0,013	0,047	-0,008
	weighted	$\gamma_{i,y}$	0,00003	0,0001	0,00005	0,000	-0,0002	0,00004	0,00005	0,000	0,000
		R-squared	*0,65*	*0,69*	*0,70*	*0,60*	*0,33*	*0,67*	*0,67*	*0,02*	*0,58*

3. Cubic Regression with time

	Portfolios Structure	Coefficients	P/E	EPS	D/P	P/BV	P.E.G.	BV/Shares	TBC/Shares	ROE	P/S
			Fundamental Ratio as basis in Portofolios' Structure								
1		c	0,005	0,009	0,006	0,012	0,013	0,010	0,011	0,007	0,010
		$\beta_{i,y}$	1,75	1,74	1,94	1,60	1,43	1,55	1,54	1,82	1,66
	5 stocks equally	$\alpha_{i,y}$	0,003	0,004	-0,014	0,001	0,001	0,013	0,014	-0,006	0,007
	weighted	$\gamma_{i,y}$	0,000	0,000	0,000	0,000	0,000	0,000	-0,0003	0,000	0,000
		$\delta_{i,y}$	0,000	0,000	0,000	0,000	0,000	0,000	0,000001	0,000	0,000
		R-squared	*0,61*	*0,63*	*0,65*	*0,54*	*0,57*	*0,59*	*0,58*	*0,65*	*0,57*
2		c	0,006	0,007	0,006	0,013	0,014	0,011	0,009	0,006	0,011
	5 stocks	$\beta_{i,y}$	1,62	1,83	1,85	1,36	1,38	1,60	1,68	1,72	1,39
	proportionally	$\alpha_{i,y}$	0,007	0,003	-0,009	0,008	0,008	0,008	0,006	-0,007	0,010
	weighted	$\gamma_{i,y}$	0,000	-0,0002	0,000	0,000	0,000	0,000	0,000	0,000	0,000
		$\delta_{i,y}$	0,000	0,000001	0,000	0,000	0,000	0,000	0,000001	0,000	0,000
		R-squared	*0,56*	*0,64*	*0,68*	*0,47*	*0,58*	*0,59*	*0,60*	*0,66*	*0,49*
3		c	0,008	0,007	0,006	0,012	0,016	0,010	0,010	-0,001	0,012
	all stocks	$\beta_{i,y}$	1,62	1,87	1,87	1,45	-3,22	1,71	1,74	3,62	1,42
	proportionally	$\alpha_{i,y}$	0,005	0,000	-0,011	0,009	0,102	0,003	0,003	-0,176	0,010
	weighted	$\gamma_{i,y}$	0,000	0,000	0,000	0,000	-0,001	0,000	0,000	0,002	0,000
		$\delta_{i,y}$	0,000	0,000	0,000	0,000	0,000002	0,000	0,000	0,000	0,000
		R-squared	*0,65*	*0,69*	*0,70*	*0,60*	*0,36*	*0,67*	*0,67*	*0,03*	*0,59*

In Information-Technology Portfolios, the general overview is different comparing with the Financial Sector. Firstly, S&P100 monthly returns are efficient explanatory variable for the vast majority of portfolio returns, except of P.E.G. and ROE 3rd category. Regarding with time factor, the same phenomenon that occurs in Financial Sector observed in this Sector too, a slight improvement in the results is occurred, so even in a close time set (month), time factor would be able to interfere in the upcoming results.

7. CONCLUSION-SUGGESTIONS

7.1. Brief Summary of the Research Process

The scope of this survey is focused in companies that consist of a major part of S&P 100 Stock Market Index (almost 41,1% with 2018 data), which reflecting the so-called 'blue chips' of the US stock market. Addressing risk from the part of investors plays a key role in the selection of investment portfolios by fund managers. Knowing that in general this category of shares does not appear high volatility levels over time, therefore has less risk and less likely returns than other shares with more volatile profiles, investors who choose this particular profile of shares are not prepared to be widely exposed.

However, within the same category of investors a relative range of yield-risk combinations that may be chosen by fund managers can be distinguished after identifying their risk tolerance. In this way, it is possible to divide the shares into sub-categories of risk levels. To this end, the study focuses on the analysis of two important economic sectors of the S&P100, Financial and Information-Technology, which according to S&P Global research appear be two of the most volatile sectors. Financial Sector is shown not only greater volatility but also and minor annualized yields, fact that is not complied with the general theory where higher risk leads to higher returns.

Initially, collecting all available published data of the Annual Financial Statements and the monthly stock market closing prices for all companies that are part of the 2 sectors, for both classes of sectors the monthly returns of nine different stock portfolios are calculated on the basis of the fundamental indicators P/E, EPS, D/P, P/BV, P.E.G., BV/Shares, TBC/Shares, ROE, P/S and are re-adjusted each year according to the price of each stock's fundamental indicator. The portfolios are also divided into three different categories, in relation to their structure, i.e., those consisting of 5 shares with the best indicator value weighted equally, those consisting of 5 shares with the best indicator value weighted proportionally and those consisting of all shares weighted in proportion to their fundamental indicator. Therefore, a total of 27 portfolios are formed for each of economic activity sector. Analyzing the Descriptive Statistics of all portfolio returns, it seems to have a controversial result. In the one hand Information-Technology portfolios have lower mean standard deviations (or St. Errors) in their monthly returns, on the other hand that not led to lower yields but to higher returns so, they have in average higher monthly returns. None distribution of any portfolio is following normality. Portfolios with 5 stocks equally weighted are showing higher returns and lower volatility in general for both Sectors and are safer and more efficient investment option.

The stimulus element for this research consists of 2 different aspects. The first is to examine the possible influence of macroeconomic data on monthly portfolio returns calculated and for this reason macroeconomic indicators of the American Economy are collected and tested for their relationship with monthly portfolio performance. The second is to examine any effect on monthly return courses from time factor, focusing on the possibility of time-changing beta coefficients of independent variables resulting from a Rolling Regression process, with 5-year time window for estimating these beta coefficients, with all the portfolio returns. In the end, the beta coefficients time-variability are attempted to be modelized in a non-linear function with time.

7.2. Conclusion

7.2.1. Macroeconomic effect in portfolios' returns

The initial conclusion concerning the possible involvement of macroeconomic indicators in the monthly portfolio returns courses, shows that in every portfolio returns that formed by one of the 9 fundamental indicators, macroeconomics do really affect returns courses in a long-term basis. During the research for common macroeconomic indicators that affect all portfolio returns formed by a specific fundamental indicator, a small group of macroeconomics seems to interact separately in every fundamental-base portfolio returns in long-term period.

But when the examined period is reduced in mid-term length of 5-years horizon, except from the Market return (S&P100), additional macroeconomic affect in portfolio returns is not confirmed. So, the most reliable way to explain, estimate models and attempt to predict portfolio returns, is to focus on a parallel comparison with the course of the stock market index's performance. Therefore, the research ends up in the belief that most of theories and predicting models of stock market yields follow, i.e., the primary importance of Market returns. Macroeconomics in this research continue to have effect only in long-term examination.

The specific construction and annual adjustment of the portfolios stock structure that carried out in this survey, makes the timeless behavior of the Market Index performance a dominant factor in modelling portfolio returns.

7.2.2. Betas Time Variability in Portfolios returns

After testing the common independent variables for all portfolio categories formed by a specific fundamental indicator through the Rolling Regression process, with a fixed time horizon of 60 months in every step, starting from 1/1/2001 to 1/10/2019 with the first beta factor of this procedure resulting on 1/3/2006 and a total of 164 observations, the first visual results of the 5-year beta coefficients are available. Initially, the t-statistics of all produced 5-year beta coefficients are analyzed via visual examination of their time course diagrams (Figure 10 to 59) and obviously the only variable that produce statistically significant beta coefficients in every portfolio formation through this period is the S&P100 monthly returns.

Furthermore, proceeding in analyzing the produced 5-year beta coefficients of S&P100, it is clearly from the main Descriptive Statistics that none of them are following Normal Distribution, with mean upper than 1 in every portfolio category in both Sectors, meaning that these portfolios are highly-risk investments. In Addition, beta coefficients distribution from both Sectors are far from normality, but in Financial Sector portfolios are presenting lower Skewness and Kurtosis. For Financial Sector the portfolios that present higher beta prices are these that formed by BV/Shares and TBC/Shares and these that present lower beta prices are formed by P/E fundamental indicator. Respectively, in Information-Technology Sector higher beta prices present the portfolios formed by P/BV and lower these that formed by P.E.G, ROE and D/P fundamental in each category.

Thereinafter, by examining the time course graphs of S&P100 monthly returns' 5-year beta coefficients (Figure 60 to 65), the two Sectors appears to show two distinct course patterns. Financial Sector are shown a form of concave curve during of which a tremendous increase in beta values is occurred between in average 2009-2014 in all portfolio returns, after that betas are coming back in their initial average levels. On the contrary, in Information Technology Sector at the same time period a form of convex curve where beta coefficients values are steadily decreasing and ending in lower levels than their initial average states. This phenomenon is probably linked to the US Stock Market crisis that erupted in 2009 and clearly affected the portfolios formed, due to the 5-year time window of the study into beta coefficients, by changing their sensitivity factor differently from the Index. In particular, in Financial Sector portfolios, changes in the monthly S&P100 returns led to larger changes in the course of Financial Sector portfolio returns, which makes sense as the crisis mainly concerned the financial sector of economy. Information-Technology Sector portfolios, this slight continuous decline in their beta coefficients that experienced between 2009 and 2014, indicates that although they were affected by the Index to which they belong, this influence was also downward due to the nature of their activities.

However, the analysis of this relationship found, in order to be more statistically integrated, also requires its modeling estimation in relation with time. Therefore, a regression between all portfolio category returns and S&P100 monthly returns is executed to identify their time variability with 2 different cases: i) the produced 5-year beta coefficients regressed with time, ii) monthly beta coefficients regressed with time. The results ultimately in first case attest to what has also been observed visually, i.e., that time contributes actively to the course and affect the returns of portfolio performance (Table 24 & 25). In the second case the results are not in the same direction as 5-year beta coefficients, nevertheless, in regressions that present statistically significant α, γ or δ time factors a minor improvement in the results is occurred, so even in a close time set (month), time factor would be able to interfere in the upcoming results. Comparing the results between the two Sectors, time factor affect is greater and more reliable in the majority of Information-Technology Portfolios, while in Financial Portfolios this relationship is also exists but with less influence.

In conclusion, time influence in portfolio returns is bigger in a more long-term period. This phenomenon occurs because the interpretive power of monthly S&P100 returns in these portfolio categories that formed for the study are not so strong in short-term periods, on the contrary in mid-term or long-term periods like the 5-year window is much more noticeable.

7.3. Suggestions

Beginning with the collected stock market data that used to form portfolio returns, it is proposed to test them for break points before portfolio formations, examining the possibility of identifying and smoothing or excluding data from periods with non-normal course (i.e., Crisis in 2009) in compare with their general time course. Also, the annual fundamental indicators that used as basis to form portfolios, could substitute from average annual fundamental indicators for mid-term period, in order to smooth possible anomalies. Continuing with the portfolios formed, may is more useful to isolate some of them that present different returns course from the average profile and attempt to analyze possible abnormal behavior.

As a result, in executing Rolling Regression Analysis between portfolio returns and the remaining independent variables for every group of portfolio returns formed by a specific fundamental, the procedure led to the exclusion of all independent variables. Only the monthly Market returns could manage to produce statistically significant betas. This fact, although supported by many theories and models, is likely due to the following reasons and should be taken into account in subsequent research:

- The non-existence of further stock market sizes in the regression process as independent variables but only macroeconomic indicators, which usually have a supporting role and increase the accuracy of the models. Especially in mid-term periods, 5-years horizon that used in Rolling Regression, variables with similar time profile should be complemented with macroeconomics, which is proven to have more long-term power.
- The non-collection of additional macroeconomic indicators, other than those used and likely to have played an important role in the final outcome of the selection stage of independent variables, either individually or in combination with other sizes.
- Some of the existing macroeconomic variables in this research should be used with time lags, due to the fact that information about their size for a specific time set are published with a time delay.

Further, in the final part of the survey in model estimation of time-variable beta coefficients, it is recommended to test a different non-linear form of equations in two Sectors. This is because, as graphics show and also explained, the two Sectors follow two different time course patterns in 5-year beta coefficients. The model equation that used is more suitable for data generated through the Rolling Regression in Information -Technology Portfolios rather than Financial Portfolios, resulting in greater accuracy of the R-squared of the formers and the non-compatibility to a significant extent of the seconds. It is also encouraged an attempt to predict coefficients in relation to time, as well as to assess the effectiveness of this forecast, with a possible adjustment of the functional relationship to improve their results with more refined econometric methods developed over the years.

8. REFERENCES

Abarbanell J.S. and Bushee B.J. (1997), "Fundamental analysis, future earnings, and stock prices.", *Journal of Accounting Research*, Vol. 35, Issue 1, pp. 1–24.

Abhyankar A., Copeland L.S. and Wong W. (1997), "Uncovering Nonlinear Structure in Real-Time Stock Market indices.", *Journal of Business and Economic Statistics*, Vol. 15, Issue 1, pp. 1-14.

Abu-Mostafa Y.S. and Atiya A.F. (1996), "Introduction to financial forecasting.", *Applied Intelligence*, Vol. 6, pp. 205–213.

Acharya V. V. and Pedersen, L. H. (2005), "Asset Pricing with Liquidity Risk." *Journal of Financial Economics*, Vol. 77, Issue 2, pp. 375-410.

Amihud Y., Mendelson H. and Wood R.A. (1990), "Liquidity and the 1987 Stock Market Crash." *The Journal Portfolio of Management*, Vol. 16, Issue 3, pp. 65–69.

Andersen T.G., Bollerslev T., Diebold F.X. and Labys P. (2003), "Modeling and forecasting realized volatility", *Econometrica*, Vol. 71, Issue 2, pp. 579-625.

Banz W. R. (1981), "The relationship between return and market value of common stocks.", *Journal of Financial Economics*, Vol 9, Issue 1, pp. 3–18.

Barak S. and Modarres M. (2015), "Developing an approach to evaluate stocks by forecasting effective features with data mining methods.", *Expert System with Applications*, Vol. 42, Issue 3, pp. 1325–1339.

Barry A. N. B. (2009), "The Predictive Ability of the Historic Beta of Hotel Stocks in the 2008 Market Downturn.", *The Journal of Hospitality Financial Management*, Vol. 17, Issue 1, pp. 47-61.

Basu S. (1977), "The Investment Performance of Common Stocks in Relation to their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis.", *Journal of Finance*, Vol. 32, pp. 663-682.

Bessler W. and Wolff D. (2015), "Do commodities add value in multi-asset portfolios? An out-of-sample analysis for different investment strategies.", *Journal of Banking & Finance*, Vol. 60, Issue 3, pp. 1-20.

Billio M, Getmansky M., Lo A. W. and Pelizzon L. (2012), "Econometric measures of connectedness and systemic risk in the finance and insurance sectors.", *Journal of Financial Economics*, Vol. 104, Issue 3, pp. 535-559.

Booth A., Gerding E. and McGroarty F. (2014), "Automated trading with performance weighted random forests and seasonality.", *Expert System with Applications*, Vol. 41, Issue 8, pp. 3651–3661.

Bretschger L. and Lechthaler F. (2018), "Stock performance and economic growth: lessons from the Japanese case.", *Macroeconomics and Finance in Emerging Market Economies*, Vol. 11, Issue 2, pp. 195-217.

Büyükşahin, B. and Robe M.A. (2014), "Speculators, commodities and cross-market linkages.", *Journal of International Money and Finance*, Vol. 42, pp. 38-70.

Campbell J. Y. (1987), "Stock returns and the term structure.", *Journal of Financial Economics*, Vol 18, Issue 2, pp. 373-399.

Chen A.S., Leung M.T. and Daouk H. (2003), "Application of neural networks to an emerging financial market: forecasting and trading the Taiwan Stock Index.", *Computers and Operations Research*, Vol. 30, Issue 6, pp. 901-923.

Chortareas G., Jiang Y. and Nankervis J.C. (2011), "Forecasting exchange rate volatility using high frequency data: Is the euro different?", *International Journal of Forecasting*, Vol. 27, Issue 4, pp. 1089-1107.

Clinebell J., Squires J. and Stevens J. (1993), "Investment Performance over Bull and Bear Markets: Fabozzi and Francis Revisited.", *Quarterly Journal of Business and Economics*, Vol. 32, Issue 4, pp. 14-25.

Cox J., Ingersoll J. and Ross S. (1985), "An Intertemporal General Equilibrium Model of Asset Prices.", *Econometrica*, Vol. 53, Issue 2, pp. 363-384.

Datar V. T., Naik N. Y. and Radcliffe R. (1998), "Liquidity and Stock Returns: An Alternative Test.", *Journal of Financial Markets*, Vol. 1, Issue 2, pp. 203–19.

De Bondt W. and Thaler, R. (1987), "Further evidence of investor overreaction and stock market seasonality.", *Journal of Finance*, Vol. 42, Issue 3, pp. 557–581.

Fama E.F. and French K. R. (1988), "Dividend yields and expected stock returns.", *Journal of Financial Economics*, Vol. 22, Issue 1, pp. 3-25.

Fama, E.F. and French, K.R. (1992), "The Cross-Section of Expected Stock Returns.", *The Journal of Finance*, Vol. 47, Issue 2, pp. 427-465.

Fama E.F. and French K.R. (1993), "Common risk factors in the returns on stocks and bonds.", *Journal of Financial Economics*, Vol. 33, Issue 1, pp. 3-56.

Fama E.F. and French, K.R. (1996), "Multifactor Explanations of Asset Pricing Anomalies.", *The Journal of Finance*, Vol 51, Issue 1, pp. 55-84.

Fama E.F. and French, K.R. (2015), "A five-factor asset pricing model.", *Journal of Financial Economics*, Vol. 116, Issue 1, pp. 1-22.

Fama E.F. and Schwert G.W. (1977), "Asset returns and inflation.", *Journal of Financial Economics*, Vol. 5, Issue 2, pp. 115-146.

Ferson W.E. and Harvey C.R. (1991), "The Variation of Economic Risk Premiums.", *Journal of Political Economy*, Vol. 99, Issue 2, pp. 385-415.

Ferson W.E. and Harvey C.R. (1993), "The Risk and Predictability of International Equity Returns.", *Review of Financial Studies*, Vol. 6, Issue 3, pp. 527-566.

Ferson W. E. and Campbell R. H. (1993), "The Risk and Predictability of International Equity Returns.", *The Review of Financial Studies*, Vol. 6, Issue 3, pp. 527–566.

Fong W. M. (2017), "Beating the Market: Dollar-Cost Averaging with the Profitable Dividend Yield Strategy.", *The Journal of Wealth Management*, Vol. 20, Issue 2, pp. 54-66.

Frankel R. and Lee, M. (1998), "Accounting valuation, market expectation, and cross-sectional stock returns.", *Journal of Accounting and Economics*, Vol. 25, Issue 3, pp. 283–319.

Gertler M. and Grinols, E. (1982), "Unemployment, Inflation, and Common Stock Returns.", *Journal of Money, Credit and Banking*, Vol. 14, Issue 2, pp. 216-233.

Hamilton J. D. (2009), "Causes and consequences of the oil shock of 2007–08.", Brookings Papers on Economic Activity.

Hasanov M. and Omay T. (2008), "Nonlinearities in emerging stock markets: evidence from Europe's two largest emerging markets.", *Applied Economics*, Vol. 40, Issue 20, pp. 2645-2658.

Horpestad J.B., Lyócsa Š., Molnár P. and Olsen T.B. (2019), "Asymmetric volatility in equity markets around the world.", *The North American Journal of Economics and Finance*, Vol. 48, pp. 540-554.

Huang H.C., Lin S.C., Kim D.H. and Yeh C.C. (2010), "Inflation and the finance-growth nexus.", *Economic Modelling*, Vol. 27, Issue 1, pp. 229-236.

Jaffe J.F. and Westerfield R. (1985a), "The Week-End Effect in Common Stock Returns: The International Evidence.", *The Journal of Finance*, Vol. 40, Issue 2, pp. 433-54.

Jaffe, J. and Westerfield, R. (1985b), "Patterns in Japanese common stock returns Day of the week and turn of the year effects.", *Journal of Financial and Quantitative Analysis*, Vol. 20, Issue 2, pp. 243-260.

Jank S. (2012), "Mutual fund flows, expected returns, and the real economy.", *Journal of Banking and Finance*, Vol. 36, Issue 11, pp. 3060-3070.

Jiang F., Tang G and Zhou G. (2018), "Firm Characteristics and Chinese Stocks.", *Journal of Management Science and Engineering*, Vol. 3, Issue 4, pp. 259-283.

Jung C. and Boyd R. (1996), "Forecasting UK stock prices.", *Applied Financial Economics*, Vol. 6, Issue 3, pp. 279-286.

Kanojia, S. and Arora N. (2017), "Investments, Market Timing and Portfolio Performance across Indian Bull and Bear Markets.", *Asia-Pacific Journal of Management Research and Innovation*, Vol. 13, Issue (3–4), pp. 98–109.

Kato K. (1990a), "Weekly patterns in Japanese stock returns.", *Management Science*, Vol. 36, Issue 9, pp. 1031-1043.

Kehoe P. J., Lopez P., Midrigan V. and Pastorino E. (2020), "Asset Prices and Unemployment Fluctuations.", Federal Reserve Bank of Cleveland, Working Paper No. 20-10.

Keim D.B. and Stambaugh R.F. (1986), "Predicting Returns in the Stock and Bond Markets.", *Journal of Financial Economics*, Vol. 12, Issue 2, pp. 357-390.

Koopman S.J., Jungbacker B. and Hol E. (2005), "Forecasting daily variability of the S&P 100 stock index using historical, realized and implied volatility measurements.", *Journal of Empirical Finance*, Vol. 12, Issue 3, pp. 445-475.

Lev B. and Thiagarajan S.R. (1993), "Fundamental information analysis.", *Journal of Accounting Research*, Vol. 31, Issue 2, pp. 190–215.

Levy R (1974), "Beta coefficients as predictors of returns.", *Financial Analysts Journal*, Vol. 30, Issue 1, pp. 61-69.

Lintner J. (1965b), "Security Prices, Risk and Maximal Gains from Diversification.", *Journal of Finance*, Vol. 20, Issue 4, pp. 587-615.

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

Long J. B. (1974), "Stock prices, inflation, and the term structure of interest rates.", *Journal of Financial Economics*, Vol. 1, Issue 2, pp. 131-170.

Lu W., Li J., Li Y., Sun A. and Wang J. (2020), "A CNN-LSTM-Based Model to Forecast Stock Prices.", *Complexity*, Vol. 2020, Article ID 6622927 | https://doi.org/10.1155/2020/6622927.

Lyócsa S., Molnár P. and Výrost T. (2021), "Stock market volatility forecasting: Do we need high-frequency data?", *International Journal of Forecasting*.

Ma F., Li Y., Liu L. and Zhang Y. (2018), "Are low-frequency data really uninformative? A forecasting combination perspective.", *The North American Journal of Economics and Finance*, Vol. 44, pp. 92-108.

Martens M. (2001), "Forecasting daily exchange rate volatility using intraday returns.", *Journal of International Money and Finance*, Vol. 20, Issue 1, pp. 1-23.

McMillan D. G. (2001), "Non-Linear Predictability of Stock Market Returns: Evidence from Non-Parametric and Threshold Models.*", International Review of Economics and Finance*, Vol.10, Issue 4, pp. 353-368.

Merton R. C. (1973), "An Intertemporal Capital Asset Pricing Model.", *Econometrica*, Vol. 41, Issue 5, pp. 867-887.

Messis P. and Zapranis A. (2014), "Asset pricing with time-varying betas for stocks traded on S&P 500.", *Applied Finance*, Vol. 46, Issue 36, pp. 4508-4518.

Messis P. and Zapranis A. (2016), "Forecasting time-varying daily betas: a new nonlinear approach.", *Managerial Finance*, Vol. 42, Issue 2, pp. 54-73.

Messis P., Alexandridis A. and Zapranis, A. (2019), "Testing and comparing conditional risk-return relationship with a new approach in the cross-sectional framework.", *International Journal of Finance & Economics*.

Min Qi (1999), “Nonlinear Predictability of Stock Returns Using Financial and Economic Variables.”, *Journal of Business & Economic Statistics*, Vol. 17, Issue 4, pp. 419-429.

Mossin, J. (1966), “Equilibrium in a Capital Asset Market.”, *Econometrica*, Vol. 35, Issue 4, pp. 768-783.

Ou J.A. and Penman S.H. (1989), “Financial statement analysis and the prediction of stock returns.”, *Journal of Accounting and Economics*, Vol. 11, Issue 4, pp. 295–329.

Paster L. and Stambaugh R. (2003), “Liquidity risk and expected stock returns.”, *Journal of Political Economy*, Vol. 111, Issue 3, pp. 642–685.

Rodrigues, A.A. and Lleo, S. (2018), “Combining standard and behavioral portfolio theories: A practical and intuitive approach.”, *Quantitive Finance*, Vol. 18, Issue 5, pp. 707–717.

Rosenberg B. (1974), “Extra-market components of covariance in security returns.”, *Journal of Financial and Quantitative Analysis*, Vol. 9, Issue 2, pp. 263–274.

Rosenberg B., Reid K. and Lanstein R. (1985), “Persuasive evidence of market inefficiency.”, *Journal of Portfolio Management*, Vol. 11, Issue 3, pp. 9–17.

Rozeff M. (1984), “Dividend yields are equity risk premiums.”, *Journal of Portfolio Management*, Vol. 11, Issue 1, pp. 68-75.

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

Silvennoinen, A. and Thorp S. (2013), “Financialization, crisis and commodity correlation dynamics.”, *Journal of International Financial Markets, Institutions and Money*, Vol. 24, Issue 1, pp. 42-65.

Sim M., Deng S. and Huo X. (2014), “Market connectedness and expected stock returns.”, Working paper, Georgia Institute of Technology.

Treynor J. L. (1962), “Toward a theory of market value of risky assets.”, Unpublished manuscript. In R. Korajczyk (Ed.), A later version was published in 1999 as a chapter in Asset pricing and portfolio performance (pp. 15–22). London: Risk Books.

Wei Y. (2012), “Forecasting volatility of fuel oil futures in China: GARCH-type, SV or realized volatility models?”, *Physica: A. Statistical Mechanics and its Applications*, Vol. 391, Issue 22, pp. 5546-5556.

Zhang Y., Ma F., Wang T. and Liu L. (2019), "Out-of-sample volatility prediction: A new mixed-frequency approach.", *Journal of Forecasting*, Vol. 38, Issue 7, pp. 669-680.

https://www.spglobal.com/en/research-insights/articles/performance-and-volatility-for-sectors-in-the-2010s

https://www.spglobal.com/spdji/en/indices/equity/sp-100/#data

9. APPENDIXES

9.1. APPENDIX A- US Macroeconomic Data

In summary, Table 28 contains all the US macroeconomic indicators used in the study, divided into 9 categories depending on the type of activity, whilst for Commodity Indicators there is an additional division into 2 subcategories, depending on the nature of the material dealt with:

Table 28: *U.S. Macroeconomic Indicators collected from IMF.*

No.	Index Category	Subcategory	Macroeconomic Index	Ticker	Comments
1.	Market Rates Indicators		S&P 100	^OEXS&P100	Capitalization Index
2.			S&P 500	^GSPC	Capitalization Index
3.	US Exchange Rates Indicators		US Dollars per SDR, End of Period, Rate	EDSE_USD_XDR_RATE	Index expressed in SDR, an international reserve asset, created by the IMF, end of period.
4.			US Dollar per SDR, Period Average	EDSA_USD_XDR_RATE	Index expressed in SDR, an international reserve asset, created by the IMF, period average.
5.			Nominal Effective Exchange Rate, Trade Partners by Consumer Price Index	ENEER_IX	Is an unadjusted weighted average rate at which one country's currency exchanges for a basket of multiple foreign currencies. An indicator of a country's international competitiveness in terms of the foreign exchange (forex) market.
6.			Real Effective Exchange Rate, based on Consumer Price Index	EREER_IX	A weighted average of nominal exchange rates adjusted for relative price differential between the domestic and foreign countries, relates to the

					purchasing power parity (PPP) hypothesis.
7.	US Interest Rates Indicators		Central Bank Annual Policy Rate	FPOLM_PA	A policy rate is a short-term reference rate set by a central bank. It is the rate at which commercial banks can borrow money from their central bank.
8.			Annual Discount Rate	FID_PA	Is the interest rate used to determine the present value of future cash flows in a discounted cash flow (DCF) analysis. This helps determine if the future cash flows from a project or investment will be worth more than the capital outlay needed to fund the project or investment in the present.
9.			Annual Money Market Rate	FIMM_PA	A money market account is a type of savings account that can be found at banks and credit unions. These high-rate money market accounts may pay a higher interest rate than traditional savings accounts, but their minimum deposit and balance requirements are often higher.
10.			Annual Treasury Bill Rate	FITB_PA	A Treasury Bill (T-Bill) is a short-term debt obligation backed by the U.S. Treasury Department with a maturity of one year or less.
11.			Annual Lending Rate	FILR_PA	Is the amount charged by lenders for a year as a percentage of the amount lent or deposited.
12.			Annual Government Bonds	FIGB_PA	Sovereign bond yield is the rate of interest at which a national government can borrow. Sovereign bonds are sold by

					governments to investors to raise money for government spending.
13.			10year Government Bonds	FIGB_PT	Sovereign bond yield is the rate of interest at which a national government can borrow. Sovereign bonds are sold by governments to investors to raise money for government spending.
14.	US Trade of Goods Indicators		Goods, Value of Exports, US Dollars	TXG_FOB_USD	Total value of foreign countries spending on the goods and services of the home country.
15.			Goods, Value of Imports, CIF, US Dollars	TMG_CIF_USD	Total value of spending of the home country on the goods and services imported from foreign countries.
16.	US Liquidity Indicators		International Liquidity, Total Reserves excluding Gold, US Dollars	RAXG_USD	Total International reserves are a country's "external assets"—including foreign currency deposits and bonds held by central banks and monetary authorities, SDRs, excluding gold.
17.			International Liquidity, Total Reserves excluding Gold, Foreign Exchange, US Dollars	RAXGFX_USD	Total International reserves are a country's "external assets" including bonds held by central banks and monetary authorities, SDRs, excluding gold and foreign currency deposits.
18.			International Liquidity, Gold Holdings, National Valuation, US Dollars	RAFAGOLDNV_USD	International reserves are a country's "external assets" including only gold.
19.			Prices, Producer Price Index, All Commodities, Index	PPPI_IX	Is a sum of indexes that measures the average change over time in selling prices received by domestic producers of goods and services. PPIs measure price

					change from the perspective of the seller.
20.	US Price Index Indicators		Prices, Consumer Price Index, All items, Index	PCPI_IX	Is a measure of the aggregate price level in an economy. The CPI consists of a bundle of commonly purchased goods and services. The CPI measures the changes in the purchasing power of a country's currency, and the price level of a basket of goods and services.
21.			Inflation Rate	IR_IX	Inflation refers to an overall increase in the Consumer Price Index (CPI), which is a weighted average of prices for different goods. The set of goods that make up the index depends on which are considered representative of a common consumption basket.
22.	US Production Indicators		Economic Activity, Oil Production, Crude, Index	AOMPC_IX	The monthly US Crude Oil Productivity Index.
23.			Economic Activity, Industrial Production, Manufacturing, Index	AIPMA_IX	The monthly US Industrial & Manufacturing Productivity Index.
24.			Economic Activity, Industrial Production, Index	AIP_IX	The monthly US Industrial Productivity Index.
25.			Industrial Production, Seasonally adjusted, Index	AIP_SA_IX	The monthly US Industrial Productivity, Seasonally adjusted Index.
26.			Labor Force, Persons, Number of	LLF_PE_NUM	The monthly US Labor Force.

27.	US Labor Indicators		Unemployment, Persons, Number of	LU_PE_NUM	The monthly US persons in unemployment.
28.			Labor Markets, Unemployment Rate, Percent	LUR_PT	The monthly US unemployment rate.
29.	US Commodity Indicators	Precious & industrial Metal	Gold- COMEX 2 months future	GC=F	The price (US Dollars) needed for purchasing a 2 months gold future.
30.		Precious & industrial Metal	Silver-COMEX 3 months future	SI=F	The price (US Dollars) needed for purchasing a 3 months silver future.
31.		Precious & industrial Metal	Copper- COMEX 3 months future	HG=F	The price (US Dollars) needed for purchasing a 3 months copper future.
32.		Energy	Crude Oil- NY Mercantile 2 months future	CL=F	The price (US Dollars) needed for purchasing a 2 months crude oil future.
33.		Energy	Gasoline- NY Mercantile 1-month future	RB=F	The price (US Dollars) needed for purchasing a 1-month gasoline future.
34.		Energy	Natural Gas- NY Mercantile 1-month future	NG=F	The price (US Dollars) needed for purchasing a 1-month natural gas future.
35.		Energy	Heating Oil- NY Mercantile 1-month future	HO=F	The price (US Dollars) needed for purchasing a 1-month heating oil future.

9.2. APPENDIX B- Augmented Dickey Fuller Tests for the set of Variables

9.2.1. Variables considered as Independents

Table 29: *Initial Level ADF Tests for Independent Variables.*

No.	Variable	Coefficient with Trend & Intercept	ADF Probability	Coefficient with Intercept	ADF Probability	Coefficient without Intercept & trend	ADF Probability
1	S&P 100	-0,948	0,000	-0,933	0,000	-0,926	0,000
2	S&P 500	-0,924119	0,00	-0,912566	0,00	-0,902156	0,00
3	US Dollars per SDR, End of Period, Rate	-0,024	0,715	-0,027	0,318	0,000	0,732
4	US Dollar per SDR, Period Average	-0,022021	0,6119	-0,023637	0,2314	0,00000879	0,7215
5	Nominal Effective Exchange Rate, Trade Partners by Consumer Price Index	-0,011	0,869	-0,013	0,527	0,000	0,589
6	Real Effective Exchange Rate, based on Consumer Price Index	-0,012015	0,8843	-0,016162	0,3517	-0,000411	0,4763
7	Central Bank Annual Policy Rate	-0,023	0,002	-0,015	0,024	-0,007	0,145
8	Annual Discount Rate	-0,017373	0,5875	-0,015771	0,3002	-0,007275	0,1404
9	Annual Money Market Rate	-0,017	0,056	-0,010	0,219	-0,007	0,047
10	Annual Treasury Bill Rate	-0,011227	0,681	-0,010099	0,3678	-0,00628	0,1166
11	Annual Lending Rate	-0,012	0,381	-0,012	0,115	-0,002	0,198
12	Annual Government Bonds	-0,076412	0,0599	-0,023369	0,3469	-0,00551	0,1493
13	10year Government Bonds	-0,076	0,060	-0,023	0,342	-0,006	0,146
14	Goods, Value of Exports, US Dollars	-0,050776	0,458	-0,011479	0,4904	0,002119	0,9255
15	Goods, Value of Imports, CIF, US Dollars	-0,010	0,026	-0,029	0,114	0,002	0,861
16	International Liquidity, Total Reserves excluding Gold, US Dollars	-0,014129	0,8896	-0,018379	0,3433	0,000671	0,813

17	**International Liquidity, Total Reserves excluding Gold, Foreign Exchange, US Dollars**	-0,016	0,858	-0,010	0,641	0,001	0,837
18	**International Liquidity, Gold Holdings, National Valuation, US Dollars**	-0,12511	0,0054	-0,082014	0,0043	-0,000000199	0,3858
19	**Prices, Producer Price Index, All Commodities, Index**	-0,040	0,138	-0,005	0,717	0,001	0,977
20	**Prices, Consumer Price Index, All items, Index**	-0,044	0,190	-0,001	0,883	0,001	1,000
21	**Inflation Rate**	-0,139	0,220	-0,111	0,105	-0,019	0,251
22	**Economic Activity, Oil Production, Crude, Index**	-0,004	0,988	0,013	1,000	0,005	1,000
23	**Economic Activity, Industrial Production, Manufacturing, Index**	-0,061	0,043	-0,058	0,010	0,000	0,749
24	**Economic Activity, Industrial Production, Index**	-0,079	0,002	-0,044	0,010	0,000	0,822
25	**Industrial Production, Seasonally adjusted, Index**	-0,032	0,104	-0,017	0,191	0,000	0,845
26	**Labor Force, Persons, Number of**	-0,042	0,709	-0,003	0,892	0,001	0,998
27	**Unemployment, Persons, Number of**	-0,021	0,310	-0,021	0,108	-0,003	0,225
28	**Labor Markets, Unemployment Rate, Percent**	-0,021	0,307	-0,021	0,104	-0,003	0,196
29	**Gold- COMEX 2 months future**	-0,024	0,779	-0,009	0,689	0,003	0,903
30	**Silver-COMEX 3 months future**	-0,037	0,583	-0,030	0,309	-0,004	0,478
31	**Copper- COMEX 3 months future**	-0,027	0,091	-0,025	0,059	-0,001	0,847
32	**Crude Oil- NY Mercantile 2 months future**	-0,039	0,390	-0,378	0,121	-0,004	0,413
33	**Gasoline- NY Mercantile 1-month future**	-0,055	0,342	-0,051	0,113	-0,005	0,413

34	Natural Gas- NY Mercantile 1-month future	-0,089	0,081	-0,066	0,071	-0,015	0,150
35	Heating Oil- NY Mercantile 1-month future	-0,030	0,701	-0,028	0,310	-0,002	0,556

Table 30: *1st Level Differences ADF Tests for Independent Variables.*

No.	Variable	Coefficient with Trend & Intercept	ADF Probability	Coefficient with Intercept	ADF Probability	Coefficient without Intercept & trend	ADF Probability
1	US Dollars per SDR, End of Period, Rate	-0,979	0,000	-0,969	0,000	-0,968	0,000
2	US Dollar per SDR, Period Average	-0,717596	0,00	-0,706704	0,00	-0,706395	0,00
3	Nominal Effective Exchange Rate, Trade Partners by Consumer Price Index	-0,733	0,000	-0,707	0,000	-0,707	0,000
4	Real Effective Exchange Rate, based on Consumer Price Index	-0,768408	0	-0,744858	0	-0,744133	0
5	Central Bank Annual Policy Rate	-0,317	0,039	-0,337	0,003	-0,339	0,000
6	Annual Discount Rate	-0,467911	0,0001	-0,464242	0	-0,462796	0
7	Annual Money Market Rate	-0,320	0,000	-0,310	0,000	-0,308	0,000
8	Annual Treasury Bill Rate	-0,358319	0	-0,35285	0	-0,351163	0
9	Annual Lending Rate	-0,257	0,000	-0,247	0,000	-0,245	0,000
10	Annual Government Bonds	-0,785968	0	-0,785917	0	-0,78176	0
11	10year Government Bonds	-0,786	0,000	-0,786	0,000	-0,781	0,000
12	Goods, Value of Exports, US Dollars	-0,919478	0,0166	-0,899384	0,0038	-0,750739	0,0007
13	International Liquidity, Total Reserves excluding Gold, US Dollars	-0,979	0,000	-0,967	0,000	-0,964	0,000

14	International Liquidity, Total Reserves excluding Gold, Foreign Exchange, US Dollars	-0,836	0,000	-0,835	0,000	-0,830	0,000
15	Prices, Producer Price Index, All Commodities, Index	-0,603	0,000	-0,602	0,000	-0,488	0,000
16	Prices, Consumer Price Index, All items, Index	-0,622	0,000	-0,622	0,000	-0,491	0,000
17	Inflation Rate	-1,779	0,000	-1,775	0,000	-1,774	0,000
18	Economic Activity, Oil Production, Crude, Index	-1,022	0,000	-0,973	0,000	-0,931	0,000
19	Industrial Production, Seasonally adjusted, Index	-0,374	0,011	-0,375	0,002	-0,364	0,000
20	Labor Force, Persons, Number of	-1,343	0,075	-1,343	0,017	-0,483	0,058
21	Unemployment, Persons, Number of	-0,342	0,564	-0,349	0,191	-0,347	0,025
22	Labor Markets, Unemployment Rate, Percent	-0,342	0,536	-0,353	0,168	-0,348	0,022
23	Gold- COMEX 2 months future	-1,155	0,000	-1,155	0,000	-1,143	0,000
24	Silver-COMEX 3 months future	-1,303	0,000	-1,300	0,000	-1,297	0,000
25	Copper- COMEX 3 months future	-0,869	0,000	-0,866	0,000	-0,864	0,000
26	Crude Oil- NY Mercantile 2 months future	-0,767	0,000	-0,764	0,000	-0,764	0,000
27	Gasoline- NY Mercantile 1-month future	-0,877	0,000	-0,875	0,000	-0,875	0,000
28	Natural Gas- NY Mercantile 1-month future	-0,998	0,000	-0,998	0,000	-0,998	0,000
29	Heating Oil- NY Mercantile 1-month future	-0,904	0,000	-0,902	0,000	-0,901	0,000

Table 31: 2nd Level Differences ADF Tests for Independent Variables

No.	Variable	Coefficient with Trend & Intercept	ADF Probability	Coefficient with Intercept	ADF Probability	Coefficient without	ADF Probability

						Intercept & trend	
1	Unemployment, Persons, Number of	-8,803	0,000	-8,788	0,000	-8,778	0,000
2	Labor Markets, Unemployment Rate, Percent	-8,56105	0,00	-8,536073	0,00	-8,527794	0,00

9.2.2. Variables considered as Dependents

Table 32: *Initial Level ADF Tests for Financial Sector Portfolios Returns & Cap. Index considered as Dependent Variables.*

No.	Portfolio Structure	Fundamental Variable Returns	Coefficient with Trend & Intercept	ADF Probability	Coefficient with Intercept	ADF Probability	Coefficient without Intercept & trend	ADF Probability
1	5 stocks equally weighted	*P_E*	-1,000958	0,00	-0,999045	0,00	-0,977667	0,00
2		*EPS*	-0,839132	0,00	-0,834213	0,00	-0,832165	0,00
3		*D_P*	-0,981986	0,00	-0,981249	0,00	-0,973447	0,00
4		*P_BV*	-1,16472	0,00	-1,164721	0,00	-1,141453	0,00
5		*P.E.G.*	-1,205889	0,00	-1,20553	0,00	-1,150576	0,00
6		*BV_Shares*	-0,860539	0,00	-0,855193	0,00	-0,842695	0,00
7		*TBC_Shares*	-0,927696	0,00	-0,925375	0,00	-0,924286	0,00
8		*ROE*	-0,988685	0,00	-0,986788	0,00	-0,97163	0,00
9		*P_S*	-0,869354	0,00	-0,868444	0,00	-0,808504	0,00
10	5 stocks proportionally weighted	*P_E*	-0,982363	0,00	-0,981378	0,00	-0,9656	0,00
11		*EPS*	-0,766749	0,00	-0,760469	0,00	-0,760199	0,00
12		*D_P*	-1,221017	0,00	-1,220473	0,00	-1,204687	0,00
13		*P_BV*	-0,913483	0,00	-0,913342	0,00	-0,857485	0,00
14		*P.E.G.*	-1,098393	0,00	-1,098192	0,00	-0,985346	0,00
15		*BV_Shares*	-0,793885	0,00	-0,786063	0,00	-0,784865	0,00
16		*TBC_Shares*	-0,922101	0,00	-0,913906	0,00	-0,911568	0,00
17		*ROE*	-0,94499	0,00	-0,943361	0,00	-0,929464	0,00
18		*P_S*	-1,285311	0,00	-1,285249	0,00	-1,253714	0,00
19	all stocks proportionally weighted	*P_E*	-0,783469	0,00	-0,782039	0,00	-0,781595	0,00
20		*EPS*	-0,792233	0,00	-0,780615	0,00	-0,717133	0,00
21		*D_P*	-1,177101	0,00	-1,176124	0,00	-1,161458	0,00
22		*P_BV*	-0,963843	0,00	-0,963074	0,00	-0,909421	0,00
23		*P.E.G.*	-1,026354	0,00	-1,026369	0,00	-0,899552	0,00
24		*BV_Shares*	-0,775108	0,00	-0,766627	0,00	-0,764181	0,00
25		*TBC_Shares*	-0,884756	0,00	-0,876789	0,00	-0,872441	0,00

26		ROE	-0,999898	0,00	-0,995524	0,00	-0,982172	0,00
27		P_S	-1,142132	0,00	-1,141237	0,00	-1,11649	0,00
28	Financial Sector Capitalization Index		-0,85363	0,00	-0,852919	0,00	-0,848125	0,00

Table 33: Initial Level ADF Tests for Information-Technology Sector Portfolios Returns & Cap. Index considered as Dependent Variables.

No.	Portfolio Structure	Fundamental Variable Returns	Coefficient with Trend & Intercept	ADF Probability	Coefficient with Intercept	ADF Probability	Coefficient without Intercept & trend	ADF Probability
1	5 stocks equally weighted	P_E	-1,03103	0,00	-1,031199	0,00	-1,015617	0,00
2		EPS	-1,019089	0,00	-1,019361	0,00	-0,990916	0,00
3		D_P	-1,062841	0,00	-1,058988	0,00	-1,040721	0,00
4		P_BV	-1,074593	0,00	-1,07383	0,00	-1,026307	0,00
5		P.E.G.	-1,064396	0,00	-1,060178	0,00	-1,000172	0,00
6		BV_Shares	-1,015189	0,00	-1,015254	0,00	-0,981943	0,00
7		TBC_Shares	-1,003873	0,00	-1,003341	0,00	-0,970088	0,00
8		ROE	-0,955748	0,00	-0,95247	0,00	-0,932173	0,00
9		P_S	-1,016639	0,00	-1,016279	0,00	-0,985825	0,00
10	5 stocks proportionally weighted	P_E	-1,033661	0,00	-1,033686	0,00	-1,01773	0,00
11		EPS	-1,013645	0,00	-1,013595	0,00	-0,993869	0,00
12		D_P	-1,082229	0,00	-1,080004	0,00	-1,058581	0,00
13		P_BV	-1,065052	0,00	-1,063465	0,00	-1,015862	0,00
14		P.E.G.	-1,004284	0,00	-0,994157	0,00	-0,943458	0,00
15		BV_Shares	-1,018672	0,00	-1,018043	0,00	-0,981701	0,00
16		TBC_Shares	-1,0084	0,00	-1,008558	0,00	-0,978379	0,00
17		ROE	-0,991447	0,00	-0,98711	0,00	-0,967887	0,00
18		P_S	-1,052001	0,00	-1,049406	0,00	-1,009918	0,00
19	all stocks proportionally weighted	P_E	-1,022282	0,00	-1,022171	0,00	-0,99243	0,00
20		EPS	-1,006333	0,00	-1,004356	0,00	-0,98129	0,00
21		D_P	-1,088044	0,00	-1,085282	0,00	-1,06075	0,00
22		P_BV	-1,048731	0,00	-1,04893	0,00	-1,002765	0,00
23		P.E.G.	-1,078422	0,00	-1,077592	0,00	-1,016618	0,00
24		BV_Shares	-1,02597	0,00	-1,024246	0,00	-0,984852	0,00
25		TBC_Shares	-1,031413	0,00	-1,030846	0,00	-0,99539	0,00
26		ROE	-7,531646	0,00	-7,452731	0,00	-6,545119	0,00
27		P_S	-1,048501	0,00	-1,048437	0,00	-1,001016	0,00
28	Information-Technology Sector Capitalization Index		-1,041144	0,00	-1,032534	0,00	-1,018867	0,00

9.2. APPENDIX C- Covariance Matrix in Collinearity Test

Table 34: *Covariance Matrix for Collinearity Test*

	X01	X02	X03	X04	X05	X06	X07	X08	X09	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	X24	X25	X26	X27	X28	X29	X30	X31	X32	X33	X34	X35	X36	X37
X01	1,000	0,576	0,085	0,108	-0,059	0,076	-0,187	-0,172	0,134	0,099	0,094	0,178	0,103	0,293	0,274	-0,006	0,098	0,041	-0,084	0,005	0,113	0,100	-0,093	-0,041	-0,091	-0,070	0,173	-0,095	0,071	0,051	-0,098	0,015	0,004	0,143	0,093	0,090	0,126
X02	0,576	1,000	0,074	0,096	-0,001	0,114	-0,230	-0,204	0,072	-0,007	0,116	0,209	0,086	0,191	0,240	0,074	-0,025	0,045	-0,045	-0,096	0,201	0,147	0,044	-0,041	0,023	0,033	0,041	-0,028	0,020	-0,001	-0,009	0,008	0,023	0,128	0,060	0,026	0,113
X03	0,085	0,074	1,000	0,988	0,272	0,158	-0,310	-0,310	0,077	0,047	0,144	0,096	0,112	0,232	0,003	0,061	0,028	0,107	0,178	-0,067	0,094	0,050	-0,093	-0,016	-0,026	0,011	0,033	-0,041	-0,067	-0,092	0,024	0,152	0,389	0,312	0,290	0,035	0,280
X04	0,108	0,096	0,988	1,000	0,289	0,167	-0,331	-0,331	0,106	0,075	0,163	0,129	0,120	0,232	0,013	0,039	0,040	0,113	0,185	-0,046	0,111	0,061	-0,078	-0,028	-0,044	-0,007	0,034	-0,053	-0,061	-0,086	0,050	0,175	0,422	0,356	0,321	0,059	0,317
X05	-0,059	-0,001	0,272	0,289	1,000	0,688	-0,625	-0,629	0,005	0,020	0,064	-0,008	0,039	-0,116	0,172	-0,142	-0,018	0,455	0,899	0,085	0,237	0,128	-0,007	-0,091	-0,027	-0,080	0,013	-0,040	-0,038	-0,044	0,375	0,355	0,404	0,367	0,257	0,131	0,372
X06	0,076	0,114	0,158	0,167	0,688	1,000	-0,837	-0,821	-0,022	0,013	0,079	-0,039	0,036	-0,151	0,069	-0,156	0,085	0,300	0,605	0,090	0,344	0,234	-0,047	-0,093	-0,043	-0,106	0,023	0,018	0,011	0,007	0,181	0,212	0,280	0,268	0,197	0,039	0,298
X07	-0,187	-0,230	-0,310	-0,331	-0,625	-0,837	1,000	0,985	-0,083	-0,108	-0,169	-0,070	-0,100	0,064	-0,016	0,178	-0,075	-0,289	-0,520	-0,078	-0,399	-0,289	0,062	0,162	0,075	0,154	0,006	-0,039	0,001	0,019	-0,230	-0,241	-0,351	-0,394	-0,321	-0,036	-0,390
X08	-0,172	-0,204	-0,310	-0,331	-0,629	-0,821	0,985	1,000	-0,073	-0,103	-0,133	-0,033	-0,070	0,112	-0,005	0,167	-0,051	-0,297	-0,537	-0,069	-0,311	-0,179	0,051	0,129	0,081	0,153	0,006	-0,032	-0,021	0,000	-0,234	-0,233	-0,340	-0,363	-0,302	-0,019	-0,361
X09	0,134	0,072	0,077	0,106	0,005	-0,022	-0,083	-0,073	1,000	0,869	0,696	0,665	0,698	0,159	0,181	0,144	0,098	-0,038	-0,097	-0,159	0,190	0,103	0,053	-0,130	0,101	0,143	0,172	0,035	-0,050	-0,052	0,012	0,002	0,140	0,187	0,186	-0,004	0,170
X10	0,099	-0,007	0,047	0,075	0,020	0,013	-0,108	-0,103	0,869	1,000	0,623	0,621	0,606	0,154	0,158	0,062	0,046	-0,044	-0,084	-0,102	0,191	0,095	0,067	-0,110	0,005	0,059	0,171	0,066	0,000	0,001	0,030	0,015	0,148	0,181	0,177	0,025	0,159
X11	0,094	0,116	0,144	0,163	0,064	0,079	-0,169	-0,133	0,696	0,623	1,000	0,806	0,948	0,073	0,166	0,164	0,039	-0,056	-0,039	-0,207	0,261	0,187	0,065	-0,123	0,096	0,166	0,225	0,070	-0,014	-0,015	0,020	-0,002	0,180	0,145	0,133	0,000	0,115
X12	0,178	0,209	0,096	0,129	-0,008	-0,039	-0,070	-0,033	0,665	0,621	0,806	1,000	0,742	0,244	0,194	0,142	0,043	-0,072	-0,100	-0,160	0,225	0,173	0,099	-0,021	0,035	0,109	0,184	0,105	-0,025	-0,025	-0,006	0,021	0,153	0,203	0,162	0,061	0,152
X13	0,103	0,086	0,112	0,120	0,039	0,036	-0,100	-0,070	0,698	0,606	0,948	0,742	1,000	0,073	0,213	0,192	0,057	-0,047	-0,045	-0,216	0,195	0,145	0,045	-0,122	0,132	0,188	0,269	0,069	-0,027	-0,017	-0,028	-0,032	0,091	0,065	0,046	-0,030	0,043
X14	0,293	0,191	0,232	0,232	-0,116	-0,151	0,064	0,112	0,159	0,154	0,073	0,244	0,073	1,000	0,214	-0,025	0,042	-0,096	-0,230	0,045	0,164	0,241	-0,046	-0,007	-0,068	-0,069	0,095	0,054	-0,085	-0,080	-0,201	0,044	0,220	0,278	0,269	0,060	0,229
X15	0,274	0,240	0,003	0,013	0,172	0,069	-0,016	-0,005	0,181	0,158	0,166	0,194	0,213	0,214	1,000	0,002	0,063	0,018	0,143	0,042	0,144	0,149	-0,065	0,055	-0,026	-0,020	0,177	0,039	0,035	0,034	0,031	0,029	0,126	0,060	-0,003	0,027	0,007
X16	-0,006	0,074	0,061	0,039	-0,142	-0,156	0,178	0,167	0,144	0,062	0,164	0,142	0,192	-0,025	0,002	1,000	0,045	-0,110	-0,140	-0,741	0,017	0,008	0,049	0,217	0,585	0,822	0,035	0,022	0,019	0,018	-0,054	-0,072	-0,133	-0,109	-0,100	-0,030	-0,097
X17	0,098	-0,025	0,028	0,040	-0,018	0,085	-0,075	-0,051	0,098	0,046	0,039	0,043	0,057	0,042	0,063	0,045	1,000	-0,003	-0,015	0,007	0,173	0,238	-0,142	0,101	0,139	0,065	0,240	0,061	-0,065	-0,027	-0,118	0,002	0,043	0,119	0,142	0,100	0,121
X18	0,041	0,045	0,107	0,113	0,455	0,300	-0,289	-0,297	-0,038	-0,044	-0,056	-0,072	-0,047	-0,096	0,018	-0,110	-0,003	1,000	0,467	-0,011	0,105	0,052	-0,062	-0,019	-0,159	-0,159	0,059	-0,113	0,009	-0,010	0,179	0,164	0,164	0,131	0,049	-0,011	0,125
X19	-0,084	-0,045	0,178	0,185	0,899	0,605	-0,520	-0,537	-0,097	-0,084	-0,039	-0,100	-0,045	-0,230	0,143	-0,140	-0,015	0,467	1,000	0,064	0,129	0,039	-0,055	-0,045	-0,029	-0,088	-0,013	-0,031	-0,029	-0,030	0,452	0,372	0,317	0,241	0,182	0,095	0,253
X20	0,005	-0,096	-0,067	-0,046	0,085	0,090	-0,078	-0,069	-0,159	-0,102	-0,207	-0,160	-0,216	0,045	0,042	-0,741	0,007	-0,011	0,064	1,000	-0,054	-0,005	0,001	-0,111	-0,334	-0,492	0,019	0,015	-0,001	0,004	-0,011	0,006	0,025	0,030	0,039	-0,065	0,020
X21	0,113	0,201	0,094	0,111	0,237	0,344	-0,399	-0,311	0,190	0,191	0,261	0,225	0,195	0,164	0,144	0,017	0,173	0,105	0,129	-0,054	1,000	0,744	-0,031	-0,161	0,141	0,070	0,188	0,149	0,031	0,025	0,095	0,124	0,273	0,396	0,294	0,078	0,366
X22	0,100	0,147	0,050	0,061	0,128	0,234	-0,289	-0,179	0,103	0,095	0,187	0,173	0,145	0,241	0,149	0,008	0,238	0,052	0,039	-0,005	0,744	1,000	0,004	-0,191	0,099	0,038	0,030	0,148	-0,092	-0,077	0,037	0,102	0,207	0,393	0,343	0,115	0,361
X23	-0,093	0,044	-0,093	-0,078	-0,007	-0,047	0,062	0,051	0,053	0,067	0,065	0,099	0,045	-0,046	-0,065	0,049	-0,142	-0,062	-0,055	0,001	-0,031	0,004	1,000	-0,060	0,084	0,080	-0,115	0,019	0,043	0,035	0,052	0,041	-0,097	0,015	-0,074	0,108	0,040
X24	-0,041	-0,041	-0,016	-0,028	-0,091	-0,093	0,162	0,129	-0,130	-0,110	-0,123	-0,021	-0,122	-0,007	0,055	0,217	0,101	-0,019	-0,045	-0,111	-0,161	-0,191	-0,060	1,000	0,089	0,202	0,384	0,045	-0,014	-0,013	-0,036	0,007	-0,083	-0,107	-0,074	-0,092	-0,155
X25	-0,091	0,023	-0,026	-0,044	-0,027	-0,043	0,075	0,081	0,101	0,005	0,096	0,035	0,132	-0,068	-0,026	0,585	0,139	-0,159	-0,029	-0,334	0,141	0,099	0,084	0,089	1,000	0,860	0,079	0,101	0,055	0,056	-0,055	-0,080	-0,090	-0,012	-0,067	0,057	-0,002
X26	-0,070	0,033	0,011	-0,007	-0,080	-0,106	0,154	0,153	0,143	0,059	0,166	0,109	0,188	-0,069	-0,020	0,822	0,065	-0,159	-0,088	-0,492	0,070	0,038	0,080	0,202	0,860	1,000	0,080	0,048	0,025	0,021	-0,049	-0,074	-0,102	-0,058	-0,075	0,012	-0,039
X27	0,173	0,041	0,033	0,034	0,013	0,023	0,006	0,006	0,172	0,171	0,225	0,184	0,269	0,095	0,177	0,035	0,240	0,059	-0,013	0,019	0,188	0,030	-0,115	0,384	0,079	0,080	1,000	0,051	-0,006	-0,007	-0,065	0,010	0,105	0,058	0,002	0,016	0,012
X28	-0,095	-0,028	-0,041	-0,053	-0,040	0,018	-0,039	-0,032	0,035	0,066	0,070	0,105	0,069	0,054	0,039	0,022	0,061	-0,113	-0,031	0,015	0,149	0,148	0,019	0,045	0,101	0,048	0,051	1,000	0,170	0,216	-0,106	-0,072	-0,043	0,025	-0,042	-0,007	-0,045
X29	0,071	0,020	-0,067	-0,061	-0,038	0,011	0,001	-0,021	-0,050	0,000	-0,014	-0,025	-0,027	-0,085	0,035	0,019	-0,065	0,009	-0,029	-0,001	0,031	-0,092	0,043	-0,014	0,055	0,025	-0,006	0,170	1,000	0,977	-0,059	-0,104	-0,135	-0,111	-0,134	0,029	-0,128
X30	0,051	-0,001	-0,092	-0,086	-0,044	0,007	0,019	0,000	-0,052	0,001	-0,015	-0,025	-0,017	-0,080	0,034	0,018	-0,027	-0,010	-0,030	0,004	0,025	-0,077	0,035	-0,013	0,056	0,021	-0,007	0,216	0,977	1,000	-0,059	-0,110	-0,157	-0,118	-0,159	0,035	-0,127
X31	-0,098	-0,009	0,024	0,050	0,375	0,181	-0,230	-0,234	0,012	0,030	0,020	-0,006	-0,028	-0,201	0,031	-0,054	-0,118	0,179	0,452	-0,011	0,095	0,037	0,052	-0,036	-0,055	-0,049	-0,065	-0,106	-0,059	-0,059	1,000	0,753	0,326	0,239	0,210	0,073	0,244
X32	0,015	0,008	0,152	0,175	0,355	0,212	-0,241	-0,233	0,002	0,015	-0,002	0,021	-0,032	0,044	0,029	-0,072	0,002	0,164	0,372	0,006	0,124	0,102	0,041	0,007	-0,080	-0,074	0,010	-0,072	-0,104	-0,110	0,753	1,000	0,398	0,350	0,305	0,066	0,316
X33	0,004	0,023	0,389	0,422	0,404	0,280	-0,351	-0,340	0,140	0,148	0,180	0,153	0,091	0,220	0,126	-0,133	0,043	0,164	0,317	0,025	0,273	0,207	-0,097	-0,083	-0,090	-0,102	0,105	-0,043	-0,135	-0,157	0,326	0,398	1,000	0,495	0,419	0,125	0,455
X34	0,143	0,128	0,312	0,356	0,367	0,268	-0,394	-0,363	0,187	0,181	0,145	0,203	0,065	0,278	0,060	-0,109	0,119	0,131	0,241	0,030	0,396	0,393	0,015	-0,107	-0,012	-0,058	0,058	0,025	-0,111	-0,118	0,239	0,350	0,495	1,000	0,726	0,313	0,828
X35	0,093	0,060	0,290	0,321	0,257	0,197	-0,321	-0,302	0,186	0,177	0,133	0,162	0,046	0,269	-0,003	-0,100	0,142	0,049	0,182	0,039	0,294	0,343	-0,074	-0,074	-0,067	-0,075	0,002	-0,042	-0,134	-0,159	0,210	0,305	0,419	0,726	1,000	0,286	0,704
X36	0,090	0,026	0,035	0,059	0,131	0,039	-0,036	-0,019	-0,004	0,025	0,000	0,061	-0,030	0,060	0,027	-0,030	0,100	-0,011	0,095	-0,065	0,078	0,115	0,108	-0,092	0,057	0,012	0,016	-0,007	0,029	0,035	0,073	0,066	0,125	0,313	0,286	1,000	0,398
X37	0,126	0,113	0,280	0,317	0,372	0,298	-0,390	-0,361	0,170	0,159	0,115	0,152	0,043	0,229	0,007	-0,097	0,121	0,125	0,253	0,020	0,366	0,361	0,040	-0,155	-0,002	-0,039	0,012	-0,045	-0,128	-0,127	0,244	0,316	0,455	0,828	0,704	0,398	1,000