Saint Petersburg State University

Graduate School of Management

Master in Corporate Finance

Analysis of the impact of environmental factors on a performance of U.S. and Russian equities

Master's Thesis by the 2nd year student

Concentration – Master in Corporate Finance

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АННОТАЦИЯ

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Название ВКР	Анализ влияния экологических факторов на доходность Американских и Российских акций
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Описание цели, задач и основных результатов	Целью работы является исследование влияния ряда важных экологических событий на доходность акций Российских и Американских компаний. Основной целью исследования было определение секторов экономики, которые были менее подвержены влиянию этих событий. В работе используется метод событийного анализа для того, чтобы определить, влияло ли то или иное событие на доходности акций или нет. В первой главе описываются основные риски и способы управления ими. Во второй главе описываются экологические, социальные и факторы корпоративного управления и их влияние на оценку компаний. В третье главе представлено эмпирическое исследование. В результате были определены секторы экономики, которые не показывали сверхдоходностей в окне события после объявления той или иной информации в публичных источниках.
Ключевые слова	Ивент анализ, рынок акционерного капитала, экология, климатический риск

ABSTRACT

Master Student's Name	Baskhaev Georgii Sergeevich
Master Thesis Title	Analysis of the Impact of Environmental Factors on a Performance of U.S. and Russian Equities
Educational Program	Management
Main field of study	Corporate Finance
Year	2020
Academic Advisor's Name	Lukianova Anna Evgenjevna
Description of the goal, tasks and main results	The aim of the work is to study the influence of a number of important environmental events on the stock performance of Russian and American companies. The main research goal of the study was to identify sectors of the economy that were less affected by these events. The paper uses the event study method in order to determine whether an event affected the stock returns or not. The first chapter describes the main risks and how to manage them. The second chapter describes the environmental, social, and corporate governance factors and their impact on company valuation. An empirical study is presented in the third chapter. As a result, sectors of the economy were identified that did not show abnormal returns in the event window after the announcement of information in public sources.
Keywords	Event studies, equity capital markets, ESG, environment, climate risk

Introduction

Considering that with each day more and more people start to care about an environment. It is verified at least by a steady growth of interest according to Google Trends search by the word "climate change". Paris Agreement, which was signed in 2016, is one of the precursors of global consciousness about the climate change. It is obvious that with a such a rapid growth in world's GDP, which has almost doubled for the past 20 years, businesses all around the world had made an impact on the world's environmental state. Starting from a huge leap of production rate in China to an increase of wealth of emerging markets, which result in an increased consumption of goods and, consequently, wastage. As of now, the global temperature already increased by 2 degrees Fahrenheit or 1.15 degrees Celsius, compared with pre-Industrial era. Despite the fact it might seem as a small tradeoff between economic growth, it actually damages Earth in a big way by driving temperature extremes, reducing sea ice and changing natural habitats for different species. All in all, the rapid economic growth brings with itself not only a good thing, such as comfort, wealth and satisfaction of almost all needs, but also a great risk not only to the business in general, but whole humanity.

Not only researches around the world are worried about the climate change, but also prominent entrepreneurs. It can be seen in a huge increase of popularity of such people as Elon Musk. Musk's companies have been stating their mission as "to accelerate the world's transition to sustainable energy" since their beginning. Back in the day it was assessed as a joke – that a small startup from California can outperform and can have a bigger market capitalization than used-to-be giants, as General Motors. However, nowadays it is the reality – sustainability and environmental issues became not only the fancy topics of discussions, but the big value drivers for businesses all around the world.

However, what about investors' side? According to JPMorgan Investment Outlook for 2020, starting onward, an increased market volatility can take place in 2020, because that is an election year for U.S. President. In addition, now during the COVID-19 pandemic, this uncertainty is likely to become even higher. Obviously, an increased market volatility in U.S. would have to some extent a spillover effects on other markets. Market volatility, which can be described as an increased range of possible returns on assets, is one thing that every investor should consider for. In other words, market volatility is the risk measure, meaning that there is a wider range of possible final values for investor's investment. As it is said in the same JPMorgan Investment Outlook for 2020, due to an increased market volatility and uncertainty on the market, investors should stick to their plans and make investment decisions despite of any political or geo-political news arise. However, every investment decision should

be still done in accordance to external factors, therefore, an investor most likely would like to know – what assets or what regions are impacted by these unexpected events from either political news or environmental news? In addition, according to Vanguard's economic and market outlook for 2020, global growth is likely to decline in the future years, which in turn would mean a narrower room for investments to take place. However, in 2019 U.S. equity market in the face of S&P 500 has risen up over 25%, but GDP growth across the world is still at all times low, meaning that there is a limited amount of money to be made in the future. Therefore, while making investments, investors should be aware of securities and theirs' risk-return tradeoff they are opting to. Besides, as 2019 and 2020 have already shown, a one or two words written by a famous and important person (such as Donald Trump or Elon Musk) can deteriorate stocks' returns. However, such tweets are just a drop in the ocean, compared to the big news, such as bankruptcy of a company, new legislative requirements to firms or a pandemic outbreak in the region. Therefore, it is wise for investors to actually understand, what industries would be more or less stable in the light of unexpected shocking events on the market.

Research goal is determined as to find out sectors of economy, which are less influenced by important environmental events.

Research questions, answers for which would help to achieve the paper's research goal, are defined as follows, based both on the prior academic research and an interest from investor community:

Question 1 – Do events of this study affect stock performance of companies from the sample?

Question 2 – Which economy sectors are less influenced in regard to these events?

Question 3 – How do U.S. and Russian stock markets differ in regard to the reaction to these events?

Research goal is going to be achieved through several research objectives, which are outlined below:

1. Acquire and synthesize knowledge about ESG factors;
2. Understand and synthesize risk mitigation techniques by investors
3. Analyze previous researches on climate risk incorporation into valuation
4. Propose an empirical methodology for the analysis of climate risk impact on stock returns
5. Acquire and describe the data for the analysis and conduct the event study analysis

6. Synthesize the results of the analysis and propose managerial implications of the findings

This research is structured in accordance with an aforementioned structure and consists of introduction, three chapters, final discussion on the subject, references list and appendices.

In the first chapter, a description of different type of risks for financial investors is going to be discussed. Next, a brief literature overview on risk management approaches is going to be done. Such approaches include diversification, hedging, insurance and loss prevention. That is done in order to understand the current situation on effectiveness of such procedures for investors.

In the second chapter author is dedicated to examine theoretical background on the research subject and its aspects. First, author is dedicated to show the justification of environmental risk and its relevance through literature review on the research subject. Second, an acronym "ESG", which means Environmental, Social and Governance factors, is examined. These factors are analyzed first from historical view: the moment that term was coined and how it was developed over time. More narrowly, such term as "climate risk" is explored, which is attributed to Environmental part of ESG scoring system. Simultaneously, in the second chapter environmental events are highlighted, in order to include to empirical research.

As for the third chapter, an examination of previous researches on the similar matter is done and an examination of possible empirical methodology for this research. As a result, author chose event studies analysis for the paper. In the same chapter, author proposes the methodology and describes the methodology in more details. Author lists events, which are most likely to affect the stock performance, and which are to be included in the event study analysis. Apart from that, research design is being described.

Further, author examines data sample collection process and includes the empirical research itself. In the first part of the paper, author describes the reasoning behind choosing the sample companies for an empirical study.

This research is based on 130 common stock equities from U.S. and Russian stock exchanges respectively. These stocks were chosen in accordance with their ESG-scoring and GICS sector classification. Author wanted to depict the picture of stocks from different sectors and geography. Final list of the GICS sectors, which would be fruitful for the research, is:

- Information Technology
- Health Care
- Financials

- Real Estate

- Consumer Discretionary

- Industrials

- Communication Services

- Consumer Staples

- Energy

- Materials

- Utilities

These sectors are being assigned to 130 aforementioned stocks with the main goal to answer the question – how different sectors react to environmental events and subsequent answer as to what sectors are less impacted by environmental events.

As for the data sources - data on common stock returns was collected through publicly available source – Yahoo!Finance. ESG risk profiles was also found on Yahoo!Finance portal, these ESG scores are Sustainalytics' ESG Risk Ratings. Choice of Yahoo!Finance was as such due to the availability of Sustainalytics' ESG Risk Rating, because this same rating was used in the previous research done by Robert Engle in 2019, therefore, it is fair to say this rating is verified in academic community. A more detailed review on this paper is going to be done in the next chapter.

1. Risk management overview: main financial risks and mitigation techniques

As the title implies, in this chapter a discussion about different risks, which investors are faced with, is going to be done. In order to understand it better, first, it is needed to define what "risk" actually means in finance world. Therefore, on a conceptual level, risk is some degree of uncertainty or variability of your potential return under investment decision. (Investor.gov) On a more applied and mathematical level, risk is a standard deviation or variance (which is standard deviation squared). (Brealey et al. 2013) of returns on a given security. In order to calculate standard deviation of a security, which is a risk measure, following equation sheds some light on the process:

$$\sigma = \sqrt{\frac{\sum(x_m - \bar{x}_m)^2}{N}}$$

Where x_m is an actual return on security m; $\bar{x}_m$ is a mean of returns on security; N – number of observations

It is usual for investors to face one type of risk or another, however, most of the times investors would face the whole list of different risks. These risks can be categorized based on the source of these risks (Modigliani et al. 2010)

- Credit risk

- Market risk

- Settlement risk

- Liquidity risk

- Operational risk

- Legal risk

To start with, credit risk is a type of risk, when one party is not to fulfill its obligations on contract. For instance, if an investor puts his money on a deposit account and bank, where this deposit is held, goes bankrupt – that is a situation of a credit risk realization.

Next, a market risk or systematic risk, is a risk to economic well-being of a financial institution due to sharp movements of prices on the market. This kind of risk cannot be diversified away due to the fact it applies to the market as a whole, therefore, even if an investor invests into several securities, this is not going to decrease his exposure to market risk.

Settlement risk, as described by International Financial Risk Institute, is a risk of a failed transaction between the parties. This risk includes parts of credit risk (counterparty risk) and liquidity risk.

Liquidity risk is another important risk, which heavily realized back in financial crisis 2007; this is a risk of a financial institution being unable to make transaction of a financial instrument near or at the market value. This can be seen as a wide Bid-Ask spread, meaning that a financial instrument cannot be traded without making a substantial loss.

Legal risk is a risk of loss due to lack of either legal standards or ethical standards or contractual obligations by the market player (be it either a financial institution or a company). Such risk was realized during the Enron scandal, when company officials intentionally breached the law.

Operational risk is a "risk of loss due to inadequate or failed internal processes, people and systems, or from external events" (Principles for the Sound Management of Operational Risk, Basel Committee on Banking Supervision, 2011). Major categories of operational risk, according to The Global Association of Risk Professionals, are as follows, based on the source of a loss being done to the company:

- Employee – due to action or inaction of an employee

- Business process – due to firms' execution of business operations

- Relationships – due to interaction with other stakeholders

- Technology – due to failure of a technology, data or information

- External – due to people or entities outside the firm, cannot be controlled

As it was stated, this research focuses on the analysis of company's stock returns, affected by one or another environmentally-connected events. If it is assumed that returns are affected, therefore it can be concluded companies bear some risks within, which are connected to these events. When event takes place, these risks realize to some extent. As it was mentioned, risks are being categorized based on the source, where this risk comes from.

All types of risks affect investment decisions for both investors and companies. As corporate finance theory highlights, there are three main decisions done by the company: investment decision, financing decision and dividend decision. Therefore, this research is primarily concerned about investment decisions done by either an investor or a company, because investment choice includes three main stages. First, asset allocation stage, which describes the asset class, where an investor wants to put some money. Second, asset selection stage, during which an investor looks through all possible choices of assets of the same class and makes a final call on to which security exactly he or she wants to put his or her money in. During this stage process of due diligence is done. This research aims to connect with this process. During this stage investment risks are clarified and then, an investor can understand whether the risk-return tradeoff is suitable for him or not. Last stage of the investment choice process is performance evaluation. As the name implies, after the investment is made, investor evaluates his or her return on the investment and comes up with an understanding whether the investment was successful or not.

However, what can be done in order to manage all these risks? As the universe of risk management is quite wide, it is needed to somehow structure it into mutually exclusive and collectively exhaustive categories. In "Risk Management and Financial Institutions" by John C. Hull, author comes up with the following structure, which fits the aforementioned criteria. First strategy of risk management is risk decomposition, which implies identifying each risk one by one and coming up with a proper way of managing this risk. As an example of this strategy of risk management, hedging can illustrate it. For instance, taking as an example random airline company – it is of conventional understanding that most of its costs are fuel costs. However, it is also known, that a risk of extremely high volatility of oil prices is present nowadays, therefore, after this risk is identified by company's risk managers, different actions can be undergone. To hedge its purchasing oil prices from its suppliers (through derivative financial instruments, as an example) is one way of handling of such risk.

However, in Okulov's book "Risk management" a deeper explanation what hedging is presented. Hedging can be regarded as a special case of Markowitz diversification, when one asset perfectly negatively correlates to another asset, thus, making a total risk of portfolio equaled to zero and losses in one asset are outweighed by profits in another or vice versa. However, due to the fact that it is so rare that assets can be perfectly negatively correlated, investors usually use derivative financial instruments for that mission. Since this research paper is not aiming to describe derivative financial instruments, only a short introduction to the term and its meaning is going to be presented. Derivate financial instrument is a type of a contract, under which fixes rights and liabilities of two parties signing the contract about some underlying asset. Most common types of derivative instruments are as follows:

- Forward and futures contracts
- Swap contracts
- Option contracts

As for underlying assets, pool of such assets is quite wide and includes the following:

- Commodities, such as energy materials and metals
- Currencies, such as USD or EUR
- Securities, such as common shares of companies
- Financial market indicators, such as interest rates or stock market indexes
- Weather
- Energy
- Other derivative instruments

In addition, in a recent research paper, Robert Engle also came up with an interesting application of hedging in portfolio management.

As it is discussed in Engle et al. (2019) paper "Hedging Climate Change News", with the changing climate in the world, investors need to look for a suitable hedging strategy, which would perform good in a long-run against realization of climate risk. That is supported by the fact regular futures or options cannot really hedge against this type of risk due to the fact no one can assure that, during the climate disaster, he or she will pay back on its contract. That can be explained by the fact, most probably, in such an event, everyone at the same time would like to exercise their options. As the main deliverable, Engle et al. attempted to develop dynamic hedging strategy, which would use news-based indices as the benchmark of the change in climate risk. In order to

hedge this change in climate risk, researches propose to hedge it through common stocks.

In addition, since most of the time investors are worried not about the actual realization of the risk itself, but rather about the uncertainty this risk implies on the future. This assumption was also used in Engle's paper, in which the hedging itself was proposed against climate change news. The methodology of the research is explained in the following steps.

As a first step, researches have come up with two indices, which reflected climate change as a topic in news. As the primary news source researches chose the Wall Street Journal. WSJ Climate Change Index reflects the amount of news somehow connected to climate change. However, this index does not reflect whether news was positive or negative, which is a substantial error, because good news about climate change (e.g. technology development on containing CO_2 emissions) would lower climate risk, rather than increase it. Therefore, another index was calculated. Another index was based on sentiment analysis in order to measure intensity of negative climate-related articles. This is done in order to actually find out the degree to which articles are negative or not.

Next step was to construct well-diversified portfolio, which is to diversify away climate risk. As it was already stated, pool of assets to include into the portfolio is framed into common stock equity based in U.S. Penny stocks (stocks priced below \$5 threshold) were not included into the research alongside with microcap companies, because it can potentially distort the returns of hedges portfolio according to Fama and French paper of 2008.

As asset pool is identified, it is then needed to rank these stocks by their ESG risks exposure. Engel et al. do that by including data from third-party providers of ESG data on such companies. These data-providers are MSCI and Sustainalytics. For instance, MSCI rates companies by several environmental subcategories. Threshold for including the company into "good" or "bad" condition on the subcategory is restricted for others, therefore, it is unknown how the back analysis looks like. Nevertheless, researches produced their MSCI E-Score by subtracting total score in negative environmental subcategories from total score in positive environmental categories. It is worth mentioning that, despite the fact these categories are a good proxy for environmental risk exposure of the company, however, it would be more accurate to assess the company by the exposure to one specific indicator, such as Energy & Climate Change. Obviously, a company, such as Conoco Philips, would be much more exposed to that specific risk, than a cleantech company. Yet however, in Engle et al.'s paper, it is found that industries with the lowest environmental score, according to Sustainalytics

ranking, are Personal Services, Water Transportation and Motion Pictures. Surprisingly, oil and gas industry is not even in the top-3 industry by the worst environmental rating.

In the research, a mimicking portfolio approach is being used. As a result, researchers found out a correlation of 0.17 for Sustainalytics hedged portfolio and an improvement of climate news. In other words, return for hedged portfolio would averagely increase with the improvement in climate change news by 0.17.

Second broad strategy of risk management in finance is risk aggregation. In order to reduce its risk exposure, companies or investors can be well-diversified, so the market risk, which affects the market as a whole, takes up as little room in their portfolio as possible. These two strategies have the same goal – reducing risk; yet however, they do it differently. If hedging is considered, usually this type of risk reduction strategy is seeking a negatively correlated asset with your existing asset. For example, commodity market and stock market can be assets of that nature. Usually, when stock market moves into one direction, commodity market would move the other way. By including negatively correlated assets in the portfolio, an investor can limit his or her losses in one asset by making profit in another asset.

As for the diversification strategy, that is a way of decreasing market risk component in the overall risk structure of the portfolio by including different assets into the portfolio. The degree to which this strategy is successful depends on the asset classes and their volume or, portfolio structure. Here it is needed to distinguish between two ways of diversification. First, naïve diversification is an equally distributed sum of money among several random assets. The term "naïve" comes from the fact that an investor choses asset randomly, assuming they are not correlated or have ρ=0, speaking in statistical terms. However, it is not always possible, because most of the time assets, especially assets of the same class, e.g. equities, would have correlation of some sort. By naively diversifying, an investor can decrease its risk exposure to the certain limit by diversifying away specific risks, however, market risk component would still be present. In order to estimate the market risk of an asset, it is needed to calculate covariance of an asset and fully diversified portfolio, in practice it is often regarded as market index, such as S&P 500. Another important measure for either stand-alone asset or portfolio is a beta-coefficient. That is a relation between its own market risk to the risk of the market as a whole.

$$\beta a = \sigma[Ra] * \rho_{am}/\sigma[Rm]$$

All this brings us to Capital Asset Pricing model, proposed by William F. Sharpe in 1964. That is the model of asset prices equilibrium, which are set in the market condition. That is also a practical tool for current day investors around the globe in

order to come up with a fair risk premium for different kinds of assets. CAPM assumes two important points: (1) a presence of so-called Risk-free rate, at which all investors can borrow and lend, (2) all investors have the same expectation on expected values, standard deviations and correlation coefficients. (Sharpe, 1964) Surely, such assumptions cannot be hold true in the real-world terms, however, the model still proves to be efficient now.

$$E[Ra] = Rf + \beta a * (E[Rm] - Rf)$$

Where

E[Ra] – expected return on an asset

Rf – risk-free rate

$\boldsymbol{\beta a}$ – beta of an asset

(E[Rm] – Rf) – market risk premium

Another way of diversification is called Markowitz diversification, in the name of Harry Markowitz, who proposed world-famous Modern Portfolio theory. This diversification assumes such asset selection, in order to either minimize risk with a proposed expected return or maximize expected return with a proposed level of risk. Markowitz diversification allows any investor to make an optimal portfolio of assets in regard to investor's risk appetite. However, rarely investors use Markowitz diversification in real life. (Okulov, 2019)

Limitation is another approach of financial risk management. As the name implies, this type of risk management limits some characteristic of a financial portfolio. There are two main types of limitation: structure limitation and position limitation. As for the first type of limitation – structure limitation – this type of limitation implies exact limits of money to be invested into specific asset. Generally speaking, that determined portfolio structure and, therefore, is densely connected to diversification. As it was mentioned before, by diversifying, investor has a set of assets in his or her portfolio with different weights, in order to have a well-diversified portfolio. If these weights are limited, a fact of limitation risk management is therefore present. Limitation can be regarded as a more active investing approach, that just a diversification, because during the time horizon, an investor can change limits and, therefore, change his or her portfolio structure. Such thing as limit list can take place, so it is pre-determined what kind of assets can be and what kind of assets cannot be included into portfolio. By doing so, investor can decrease different risks within his or her portfolio. As an example, by setting limits to investing into small-cap stocks with low number of intra-day operations, investor can decrease his or her liquidity risk. This type of limitation can be also applied by financial regulators to institutional investors in order to decrease overall

risk of financial system. Another view on structure limitation can be that this type of limitation is essentially an investment strategy, if an investor defines limits in regard to different criteria.

Another form of limitation – position limitation – is the type of limitation, which declares limits on losses or profits during trading operation. For instance, if a trader has an open position, which falls by 10%, and there is a position limitation on 10% loss, then command "stop-loss" is being processed and this trading position must be closed. Most important drawback of such risk management strategy is that if there are limits on positions and an investor pulls out his or her investment, he or she makes actual loss. Simultaneously, if there are no limits, there is a possibility that after a fall in price, asset can appreciate in the future period, therefore, risk is not realized.

First chapter summary

In the first chapter an overview of possible risks and ways to manage them have been overviewed. The term "risk" itself was explained in statistical measures as standard deviation of returns. This information in particular is extremely useful in this paper, as research question #2 is asking about exposure of sectors, hence, it is now clear that standard deviation will be used as a proxy of events' influence on stock returns, thus, it can be inferred about overall impact on the sector. It is needed to say that this is an important step in the research, because in order to understand the research problem in full, it is needed to understand the whole background behind the term "risk" and how investors handle it. As it was described, investors essentially build their investment strategies, based on different risk perceptions. It would be fair to say that due to information asymmetry, every investor would come up with quite different strategies, because for one investor, with some information about possible downfall in economy, an increase in credit risk is expected. Thus, as a result, such an investor would build its portfolio of assets in accordance to that information. Meanwhile, the other investors with no such information, would be dealing with the market the usual way. This example brings us to the understanding of a topic of utmost importance in financial studies – market efficiency. According to efficient market theory, market possess strong form of efficiency, if all information, including insider information, is already being taken into prices of assets. However, conventionally, it is believed market possess semi-strong form of market efficiency, meaning that security prices include all publicly-released information in itself. By knowing your enemy, or financial risks of investing money, and knowing how to approach these risks, it is still not really clear, why there are substantial differences in stock returns and, most importantly, why one stocks rally higher, than others. Answer can lie in the field of psychology or, more explicitly, in

irrational behavior of investors and their reaction to news on the market. In the next chapter, author is to examine and describe environmental factors, as one of the explanations for possible stock price movements.

On a higher level, this chapter describes the broad landscape of this thesis – risk management. In order to better understand, how companies are affected by all kinds of risks, it is needed to understand main drivers of company's value and how it is affected by different risks. In this chapter, CAPM model is presented in brief in order to understand how riskiness is implemented into day-to-day valuations of companies or projects. It is widely known technique to estimate cost of equity within the firm. By dissecting the formula, it is well understood how environmental risk can impact companies of some specific industry, by increasing risk premium and, consequently, overall market riskiness. Subsequently, stock price is affected and stock returns as well. Robert Engle's work is cited as a possible way of hedging climate change news; however, it can also be used in a more sophisticated ways, thus, decreasing dependence of company's valuation on environmental factors. Apart from that, by referring to "Risk Management" book by Vitaly L. Okulov, several other key risk management techniques are described in order to let both future practitioners or researchers decide on what kind of technique can be used to better manage environmental risk.

2. Environmental factors as a criterion for investment

As the research problem must be justified, it is needed to explore needed literature of past several years on the subject of environmental risks and market reaction to them and overview whether the research is still needed on the matter or the subject itself is not really in the main area of interest of most prominent finance researchers around the world. Several important research papers on the subject are reviewed and presented with a clear justification of the importance of climate change risk, which every business faces nowadays.

However, in addition, policymakers and institutional investors are also very intrigued by the impact of climate change and the risk, associated with it. Due to the fact this risk is not likely to realize in the nearest future, a fear of the realization is present already now. Therefore, everyone is concerned with its impact on the economy and capital markets nowadays. That is supported by Ban Ki-Moon's speech at Investor Summit on Climate Risk in 2016. UN's General Secretary told back in the time that "…investors need to know how the impacts of climate change can affect specific companies, sectors and financial markets as a whole. These risks must be more clearly disclosed…". Apart from that, the Institutional Investors Group on Climate Change, IIGCC for short, also released a working paper back in 2016 on financial regulations

considering the climate risk. In this working paper it is said "This relates to managing the risks of the transition and to physical impacts as well as to the mobilization of capital to take advantage of opportunities. Climate risk needs to be better reflected in the price of risk so that a shift in capital can be encouraged." Apart from that, 2019 is considered to be the warmest year in Europe, which justifies the problem actuality as of 2020. Therefore, it is wise to conclude that nowadays world is concerned with the climate change and the climate risk it bears along.

That is not a big surprise, due to following reasons. First, a sound investment must be done in an economy, which is alive, working and prospering. A huge driver for that economy is a civil society, where people are neither restricted nor afraid to start a business. Another point is a long-term outlook for an investment landscape – both a society and an environment around it must be in a good condition, so returns of an investment will be proceeded in the future as well as now. Generally speaking, in order to increase a predictability of markets, you need to have a sustainable plan for the future, where such things as climate change, human rights and corruption are being assessed and tackled.

However, the question is how to actually quantify sustainability into your financial analysis and make the best out of it. Yet, there is no singular answer, but a plural one – Environmental, Social and Governance factors. These are the factors that tackle all these different issues, which impact our long-term outlook of the future. Taking Elon Musk's companies as an example, we can clearly see how this environmentally-oriented mission has boosted not only his brand image, but how it changed the landscape for the whole automotive industry. Back in 2008, when the first Tesla Roadster was delivered to its first customer, not a single big automotive brand had a standard electric vehicle in their product line. As it can be seen now such brands as BMW and Nissan have such cars in their stock, which supports the hypothesis concerning the value behind sustainability-oriented company mission.

As for practical approach, according to CFA Institute, the world's largest association of investment professionals, ESG factors can be integrated into company's valuation in different ways, which will affect enterprise value and, consequently, stock price of a company. First, using DCF approach integration process can be done in either (i) adjusting discount rate higher for companies with high ESG risk profiles, in other words, driving riskiness of a company higher and vice versa for companies with low standing on ESG risk profile; or (ii) adjusting future cash flows of the company. An example of adjusting future cash flows can be based on BP Deepwater Horizon oil spill, which results not only in one-time fines, paid by BP, but also on stricter (more expensive as a result) safety policies across the board of its businesses, thus, resulting in

lower cash flows for future periods and, consequently, lower valuation. Adjusting future cash flows is regarded as more accurate, due to materiality of such issues, because while adjusting discount rate it is not clear for how much should it be decreased or increased, making assumptions play the crucial core here. Second, using multiples valuation approach, investors would adjust target multiples the same way it would adjust discount rate. If a company is doing well on ESG risk rating, he or she would add a premium to multiple, if a company is doing poorly on ESG risk rating, he or she would discount a multiple. The same problem takes place here as with discount rate – arbitrary nature of such adjustments, because there is no clear methodology on how to do that yet.

Besides the businesses itself, it is worthy to understand the implications of sustainability on other stakeholders such as institutional investors. Surely, one company can benefit from its long-term orientation and planning, but how such institutional investors, as private equity funds can assess the importance of sustainability drivers on its portfolio returns? It is worth to understand how such funds can tackle possible environmental risks and what are the implications for their portfolio returns.

In order to justify the importance and urgency of the problem, author has critically reviewed academic literature on the subject. A lot of research has already been done in the past couple of years, however, it is still needed to actually research through it and understand the state of the research on the subject as of now. Some of the prominent research papers in the field are by Hong, Li and Xu (2019), who researched market efficiency in regard to pricing climate risks; by Kumar, Shashwat, and Wermers (2018), who investigated whether fund managers overreact to climate disasters and, consequently, underweight stocks in their portfolios. However, other than some other recent research papers on the subject, such as Engle's research on hedging the climate risk, research subject is still undeveloped and requires additional empirical studies, according to Kumar, Shashwat, and Wermers (2018). In this research, author wants to test possible stock market inefficiencies in regard to climate risks, which are denoted as environmental events. Due to the fact that events themselves are not the moving forces, but the information about the event is, it is best to analyze the impact of such events (be it either regulatory improvements or direct impact events) through event study analysis, where a researcher investigates market efficiency in regard to some events. Therefore, it is worthy to understand this impact of the information, connected with climate risks, which can be both a regulatory impact or a direct impact of an event. Author wants to add into the research subject, whether markets and, subsequently, investors are efficient in regard to unexpected events, connected with climate risk. Due to aforementioned structure of the impact – whether through regulatory improvement or direct impact – events can also be classified. In this research author wants to include following events

for one or another category – Paris Agreement ratification for regulatory improvements; VW emission scandal – direct impact; and COVID-19 outbreak is for both categories, due to the fact it hampers GDP growth right now, but, surely, this event will trigger some regulatory improvements.

In addition, as Hong, Li and Xu noted in their research paper in 2019 – "…climate change risks need not be so narrowly confined to carbon exposures. Vulnerability of corporations' production processes to natural disasters amplified by climate change can impose significant damage to corporate profits.", in author's mind it is particularly important to investigate not only just carbon emissions and its implications on company's performance, but a wider picture of ESG factors. It was also something of a prophetic statement, because currently there is an obvious evidence, how companies, which were not readily available to a full digital shift, experience huge slump in their revenues and overall performance due to COVID-19 outbreak. Such companies, as PwC or McKinsey, were already operating in a fully digitized environment, so that was not a problem for them to rapidly switch to online format; yet however, some companies are experiencing huge losses due to their inability to switch to online format, because they did not really account for natural disaster scenario.

Thereby, the impact of possible environmental risks, which are brought along with environmental news, are going to be analyzed. As it was stated, since the uncertainty of such risks realization is the most dominant force on the market, it would be enthralling to see which economy sectors on average would perform good or bad in regard to such news.

2.1 ESG factors

As the name suggests, ESG factors are the group of several issues, which can be distributed into three broad categories: environmental, social and governance. As it is vague enough to include into any financial analysis, these categories should also be broken down further into key issues, which can have an impact on the value of a company.

First, there are environmental factors. These factors include following issues, but are not limited to:

- Climate change risks
- Toxic wastage reduction
- Legislative requirement for new environmental liabilities
- Reputational risks, connected with bad image of the company among civil society

- Emerging markets for environmentally-friendly goods and services (Who Cares Wins, 2005)

As it can be observed, it is a lot of qualitative data to be gathered concerning environmental factors. Nevertheless, as it is suggested by financial institutions in their paper named "Who Cares Wins", it is still worthy to more rigorously include such factors in the financial analysis, as it can shed the light on several findings about the investment project or the company. Such issues as overall risk levels and management quality are among these findings. These findings are good indicators of the long-term company's success and, consequently, such company can be a good target for an investment.

Despite the importance of all such factors, in this thesis author wants to underline the climate risk factor as the major one. That is done due to the assumption that it can possibly have a bigger impact on companies from Russian Federation, than other factors. This assumption is supported by the fact biggest Russian companies come from the industries, where environmental issues and, namely, climate risk, are taken very seriously. Metals and mining, alongside Oil and Gas are industries, where climate risk can play a big role in the future, as these companies all operate in the industries, where their asset base is physically limited. Such industries as Metals & Mining alongside Oil & Gas industries are among the biggest exporters from Russia to non-CIS countries, which is supported by the fact these industries combined exported roughly 77.1% of the total exports to non-CIS countries in 2018. Therefore, these industries are in the narrow focus of this research, due to the fact these are strategically important for Russia, as they contribute to country's export structure the most. Moreover, these industries are among the riskiest, which are to be affected by ESG factors. (S&P Global). Both Oil&Gas and Metals&Mining are assessed with 6 out of 12 risk score on the scale of environmental factors by S&P Global Ratings in May 2019. Simultaneously, social factors add to the risk score of these industries up to 11 out of 12 risk score.

Environmental side of the issues can be broken down into several points. First, oil & gas industries themselves are exposed to greenhouse gas emissions, pollution from well head and oil spills and leaks during the transportation process. These all factors add up to the fact oil and gas industry is greatly exposed to overall environmental risk and ESG risk ratings for such companies would most likely be higher, than for companies from other industries.

Second, it is worth mentioning an increased attention to CO2 emissions from combustion engines around the world. Back in 2015, when the Volkswagen emission scandal happened, when the one of the biggest automobiles holding, VAG, was

intentionally decreasing NOx emission number on its engines by a software in order to meet US standard on NOx emission number. Former Volkswagen AG's CEO, Martin Winterkorn, was charged for fraud and conspiracy. News about the scandal were released on 18 September 2015. Quantifying this fact, Volkswagen AG's stock price has plummeted after the news by 37.3% from $161.35, the stock price of VOW.DE on 13 September, to $101.15 on 27 September. This sad story tells how much an environmental issue can cost to the company. Furthermore, all of that can and will possible lead to a decline in combustion engines usage, which is to affect oil & gas industry, which are the supplier of such types of fuel.

Third, as the trend for a sustainable packaging has increased over time, it is worth mentioning a decrease in plastic usage. Plastic waste is in the focus of the biggest FMCG companies, which plan to reduce it. (P&G Annual Report, 2019) This will also lead to a decrease in Oil & Gas companies' revenues, due to the fall in demand for the oil, main raw material for plastic production.

However, not only environmental factors can affect the company's value, as it was mentioned before there are also social and governance factors, both of which had also played a huge role in Volkswagen's scandal.

As it is obvious social factors also play a crucial role in the companies' risk profiles and companies' value, it is needed to outline them. Social factors include such issues, as:

- Workplace health and safety
- Community relations
- Human rights issues at company and suppliers'/contractors' premises
- Government and community relations in the context of operations in developing countries
- Increasing pressure by civil society to improve performance, transparency and accountability, leading to reputational risks if not managed properly (Who Cares Wins, 2005)

Taking oil & gas companies as an example again, workplace safety can be one of the major issues from these social issues, due to harshness of work conditions and overall riskiness of drilling activities.

In terms of an increased pressure by civil society to improve transparency of the firm, Nestle's example can be much of use. Nestlé has been a part of numerous scandals, one of which was about the supply chain, which relied on West African plantations of cocoa. Later, it has been revealed that these plantations used child labor

for cocoa gathering. This case illustrates how non-transparent supply chain can damage whole company's reputation.

These factors are also to play an important role in Russian environment due to the very same reasons outlined before. Due to the fact oil and gas industries alongside metals and mining are one of the biggest employers in the country, thus, it means they are responsible for a large sample of the working population. Therefore, it is of highest importance to provide healthy and safe working conditions to all those workers. However, as a part of this analysis, social factors are not included into empirical study of private equity portfolios.

Last, but certainly not least, set of factors, involved into ESG methodology are corporate governance issues:

- Board structure and accountability
- Accounting and disclosure practices
- Audit committee structure and independence of auditors
- Executive compensation
- Management of corruption and bribery issues

In a paper by Bebchuk L. et al it is said corporate governance issues do have an effect on shareholders. This paper attempted to analyze which provisions of the company have an effect on firm's value. Such provisions are:

- Staggered board
- Limits to amend bylaws
- Limits to amend charter
- Supermajority
- Golden parachute
- Poison pill

It is worth mentioning that, generally, much of these issues are cross-referenced. Such issues, outlined by UN Global Compact, as executive compensation or board structure are easily identified in the provisions by Bebchuk et al., such as staggered board or. Golden parachute. As OECD's paper on Principles of Corporate Governance states – "The corporate governance framework should promote transparent and fair markets, and the efficient allocation of resources. It should be consistent with the rule of law and support effective supervision and enforcement." Therefore, it is suggested that such issues are to affect company's performance adversely. If a company does not properly follow principles of corporate governance, an event of corruption can potentially take place within such company. A world-famous example, when there were no principles of corporate governance within the company and its management is Enron.

Back in the day, Enron was one of the biggest energy companies in the world. However, due to poor disclosure of fatal points in their financial statements, Enron went bankrupt. Yet however, it can be regarded as a foolish move, but it was purely intentional and fraudulent.

2.2 Climate Risk

Climate risk can be broadly classified into three categories according to Hjort, 2016:

(a) environmental risks, such as loss of biodiversity, melting of ice sheets;

(b) policy risks, such as when and how new regulations will be imposed, and their impacts;

(c) economic risks, defined as the uncertainty impact of climate risk on the economy, in general, and financial markets in particular.

As it was already discussed, this thesis will focus on environmental factors of ESG scores. Namely, author proposes to assess climate risk as an economic risk, which in turn has an impact on companies' valuation, investors' hedging strategies and, overall, give a clear and concise picture on how it is perceived in the eyes of finance leaders.

It is worth mentioning that climate risk's impact can be distributed into several streams. First, a direct impact, such as costs for a better construction in coastal regions in order to hedge against typhoons and tsunamis. Moreover, insurance companies would also ask to pay a premium on the insured building, if it is located in the zone of an increased danger. Second, climate risk would surely impact companies via an issuance of policies and regulatory side of the climate change combat. Any kinds of restrictions on carbon emission would inevitably impact oil and gas industry or automakers. Third, according to an aforementioned example of Tesla, which is now valued much more, than General Motors, we can state a technological innovation related to climate change would surely impact traditional businesses.

In order to support the point about the importance of climate risk, it is needed to mention that a number of articles have been written, considering how climate risk is to influence different industries. Thus, institutional investors shall take into account climate risks in their investment decisions. Explicitly, recent asset pricing models highlight the importance of climate risks as a long-term risk factor (Bansal, Kiku, and Ochoa 2017) and the importance of carbon risks and environmental pollution in the stock returns (Bolton and Kacperczyk 2019; Hsu, Li, and Tsou 2019). Growing number of articles with evidence are to support the fact that climate risks may be mispriced in financial markets (Hong, Li, and Xu 2019; Daniel, Litterman, and Wagner 2017;

Kumar, Xin, and Zhang 2019). At the company level, Addoum, Ng, and Ortiz-Bobea (2019) show that extreme temperatures can adversely affect corporate earnings, Pankratz, Bauer, and Derwall (2019) provide support that increasing exposure to high temperatures reduces revenues and operating income, and Kruttli, Tran, and Watugala (2019) show that extreme weather is reflected in stock and option market prices. Moreover, evidence assumes significant changes for firm's operation activity after the Paris Agreement. For instance, increased climate risk leads to lower firm leverage and lenders reducing their lending to firms with the greatest risk (Ginglinger and Moreau 2019); banks began to price carbon risk into their loans after the Paris Agreement (Delis, de Greiff, and Ongena 2019); and credit ratings and yield spreads changed for polluting firms as a result of this event (Seltzer, Starks, and Zhu 2019). In addition, studies conclude that firms can lower their cost of capital and increase value by improving their environmental policies (Sharfman and Fernando 2008; Chava 2014; El Ghoul et al. 2018). As for investors, studies show that better environmental policies are related to lower downside and overall portfolio risk (Hoepner et al. 2019; Gibson Brandon and Krueger 2018). In a similar way, Jagannathan, Ravikumar, and Sammon (2019) argue that investors can reduce portfolio risk by incorporating climate criteria into their investment processes and Rameli et al. (2019) provide evidence that investors react to political events related to firms' climate strategies.

In their article from 2019, Krueger et al., decided to survey whether and how institutional investors deal with climate risk. With regard to the first set of questions focused on the importance of climate risks in comparison to other risks, it was found that respondents deem traditional financial risks to be the most important risks they face, followed by operating, governance, and social risks. Climate risks and environmental risks are ranked fifth and sixth, respectively. However, this low relative rank does not imply that climate risks are considered as financially immaterial. The investors believe that climate risks have significant financial implications for portfolio firms. This concern is also reflected in their climate expectations: the vast majority of investors expect a rise in global temperature by the end of this century, and four in ten even predict an increase that exceeds the Paris 2∘C target. These expectations reflect the possibility of very negative effects on financial assets (Dietz et al. 2016).

Another major point in regard to climate risk quantification is its time horizon. It is needed to understand that different investors have both different risk appetite and different time horizons of their investments. Regular Private Equity fund would have its fund going for 10 years, whilst Venture Capital Fund can exit its investments much earlier. Moreover, a time horizon for climate risk is also highly uncertain. Some say it is to materialize in years to come, some say it realizes now already. Consequently, the

investors' views are evaluated on the horizons over which they expect climate risks to materialize financially. Despite the potential horizon uncertainty, respondents do not view climate risks as a theme of the distant future. Fewer than 10% believe that climate risks will materialize only in 10 years or more, whereas 50% state that climate risks related to regulation have already started to materialize. (Krueger et al. 2019)

Second chapter summary

Taking everything into account, what has been discussed in the second chapter, author wants to clarify three most important points. First, the research problem and need for such research is clear due to following reasons. As it has been observed, policymakers, such as United Nations, have expressed their concern over an increasing climate change issue. Such an attention can be drastic for some unsustainable companies or at least hamper the growth of other companies. Moreover, not only policymakers, but also market players have expressed their worries about the climate change. IIGCC asks for a better reflection of climate risk in order to take on possible opportunities and capital shifts. Last, but not least, academic paper on professional money managers' misestimation of climate disaster risk discusses that mispricing and sometimes biased attention to climate risk are not so well researched. This gives room for a possible breach of market efficiency in regard to environmental news.

Second, one risk hedging technique is discussed, which can be a fruitful for future research, considering results of this research paper. In addition, by discussing academic paper of Robert Engle, author included in its own research way of categorizing companies based on their ESG risk rating by Sustainalytics.

Third, ESG factors and climate risk factor have been discussed in order to have a better understanding on how these issues affect companies' valuation as of now. Brief historical note is included as well, in order to understand who first coined the term "ESG" and what exactly that can include. Nevertheless, it is still quite vague term, however, it still affects companies. As for the climate risk factor, it was critically reviewed in regard to how investors judge these risks and further exploration on risk appetites and time horizon of such risk realizing. For the sake of research, ESG Risk Rating by Sustainalytics is taken as a proxy for environmental risk exposure of companies to be analyzed in the paper.

After a careful overview of literature and current state of the research, several research questions are proposed. These questions are proposed in accordance with literature review and, ultimately, answers to these questions will form a basis for achieving research goal of this paper.

Q₁: Do events of this study affect stock performance of companies from the sample?

Q₂: Which sectors are less influenced in regard to these events?

Q₃: How do U.S. and Russian stock markets differ in regard to the reaction to these events?

These questions are answered by empirical study and lead up to main conclusions of this research. First questions would allow to understand whether events outlined actually brought along any kind of an impact to the stock performance of companies. That is an important question to answer, because otherwise, it will be impossible to actually assess a direction of this impact. Second question explores the direction of the impact and sheds the light onto different sectors of economy, so it would be of practical use for people on investor side. In addition, since events for the study were on global level (they affected the whole world), it would bring another dimension to this research, in regard to difference between two stock markets - U.S. and Russian – to understand whether a different reaction is present or not. As a result, with all answers to questions aforementioned it will be possible to achieve the ultimate research goal on finding sectors, which are less influenced than others in regard to environmental events. This would be of great help to understand (i) where returns are less influenced and (ii) in which sectors.

3. Empirical study of environmental events' impact

3.1 Research methodology overview

Due to research question aforementioned, the empirical methodology of best fit would be an event study methodology, proposed by Craig MacKinlay in 1997. The event study methodology serves to measure the impact of a particular event on stock performance or, inherently, company's value. This impact or reaction is also known as "announcement effect", which is to be captured during the empirical study. Such an effect can be brought upon from different events. Most obvious ones are:

- Release of earnings statement
- Issuance of equity or debt instruments
- M&A deals
- Dividend payments

However, other events can also be used in this methodology. Such events can be not directly connected with the company of the research; however, they would still affect company's valuation. Such things, as changes in legislation, can affect company's performance on the same level, as the events aforementioned.

Overall, research model is going to test the implications of such events, connected to climate change and environmental issues, as Paris Agreement, outbreak of COVID-19 in China and Volkswagen AG emissions scandal. Author suggests to use event studies in this thesis in order to analyze stock performance and the possibilities of hedging by companies.

In terms of data collection, author suggest to use such sources, as Refinitiv Eikon or Yahoo!Finance, in order to see stock's performance along the time. That is going to be the main source of financial data, because Bloomberg Terminal is not going to be available for author during the quarantine times.

As for the pool of companies, whose performance is going to be assessed, author suggests to rank stocks according to their ESG scores, because that way it is possible to test how companies with different approaches to ESG value drivers are being affected by important environmental events.

3.2 Proposed research methodology

Due to aforementioned suggestion by author, it is recommended to use event studies analysis in such study. Author has examined prominent research papers on event studies, such as Event Studies in Economics and Finance by Craig A. MacKinlay; Study of the Russian Stock Market Efficiency: The Market Reaction to the Publication of Analysts' Forecasts by Vitaly L. Okulov and How Does Stock Market React to Dividend Surprises?: Evidence from Emerging Markets of India and Russia by Berezinets I., Ilina Y., Smirnov M. and Bulatova L.

Since author of this thesis wants to explore the impact of environmental events on economic value of financial assets, such as stocks, event studies analysis can measure this very impact on the underlying value of an asset. (MacKinlay, 1997) Apart from the event itself, event studies can also be used in such fields as law, where such analysis can measure an impact of specific legislative regulation on economic value of an asset.

Event studies methodology lets researchers to estimate the empirical model of returns of an asset during specific timeframe, also called estimation window. Then, when an event occurs, this model calculates the difference between estimated values and actual values. As a result, abnormal returns or losses are calculated and cumulated, thus, some statistical inference can be made about the behavior of an asset returns after the event.

The process of event study is done in the following steps:

1. Identify event
2. Identify criteria for data sampling

3. Choose model of normal performance

4. Estimate the parameters of the model

5. Test hypotheses

6. Interpretation of results

Additional reasoning for such an approach can be found in Okulov's research paper on stock market reaction to analysts' coverage. Main reason of Okulov's research paper was to analyze effectiveness of Russian stock market. As Efficient Market Hypothesis states that share price reflects all information available to investors. Author of this thesis understands that this is a viable point of view in this research as well, because most likely some of the environmental events are already discussed beforehand and, most likely, as a result of such discussions companies and countries induce some actions in order to answer these discussions. Therefore, events themselves can be regarded just as a formal moment of declaration. However still, author wants to investigate this connection with effectiveness of markets.

As for the events, on which the study is to be based, author wants to underline several important events, connected with aforementioned environmental factor or at least events, which can be broadly attributed to ESG factors as a whole. Preliminary list of events includes adoption of the Paris Agreement, signed in 2016; Volkswagen emission scandal, which has broken in 2015. Third event to be included into analysis is an outbreak of COVID-19 in the beginning of 2020 in China, in order to see, how investors in Western world reacted to such an event, which initially took place in Wuhan province in China. Outbreak of COVID-19 may seem an inappropriate choice, however, there is a clear connection to environmental factors. Main reason behind this list of events lies in the timeframe – from 2010 to 2020 – due to the fact worldwide financial crisis took place in 2007 and then was followed by worldwide economic recession in 2008, it is wise not to include events before or during these years, because results can be disrupted and biased by overall bad market performance, rather than exact environmental event. The Paris Agreement, being the most valuable and important event for the research, is chosen due to the fact it was ratified by most of the developed nations with liquid finance markets, thus, an impact should be prominent from preliminary view. In addition, as one of the initiatives, imposed by Paris Agreement, there was a commitment by developed nations to make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development. This can be regarded as a shift to a more climate-oriented finance, such as green funds, green bonds or other core parts of the finance industry. Therefore, an impact of such agreement must be prominent for companies listed on stock exchanges in developed countries.

As it was discussed before, Volkswagen emission scandal was also drastic for the company. It would be useful to see, whether there is an impact of VW corporate scandal on other companies in the industry or across the board of companies. In addition, such an event is quite rare for modern history of corporates, when a company intentionally breaches the law and cheats, therefore, it is useful to use it as an example for the study. As it was mentioned, VW scandal's timeline is spanned across several weeks and consequences are still present, however, if we assume that markets are efficient (and they should be at least in semi-strong form), then this corporate scandal information must had been reflected in the stock price back when scandal took place.

Last, but certainly not least, is the outbreak of COVID-19 in Wuhan province, China. Since this thesis is written in spring term 2020, whilst the whole world is self-isolated and it is neither clear, nor obvious, what is going to happen, it will be of great interest to actually estimate possible returns' scenario for the ongoing process. This research could be developed further in the future, when the COVID-19 is being dealt with and economy is stabilized. However, currently, it would still benefit the research with interesting insights about which companies profit in such scenario and which do not; simultaneously, it is increasingly interesting to see whether ESG scoring actually matters for companies in such devastating scenarios. As it was already discussed, climate risk realizes not as a futures contract in a stable economy with understandable mechanisms of financial markets. Rather, in case of climate risk realization scenario, it would be the very same devastating situation with a lot of uncertainty on the markets going on.

As the events were described in their nature, now it is needed to structure it in accordance with Klimarev's research paper "Methodological problem with event study analysis in financial studies". In its research paper Kilmarev builds up its classification of events in two dimensions: (i) where event took place: organization, external environment, natural disaster, government or other regulatory bodies; (ii) area of event's impact: operational, investment or financial activities on the company. In accordance with the methodology, aforementioned events are structured in the following way:

Events	Where event took place	Area of impact on company
VW emission scandal	Volkswagen company	Investment Financing
Paris Agreement	United Nations Secretariat (regulatory body)	Investment Financing
COVID-19 outbreak	Natural environment	Operational area

Table 1. Classification of events in accordance with Klimarev's classification

As for the first event, it can be considered as a corporate event, which took place within the organization. In terms of an impact, it is needed to understand that such event would affect not only the company itself, but also market in general. As a result of emissions scandal, other automakers were also under scrutiny of investigating their diesel emission test and actually finding deviations in test results and real-world driving results from automakers as Volvo, Renault, Jeep and Hyundai. Thus, it is fair to conclude there is a possibility of spillover effects on other industries, due to the fact of an increased attention to emissions by big corporates. As a result, investment and financing areas can be affected, due to an increased doubt from investors and financial markets as a whole. (Independent.co.uk, 2015)

Paris Agreement, the most prominent environmental event, is an agreement between the countries with the main goal of keeping global temperature increase under 2 degrees Celsius, in comparison with pre-Industrial era and to try to keep it even lower, under 1.5 degrees Celsius. It is evident that such goals on the global level would eventually lead to stock market reaction. Since this agreement would impose restrictions and additional legislation on companies in all sectors of economy. Therefore, impacting companies' financing and investment activities, because, logically assuming, companies with a good standing with environmental issues and, namely, pollution, such company would get financing easier, which would be vice versa for companies with a bad standing in regard to environmental issues. In regard to investment opportunities, companies with bad reputation for environmental issues, would most likely be rejected as investors, because companies or startups would not want to be associated with such reputation.

COVID-19 outbreak is such an event, which can and should be regarded as a natural disaster, due to its global scale and source of the disaster of biological nature. Main area of impact of COVID-19 as of May 2020 is clearly an operational side of businesses, since most of the companies, operating in real-world and facing customers face-to-face, either closed down its places or substantially restricted the attendance. Therefore, day-to-day operations are heavily hurt by such an event, therefore, company's future cash flows are hampered and, as a result, intrinsic valuation of companies is hurt. However, not all companies show such behavior. Companies with no binding to real-world place, such as Zoom, not only do not show signs of recessions, but rather show the growth in such difficult times, when people around the world are imposed to stay at home in order to prevent worldwide disaster. This way, this event is also of substantial importance in this study, in order to see how markets, react to a clearly unexpected event. However, a difference between U.S. and Russian sample can take place, due to the fact the spread of infection was not linear across the globe.

In addition, it is needed to understand that not only these events can be influential on stock returns of companies within the data sample. Such corporate events as dividend payments, financial earnings release or announced M&A deals can also influence company's returns. Since it was confirmed that Russian stock market, as an example, is influenced in the negative way by dividend announcements, it is fair to conclude that such events are most likely to have an effect on companies within this data sample. Yet however, events aforementioned are global in their nature and affect markets as a whole. Therefore, it is assumed that the announcement effect of these events and, subsequently, stock returns will not be affected by regular corporate events. In addition, since in this study an effect on a sector as a whole is assessed, it is fair to say that individual corporate events are not likely to have a substantial impact on the final result of the study. However, for a future research that can be a good base to check and compare correlation between extraordinary environmental events and regular corporate events and whether stock returns differ in such scenario.

3.3 Research design

As events for the research are chosen, author now wants to explain the reasoning behind such core things for event studies analysis as estimation windows, event windows, model of the research and criteria for the stocks.

Author proposes to use market model for the event study analysis, which is described in every aforementioned research papers on event studies.

Market model is a statistical model, which ties a return of a security to a return of a market portfolio. (MacKinlay, 1997) In contrast with Constant Mean Return model, market model is a more flexible tool and gives a more accurate results for estimates.

For any given security X, the market model equation for return is going to be the following:

$$\boldsymbol{R_{xt}} = \boldsymbol{a_x} + \boldsymbol{\beta_x} * \boldsymbol{R_{mt}} + \boldsymbol{\varepsilon_{xt}}, where$$

$\boldsymbol{R_{xt}}$ = *Return on Security X in period T*

$\boldsymbol{R_{mt}}$ = *Return on market portfolio in period T*

$\boldsymbol{\varepsilon_{xt}}$ = *Zero mean disturbance term*

For Return on market portfolio researches usually take on market index, such as S&P 500 for U.S. equities or MOEX for Russian equities. In this research author is to take both S&P 500 and MOEX, as this research include in itself equities from both countries for comparison sake. Daily index returns are going to be used, as author

decides to construct model for the research on daily basis, therefore, both returns are going to be taken on a daily basis.

In order to capture the impact of the events, it is necessary to include such a measure as Abnormal Return. The abnormal return is an actual return of the security minus the estimated normal return of the security over the period of event window. The normal return is defined as the expected return without a possibility of prior information on the event taking place. (MacKinlay, 1997)

$$AR_{xt} = R_{xt} - \widehat{R_{xt}}$$

AR_{xt} = *Abnormal Return of Security in period T;*
R_{xt} = *Actual Return of Security in period T;*
$\widehat{R_{xt}}$ = *Expected Return of Security in period T*

Returns itself are to be calculated on a daily basis, since it is going to represent a more accurate picture, than returns accumulated on a monthly or yearly basis (MacKinlay, 1997). Formula for returns is the following:

$$R_t = \frac{P_t}{P_{t-1}} - 1$$

R_t = *Actual Return of Security in period T*
P_t = *Stock price in period T*
P_{t-1} = *Stock price in period T*

In order to actually derive the impact of abnormal returns amongst random walk, it is needed to cumulate abnormal returns:

$$CAR_i(t1, t2) = \sum_{t=t1}^{t2} AR_{xt}$$

Event study analysis' main idea lies in the assumption that expected value of CAR (E[CAR] = 0) is zero. If cumulated abnormal returns are zero, then the null hypothesis cannot be rejected. Therefore, if null is not rejected, it is stated that news does not affect the stock performance. (MacKinlay, 1997)

As it was previously briefly discussed, companies of this research should be classified in several groups. According to Engle's research on hedging climate risk, as companies differ by their ESG scoring, their stocks' performance also differs. For instance, some industries, such as Personal Services, Water Transportation and Motion

Pictures show the worst performance out of all industries. Therefore, in this research author also wants to include differentiated stocks, based on ESG scores and GICS industry classification, which are to be gathered through Yahoo Finance database and GICS identification code, which is gathered through public sources, such as stock description on stock exchanges. In order to accept or reject second research question of the thesis – namely, whether different industries react similarly to environmental events or not, it is needed to make a study not only on standalone stocks, but rather on industry as a whole. In addition, a comparison between U.S. stock market and Russian stock market is going to be done in order to answer third research question concerning market efficiency in regard to environmental news. Therefore, that can bring some fruitful insight in terms of not only ESG scoring, but also geographical stance of the companies.

Data sample of the study includes 130 stocks. All of these stocks are large-cap and most liquid in representative markets. The choice is done this way, in order to reach maximum effectiveness in the trade-off between data collection process and drawing relevant conclusions. U.S. stock market is represented as stocks, included into S&P 100 index. There are 100 stocks emitted and 99 companies overall. One additional stock is explained by the fact Google has two different shares, included into the index. These companies constitute the large share of S&P 500 at the point of almost 70%. Overall market capitalization of S&P 100 is around $17 trillion with S&P 500 market capitalization standing at around $25 trillion. This information is relevant as of April 30, 2020. Thus, it is fair to conclude such data sample of U.S. companies is representative in order to draw conclusion about the U.S. stock market as a whole.
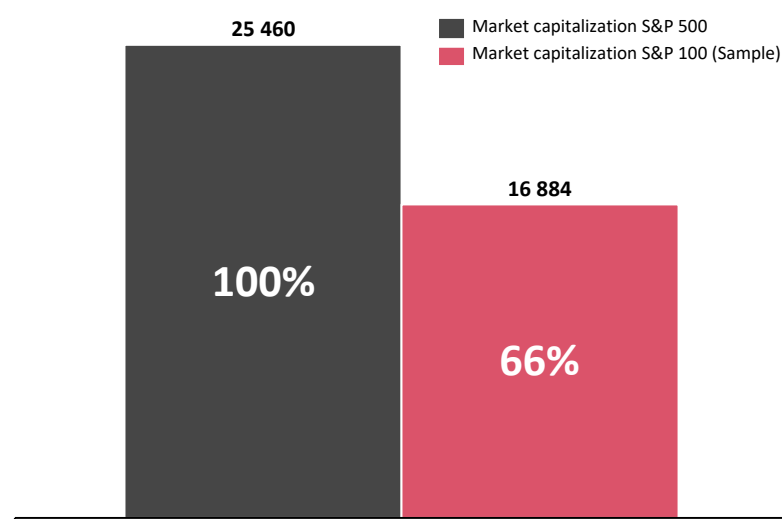
Figure 1. Comparison between S&P500 market cap and S&P100 (Sample) market cap

As for the Russian stock market, 31 stocks are chosen. These stocks were chosen in accordance with MOEX Industry Indices and top stocks by their respective weighting in index structure are chosen. As a result, stocks chosen constitute to 78% of total market capitalization of stocks listed on MOEX. 31 stocks chosen are valued at around 31 billion roubles, while total market capitalization of stocks listed on MOEX valued at 39.6 billion roubles. Thus, it is also fair to conclude that such sample of companies from Moscow Exchange is representative to draw conclusions about the market tendencies.
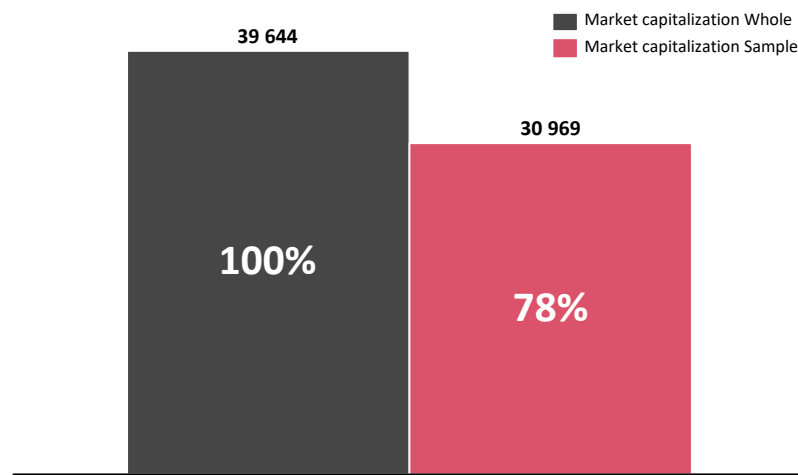
Figure 2. Comparison between MOEX market cap and Russian Sample market cap

These companies are going to be categorized based on their respective sector classification by GICS and ESG Risk Rating. By categorizing it by ESG risk rating, we observe stocks from three main segments: high ESG risk profile, medium ESG risk profile and low ESG risk profile. These risk profiles are taken based on Sustainalytics' ESG rating from Yahoo Finance. This rating is a measurement of risk of a company to ESG factors. Model for this risk is based on two dimensions: first, company's exposure to industry material risks and second, ability of the company to manage these risks. Three central parts of such rating are corporate governance, material ESG issues and idiosyncratic issues or "black swans", unexpected events. Despite the fact this rating includes five risk profiles: negligible, low, medium, high and severe, our data sample are comprised of stocks which lie only between low and high-risk profiles. Choice of such proxy for ESG riskiness of companies is based on R. Engle's paper "Hedging Climate Risk". In his research paper, R. Engle used Sustainalytics ESG rating for the companies of his research, therefore, as it brought meaningful results, it is fair to conclude that this rating can be used in this research as well. Author believes there is a possibility for interesting insights about stocks with different ESG scores, because, as it was already mentioned, Engle's research showed that O&G industry is not the worst in terms of performance under climate risk realization possibility. It is worth to mention

that not all Russian stocks from the sample have this ESG Risk Rating by Sustainalytics, therefore it would be not insightful to make conclusions based on this rating alone, due to the fact not all companies within the sample have the rating.

GICS sector	High	Medium	Low
Financials	0	1	0
Communication Services	1	1	0
Consumer Staples	1	0	0
Energy	5	0	0
Materials	4	1	0
Utilities	1	0	0

Table 2. Distribution of Russian sample by ESG Risk Rating and GICS sector

GICS sector	High	Medium	Low
Information Technology	0	1	14
Health Care	6	8	1
Financials	2	12	1
Real Estate	0	0	2
Consumer Discretionary	2	3	5
Industrials	8	4	0
Communication Services	1	2	6
Consumer Staples	1	9	1
Energy	4	2	0
Materials	2	0	0
Utilities	3	1	0

Table 3. Distribution of U.S. sample by ESG Risk Rating and GICS sector

As for GICS classification, companies were divided into different sectors of economy. The Global Industry Classification Standard is a methodology for structuring companies into their respective sectors, industry group and industry in accordance with company's primary business activity. GICS classification serves as a world-wide standard for investors and asset managers for understanding different sectors and industries. It helps financial community worldwide to assess trends within sectors or industries, with the main goal of providing relevant information for investors and their portfolios.
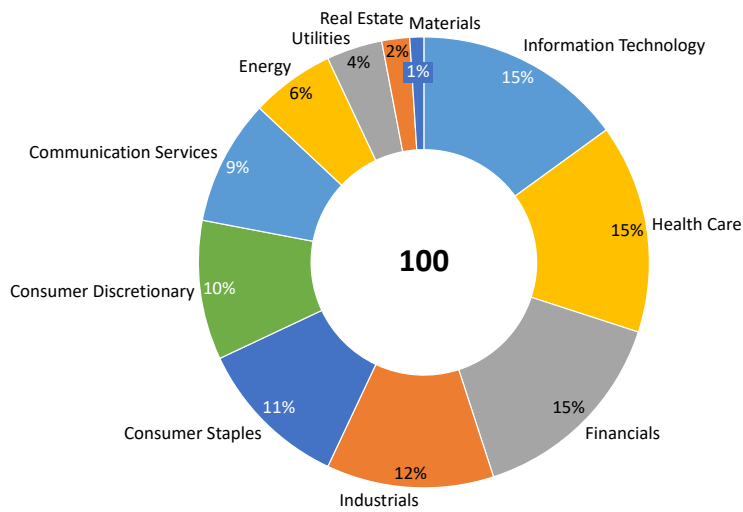
Figure 3. Sector structure of companies in U.S. sample
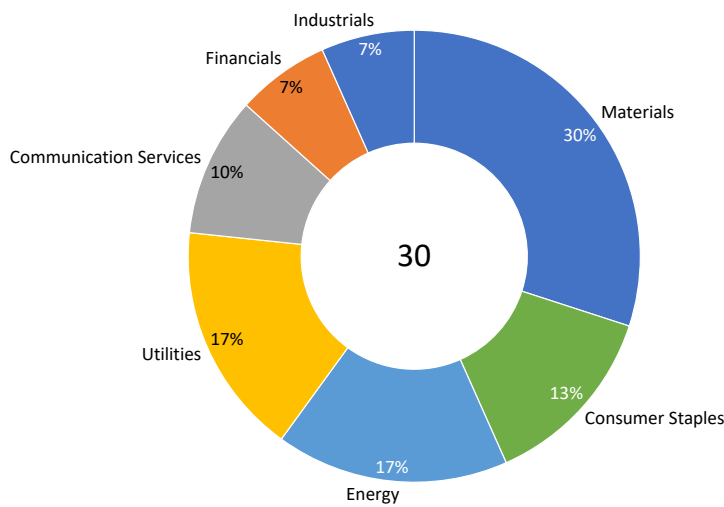
Figure 4. Sector structure of companies in Russian sample

As a result, the study will examine how these sectors are affected by environmental events and capture this impact by conducting an event study and testing whether abnormal returns are present and studying different sector's reaction to this news in order to identify less influenced sectors, with the main goal of assisting whether institutional investors or retail investors how to properly allocate money in the light of uncertainty on the capital markets. In addition, different reaction by U.S. and Russian stock markets will be studied and compared with each other in order to understand which market is more efficient in regard to pricing environmental news into its prices.

In order to come up with a sound reasoning of the research, it is needed to identify both estimation window and event window. Estimation window allows the researcher to estimate empirical model, which is going to estimate future returns of the asset. In this case, estimation window should be substantial in order to prevent possible disruptive events for the research, such as dividends announcements, stock-splits or quarterly earnings. For all events in this study, an estimation window of 250 days before

the event window is taken to estimate the econometric model and predict normal stock performance out of the sample and, as a result, calculate abnormal returns. In terms of estimation window, 51 day of estimation window is taken, in order to account for possible insider trading by taking 25 days before the event itself and possible late reaction of the markets by taking 25 days after the event. In support of a large event window, MacKinlay's own research serves as an example, where he used 20 days before and 20 days after the event, an event window of 41 days took place and returned an insightful result.

Therefore, estimation window for latter is 3 months and for the former (Paris Agreement) is 6 months. 3 months interval is chosen according to Okulov's research paper, where Mr. Okulov state 3 months prior interval is a norm for such an analysis. 6 months interval for the Paris Agreement event is chosen, because author assumes there was already a discussion about the Agreement, therefore, it is needed to include a longer period in order to catch possible information spillover across investors board. According to Okulov's research paper, event window is to be determined due to economic nature of the event and aim of the research. In this study event windows is going to be determined as 25 days before and after. 25 days before are chosen in order to catch the possible insider trading taking place. It would be especially useful in the event of VW emission scandal, due to the fact that top management knew about the situation for sure, therefore, they could have been wanted to take on the opportunity of cashing-out before the event became public.
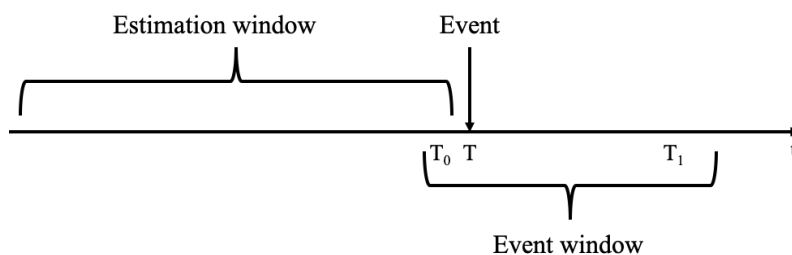
Figure 5. Event Study analysis timeline, based on MacKinlay, 1997

3.4 Empirical study

In order to conduct an event study analysis, it is needed to come up with the list of companies, whose stock return is going to be analyzed in this paper. As it was previously discussed, common stock equities both from U.S. and Russia are going to be taken. That is done due to the fact it would add an additional knowledge on how two different stock markets price environmental events. Research finding can add through such a comparison an additional managerial implication for Russian companies as to how better reflect environmental changes into their company's policies. Both U.S. and

Russian stock markets have been chosen. 100 companies from S&P 100 were chosen, with just only one company left, namely Dow Inc., because it went public only in 2019, therefore there will be no data on past events, which took place in 2015 and 2016. As for the Russian stock market, 30 companies were chosen, which contribute to almost 80% of the overall market capitalization of Moscow Exchange.

Thus, 100 companies from U.S. and 30 companies from Russia are chosen and the future study is going to be based on theirs stock returns. In order to capture on different reactions by sectors, these companies are structured by their respective sectors, in accordance with GICS classification. As it was previously discussed, GICS sectors of this study include the following:

- Information Technology
- Health Care
- Financials
- Real Estate
- Consumer Discretionary
- Industrials
- Communication Services
- Consumer Staples
- Energy
- Materials
- Utilities

Such a choice of sectors is made due to different natures of all these sectors. If we take Energy sector, which is preliminary to be the most heavily affected by environmental news, that is an sector exploring, producing and marketing oil and gas products, which have been described as one of the main contributors to CO_2 emissions. Comparing this sector to IT sector, which is much less exposed to contributing to CO_2 emissions and which is less asset-heavy, it can be understood that there is an obvious skewness towards higher abnormal returns for O&G companies. However, as it was found in Engle's research, that is not always true.

Furthermore, companies have been selected from the pool of largest companies by their market capitalization in relation to the whole market. That is done in order to have liquid stocks, which are traded on a daily basis in a substantial amount, so the estimation model can be constructed adequately.

Stock's performance is taken on a daily basis in a form of adjusted close price of the stock. Due to the fact that event's impact can be substantial and a huge effect on the stock's price can take place, it is better to use daily returns, rather than monthly or yearly returns.

Moving forward, in order to have a more narrow approach, these companies are being categorized into different chunks of companies, based on their Sustainalytics' ESG Risk Rating, which has been used in Engle's research paper in 2019. In terms of different ESG Risk Ratings, categories are (1) high risk, (2) medium risk and (3) low risk. However, for some Russian companies this rating was unavailable. Final list of companies, included into this paper, is attached in the appendix.

U.S. based stocks are going to be estimated with market returns in the form of S&P500 daily returns, whilst Russian stocks will use MOEX daily returns. It is needed to note that since Russian stocks are traded on Moscow Exchange and their price is reflected in Russian roubles, a possible fluctuation due to currency exchange rate can take place. Therefore, preliminary it can be stated that returns for Russian companies can be exposed to a higher variance of returns, than U.S. stocks.

As it was mentioned above, market model is going to be used in the research. Due to the financial nature of data, it is best to include Autoregressive component into the equation and improve the model characteristic by including generalized autoregressive conditional heteroskedasticity, or simply GARCH into variance equation. An additional background on financial time-series must be added, in order to understand the reasoning behind including GARCH component into the final model. First, it is known that financial data and asset returns in particular possess different stylized facts. These stylized facts include such things as volatility clustering and not normally distributed results or "fat" tails of distribution. In order to account for a volatility component of asset returns, it is better to model this volatility, because otherwise model results would substantially differ from actual results. As a result, it would not be wise to actually trust model results. Therefore, GARCH component is included in the following equation in order to account for and model volatility of returns. However, an obvious question can be raised why to use GARCH, instead of ARCH. Main reasoning behind using particularly GARCH model, which stands for Generalized Autoregressive Conditional Heteroskedasticity, rather than ARCH, is that ARCH models would include a lot of lags in conditional variance or, in other words, would have a high lag order. Simultaneously, GARCH model would use not only lags of residuals, but also of a conditional variance itself.

As a result, the following econometric equation is constructed in order to estimate future values of asset returns:

$$r_t = \mu + \lambda m_t + \sum_{i=1}^{l} \phi_i r_{t-i} + e_t;$$

$$e_t = \sigma_t \varepsilon_t;$$

$$\sigma_t^2 = \omega + \sum_{j=1}^{p} \alpha_j \, e_{t-1}^2 + \sum_{k=1}^{q} \beta_j \, \sigma_{t-1}^2,$$

where r_t is a daily return of the stock, m_t is a daily return of the market, μ and ϕ_i are coefficients of AR part, ω, α_j, β_k are coefficients of GARCH part, $\varepsilon_t \sim \mathcal{N}(0,1)$ is standard-normal distributed noise.

3.4.1 Event study analysis

Stock return is almost always stationary; however, it is best to test it by using Augmented Dickey-Fuller test. For each stock, we will run the test on the time interval 2015.01.01 – 2020.02.01. Such time interval is chosen, because all of the events lie within its limits, therefore, it will be enough to understand stationarity of time-series within these limits. All the calculations and hypotheses checking were done in Python software. It needs to be highlighted that 5 stocks from the initial sample were dropped due to limitation of the aforementioned estimation window of 250 days before the event window. These stocks include: DSKY.ME, DOW, BKNG, KHC and PYPL. Stock performance data on these securities were available only for later days, therefore, it is wise not to include these stocks into the study.

	t-statistic	p-value	Number of lags
AAPL	-41,20125702	0	0
ABBV	-16,35348115	2,91706E-29	5
ABT	-23,08144469	0	2
ACN	-14,46149464	6,83541E-27	6
ADBE	-17,46171182	4,59339E-30	5
AFLT	-33,56219929	0	0
AIG	-8,769824749	2,53878E-14	18
AKRN	-11,89094069	5,87086E-22	7
ALL	-9,253718253	1,46873E-15	22
ALRS	-35,92675544	0	0
AMGN	-20,0811216	0	3
AMT	-9,343995264	8,64447E-16	15
AMZN	-37,84167493	0	0
APTK	-16,58632464	1,81535E-29	3
AXP	-7,525938916	3,68479E-11	23
BA	-8,669665783	4,58268E-14	22
BAC	-13,30857309	6,81882E-25	6
BIIB	-38,16485957	0	0
BK	-25,96718652	0	1
BLK	-9,305644706	1,08266E-15	18
BMY	-25,98072493	0	1
BRK-B	-12,64226374	1,42645E-23	7
C	-7,898780317	4,24007E-12	23
CAT	-8,848848513	1,59316E-14	23
CHMF	-7,228669471	2,02144E-10	18
CHTR	-39,22010671	0	0

	t-statistic	p-value	Number of lags
CL	-21,93630384	0	3
CMCSA	-20,81478905	0	3
COF	-7,161432727	2,96109E-10	23
COP	-11,36963388	9,04596E-21	10
COST	-20,98422153	0	3
CRM	-42,51442414	0	0
CSCO	-11,30917071	1,25136E-20	11
CVS	-11,7510363	1,20904E-21	11
CVX	-9,038853314	5,1993E-15	19
DD	-8,363071658	2,78963E-13	19
DHR	-25,88857208	0	1
DIS	-8,518031811	1,12018E-13	17
DUK	-9,550155869	2,58482E-16	22
EMR	-10,77492464	2,33294E-19	10
EXC	-7,393586248	7,88379E-11	24
F	-8,775405628	2,45659E-14	18
FB	-17,0973444	7,51847E-30	5
FDX	-9,1707035	2,39272E-15	22
FEES	-36,90595618	0	0
GAZP	-35,55823293	0	0
GD	-18,87011404	0	3
GE	-8,525889117	1,0695E-13	18
GILD	-39,13237197	0	0
GM	-16,88018835	1,06439E-29	5
GMKN	-10,80048632	2,02372E-19	10
GOOG	-14,6595841	3,39821E-27	7
GOOGL	-14,57946249	4,49297E-27	7
GS	-13,57990107	2,13381E-25	6
HD	-17,07844982	7,73701E-30	5
HON	-9,947478001	2,56667E-17	18
HYDR	-21,5964087	0	2
IBM	-11,14116007	3,10582E-20	8
IMOEX	-8,928672117	9,95158E-15	23
INTC	-26,71159026	0	1
IRAO	-35,45578516	0	0
JNJ	-11,31854865	1,18983E-20	11
JPM	-8,559327585	8,78223E-14	22
KMI	-8,621408984	6,09089E-14	15
KO	-9,207057141	1,93218E-15	22
LKOH	-8,279541684	4,55899E-13	19
LLY	-21,18316856	0	3
LMT	-8,591787239	7,25298E-14	23
LOW	-8,331052884	3,36779E-13	22
MA	-9,004738949	6,35651E-15	19
MCD	-17,90964344	2,93279E-30	5
MDLZ	-12,37581576	5,15868E-23	11
MDT	-26,01824264	0	1
MET	-8,888495788	1,26109E-14	22
MGNT	-21,63783325	0	2
MMM	-39,36057693	0	0

	t-statistic	p-value	Number of lags
MO	-7,015613899	6,74512E-10	21
MRK	-16,77022618	1,28874E-29	5
MS	-13,11394401	1,61351E-24	6
MSFT	-45,57171199	0	0
MTSS	-16,56649099	1,88688E-29	4
MVID	-25,41959633	0	1
NEE	-13,65282884	1,57395E-25	10
NFLX	-17,30404504	5,60604E-30	4
NKE	-20,1548576	0	3
NKNC	-42,04256725	0	0
NLMK	-12,89436378	4,38044E-24	6
NMTP	-26,96093418	0	1
NVDA	-16,15158237	4,56354E-29	5
NVTK	-16,86883232	1,08511E-29	5
ORCL	-12,35962497	5,58452E-23	11
OXY	-6,972237768	8,60562E-10	24
PEP	-10,40251707	1,89323E-18	13
PFE	-20,25611816	0	3
PG	-11,46422366	5,46068E-21	11
PHOR	-37,14057215	0	0
PLZL	-11,64832546	2,06623E-21	8
PM	-12,57688536	1,94857E-23	10
POLY	-8,907591229	1,12683E-14	12
PRTK	-36,47999062	0	0
QCOM	-13,23162605	9,55885E-25	7
ROSN	-8,240461011	5,73575E-13	22
RSTI	-21,85471688	0	2
RTKM	-38,59769092	0	0
RTX	-8,053056887	1,72135E-12	21
SBER	-12,97832255	2,98009E-24	7
SBUX	-14,92679514	1,38523E-27	6
SLB	-9,345667726	8,56006E-16	20
SO	-8,788573961	2,27305E-14	22
SPG	-9,285983161	1,21515E-15	19
T	-12,25394615	9,40275E-23	9
TATN	-37,92710894	0	0
TGT	-39,52380077	0	0
TMO	-12,09686034	2,06102E-22	11
TXN	-14,25613145	1,45294E-26	7
UNH	-13,12880213	1,50961E-24	11
UNP	-22,0391095	0	2
UPRO	-11,46971992	5,30344E-21	9
UPS	-9,505120042	3,3634E-16	15
USB	-8,300223922	4,03712E-13	23
V	-18,65442495	2,04967E-30	5
VTBR	-35,91503994	0	0
VZ	-20,05263559	0	3
WBA	-11,70101702	1,56867E-21	12
WFC	-8,161860905	9,09841E-13	21
WMT	-20,96480501	0	3

	t-statistic	p-value	Number of lags
XOM	-7,593112394	2,50093E-11	24
YNDX	-38,53888724	0	0
^GSPC	-9,555119563	2,51093E-16	18

Table 4. Augmented Dickey-Fuller statistic for U.S. common stock equities

As it can be seen from statistics, the unit root hypothesis is rejected for each time series with a very high level of confidence. Therefore, stock returns of all companies within the proposed data sample are stationary and can be analyzed further with no additional actions for transforming time-series into a stationary one.

Further, in order to choose lag configuration l, p, q, an iterative process is being done in order to minimize the Akaike information criteria. As a result of this process, minimum AIC is chosen and, consequently, maximum values of l, p, q are set to 5, 3 and 3, respectively. Such value of l, p and q are set from the empirical results, showing that stock returns on average would not be autocorrelated with lag count of 5 and above, therefore, lag coefficient for AR part is set to 10. As for ARCH and GARCH parts, the logic is the same, due to the fact that high lag order is often times is redundant. 250 trading days as an estimation window are selected, alongside 50 days as an event window (25 days before and after the event, T0 is the event). Such a wide event window can be considered a bit vague, however, since the main goal is to see the reaction of the whole sector, it is wise to include such a big interval in order to capture all possible abnormal returns across the board. In addition, different companies can have different sources of information, thus, it is also wise to account for insider trading taking place in some companies.

To analyze the impact of the event on the stock return, the methodology has already been identified. Each step of the methodology is presented below:

1. Abnormal return for company i:

$$AR_{it} = r_t - \hat{r}_t.$$

2. Cumulative abnormal return for company i:

$$CAR_{it} = \sum_{\tau=1}^{t} AR_{i\tau}.$$

3. Average abnormal return for N companies:

$$\overline{AR}_t = \frac{1}{N} \sum_{i=1}^{N} AR_{it}.$$

4. Average cumulative abnormal return for N companies:

$$\overline{CAR}_t = \frac{1}{N} \sum_{i=1}^{N} CAR_{it}.$$

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5. Variance of the cumulative abnormal return for company i:

$$\sigma^2_{CAR_{it}} = t \cdot \sigma^2_{e\,i},$$

where $\sigma^2_{e\,i}$ is the variance of residuals from AR-GARCH market model for company i.

6. Variance of average cumulative abnormal return:

$$\sigma^2_{ACAR_t} = \frac{1}{N^2} \sum_{i=1}^{N} \sigma^2_{CAR_{it}}.$$

7. Scaled value for hypothesis test about the impact of the event on stock returns:

$$\bar{\theta}_t = \frac{\overline{CAR_t}}{\sigma_{\overline{CAR_{it}}}};$$

$$H_0 : \bar{\theta}_t \sim \mathcal{N}(0,1).$$

H_0 is going to be tested by following two-step procedure. First, it is needed to be checked if $\bar{\theta}_t$ is normally distributed by using Shapiro-Wilk test for normality. Then a probability if the mean and standard deviation of $\bar{\theta}_t$ can be 0 and 1 respectively is tested. H_0 can be accepted only if both steps are accepted. Assuming that abnormal returns are not statistically significant, white noise would be the only factor affecting stock returns with a mean of 0 and standard deviation of 1. If H_0 is rejected, we can conclude that the event has an impact on the stock returns. This procedure is going to be done for each sector per each event ($\bar{\theta}_t$).

However, the hypothesis of event impact on the whole industry could have been tested by using simple Student t-test for the average abnormal return $\overline{AR_t}$. However, the test of the hypothesis that $\bar{\theta}_t$ has a standard normal distribution has much more statistical power than t-test. Consequently, the accuracy of our event study, using a more sophisticated method, is going to be increased.

As a result, abnormal returns are calculated for each company. Then, a process of cumulating abnormal returns within an industry, which this company is assigned to, is done in order to answer the questions №1 and №2. By calculating cumulated average abnormal returns and cumulated average variance of each industry we derive the $\bar{\theta}_t$ value and can test the hypothesis that:

$$\boldsymbol{H_0 : \bar{\theta}_t \sim \mathcal{N}(0,1)}$$

Results of hypothesis testing can be seen in the tables below with a detailed analysis and discussion of results in the next section.

	W-statistic	p-value	Mean	t-statistic	p-value	Standard deviation	χ^2-statistic	p-value	H0
Communication Services	0.908025	0.0007881	0.0199422	3.0455	0.0037	0.0463016	0.1296	0	rejected
Consumer Discretionary	0.973252	0.300384	0.004033	0.027	0.9785	1.0544159	52.7208	0.7386	**accepted**
Consumer Staples	0.919125	0.00195288	-0.166801	-10.6768	0	0.110469	2.0413	0	rejected
Energy	0.934383	0.00735784	0.108662	2.4775	0.0167	0.310135	5.5076	0	rejected
Financials	0.943504	0.0170141	0.11397	-9.3885	0	0.0858382	1.0382	0	rejected
Health Care	0.949454	0.0299104	-0.14901	-9.4785	0	0.111163	1.7626	0	rejected
Industrials	0.982381	0.643599	0.0769515	9.7443	0	0.0558408	0.461	0	rejected
Information Technology	0.952794	0.0412668	0.0461281	5.4008	0	0.0603939	0.2945	0	rejected
Materials	0.867123	3.98E-05	0.883198	7.762	0	0.804581	72.7968	0.0386	rejected
Real Estate	0.960786	0.0901057	-0.248015	-4.783	0	0.366658	9.9934	0	rejected
Utilities	0.899111	0.00039284	-0.309848	-6.5857	0	0.332682	10.5408	0	rejected

Table 5. Impact of VW emission scandal on U.S. equities classified by GICS sector classification and hypothesis result

	W-statistic	p-value	Mean	t-statistic	p-value	Standard deviation	χ^2-statistic	p-value	H0
Communication Services	0.980638	0.566175	-0.0702207	-6.4554	0	0.0769172	0.5532	0	rejected
Consumer Discretionary	0.947628	0.0251198	-0.0027318	-0.2835	0.7779	0.0681311	0.2371	0	rejected
Consumer Staples	0.922494	0.00259642	-0.109754	-6.1404	0	0.126388	1.429	0	rejected
Energy	0.977452	0.436992	-0.017965	-2.4962	0.0159	0.0508906	0.1485	0	rejected
Financials	0.904907	0.00061578	0.479493	19.8553	0	0.170762	13.2128	0	rejected
Health Care	0.95866	0.0731331	-0.126517	-10.2946	0	0.0869007	1.2015	0	rejected
Industrials	0.901405	0.00046867	-0.0003184	-0.0153	0.9878	0.146973	1.1017	0	rejected
Information Technology	0.948623	0.0276234	-0.0488041	-7.0184	0	0.04917	0.2448	0	rejected
Materials	0.936598	0.00899142	0.449165	10.3119	0	0.308002	15.1274	0	rejected
Real Estate	0.888218	0.00017398	-1.35951	-17.1551	0	0.560371	110.2769	0	rejected
Utilities	0.960775	0.0900036	-0.500675	-13.1492	0	0.269242	16.4815	0	rejected

Table 6. Impact of Paris Agreement on U.S. equities classified by GICS sector classification and hypothesis result

	W-statistic	p-value	Mean	t-statistic	p-value	Standard deviation	χ^2-statistic	p-value	H0
Communication Services	0.985072	0.764851	0.0528339	0.401	0.6901	0.9315711	46.5786	0.7771	**accepted**
Consumer Discretionary	0.828454	3.54E-06	-0.0936437	-12.3451	0	0.0536374	0.594	0	rejected
Consumer Staples	0.934205	0.0072412	-0.0462859	-5.2793	0	0.0619948	0.3053	0	rejected
Energy	0.912861	0.00116354	-0.164371	-3.4727	0.0011	0.334689	7.0908	0	rejected
Financials	0.797156	6.20E-07	-0.244685	-18.5099	0	0.0934736	3.499	0	rejected
Health Care	0.964777	0.1333	-0.0332639	-5.201	0	0.0452245	0.1607	0	rejected
Industrials	0.987832	0.876655	-0.12128	-14.2674	0	0.0600925	0.9339	0	rejected
Information Technology	0.949739	0.0307373	0.109766	14.8723	0	0.0521883	0.7534	0	rejected
Materials	0.911972	0.00108241	-1.26886	-14.5036	0	0.618609	101.6242	0	rejected
Real Estate	0.970562	0.233343	0.539098	12.2447	0	0.311313	19.7643	0.0001	rejected
Utilities	0.886719	0.00015599	0.351327	6.9212	0	0.358933	12.8655	0	rejected

Table 7. Impact of COVID-19 outbreak on U.S. equities classified by GICS sector classification and hypothesis result

	W-stat	p-value	Mean	t-stat	p-value	Std. dev.	χ^2-stat	p-value	H0
Event 2015.09.18	0.9692	0.2057	-0.097605	-11.4682	0	0.060182	0.6706	0	rejected
Event 2016.11.04	0.8542	0	-0.001772	-0.7471	0.4585	0.016772	0.0145	0	accepted
Event 2020.01.30	0.8025	0	-0.014321	-3.2592	0.002	0.031071	0.0597	0	rejected

Table 8. Aggregated results for the U.S. data sample in regard to three events and hypothesis testing

Next tables depict the results of hypothesis testing for Russian companies. It is worthy to mention that not all sectors are included there, due to the fact there is a lack of Russian companies within the same sectors as on U.S. stock market.

	W-statistic	p-value	Mean	t-statistic	p-value	Standard deviation	χ^2-statistic	p-value	H0
Communication Services	0.935928	0.00846075	-0.0649465	-2.5898	0.0125	0.177329	1.8188	0	rejected
Consumer Staples	0.95053	0.0331639	0.124846	12.8644	0	0.0686232	1.0351	0	rejected
Energy	0.97345	0.305917	-0.0566337	-6.5604	0	0.0610423	0.3536	0	rejected
Financials	0.882735	0.0001171	0.265035	5.4603	0	0.343219	9.5902	0	rejected
Industrials	0.950549	0.0332273	-0.130128	-2.5741	0.0131	0.357455	7.3801	0	rejected
Materials	0.953711	0.0451069	0.0745824	1.2498	0.2172	0.0825031	0.358	0	rejected
Utilities	0.924033	0.00296145	-0.0384639	-3.4974	0.001	0.0777675	0.3839	0	rejected

Table 9. Impact of VW emission scandal on Russian equities classified by GICS sector classification and hypothesis result

	W-statistic	p-value	Mean	t-statistic	p-value	Standard deviation	χ^2-statistic	p-value	H0
Communication Services	0.850121	1.32E-05	-0.256973	-11.3625	0	0.159919	4.6721	0	rejected
Consumer Staples	0.973703	0.313135	-0.0961896	-10.6668	0	0.0637645	0.6792	0	rejected
Energy	0.979672	0.524993	0.168551	18.6254	0	0.0639897	1.6577	0	rejected
Financials	0.983332	0.686731	-0.525841	-18.8281	0	0.197485	16.091	0	rejected
Industrials	0.939749	0.0120001	0.213654	6.0714	0	0.248832	5.4858	0	rejected
Materials	0.956943	0.06181	-0.017197	-2.1335	0.0378	0.0569972	0.1808	0	rejected
Utilities	0.940513	0.012877	0.0190252	0.9256	0.3591	0.145336	1.0957	0	rejected

Table 10. Impact of Paris Agreement on Russian equities classified by GICS sector classification and hypothesis result

	W-statistic	p-value	Mean	t-statistic	p-value	Standard deviation	χ^2-statistic	p-value	H0
Communication Services	0.942682	0.0157553	0.267427	7.6975	0	0.245664	6.7253	0	rejected
Consumer Staples	0.936556	0.00895724	-0.0391531	-2.1655	0.0351	0.127851	0.9118	0	rejected
Energy	0.971913	0.265135	-0.186648	-8.7397	0	0.151013	2.9398	0	rejected
Financials	0.922795	0.00266377	0.00723354	0.2948	0.7694	0.173498	1.5378	0	rejected
Industrials	0.903241	0.00054051	0.486177	5.8202	0	0.590666	29.848	0.0211	rejected
Materials	0.973531	0.308208	0.107186	9.8576	0	0.0768864	0.8874	0	rejected
Utilities	0.871589	5.38E-05	0.736489	19.315	0	0.269623	31.3707	0.0363	rejected

Table 11. Impact of COVID-19 on Russian equities classified by GICS sector classification and hypothesis result

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	W-stat	p-value	Mean	t-stat	p-value	Standard deviation	χ²-stat	p-value	H0
Event 2015.09.18	0.9215	0.0024	0.004316	1.9132	0.0615	0.015952	0.0139	0	rejected
Event 2016.11.04	0.9308	0.0054	-0.008629	-4.2738	0.0001	0.014277	0.0142	0	rejected
Event 2020.01.30	0.8637	0	0.065579	10.9397	0	0.042388	0.311	0	rejected

Table 12. Aggregated results for the Russian data sample in regard to three events and hypothesis testing

3.4.2 Discussion of results

This section of the paper would discuss main findings from the empirical study and is going to be structured by (i) geography, (ii) event, (iii) impact of event on sector. In the end there will be a comparison of aggregated results of hypothesis testing between U.S. and Russian stock markets.

First, reaction of sectors of U.S. stock market is going to be interpreted and discussed. As it can be seen from the Table 5, VW emission scandal actually affected all sectors of economy, but not Consumer Discretionary sector. For Industrials and Real Estate sectors null hypothesis about normal distribution of Theta is accepted. However, criterion for mean and standard deviation to be 0 and 1 respectively takes place, thus, the event has an impact on stock returns of companies within these sectors. As for Paris Agreement ratification, all sectors are affected by this event. However, theta for Communication Services, Energy, Health Care and Utilities seem to be normally distributed, but the same situation takes place – mean and standard deviation differ from 0 and 1, thus, it can be concluded that these sectors were actually affected by Paris Agreement ratification. COVID-19 outbreak event in its turn affects all sectors, excluding Communication Services.

Second, reaction of sectors of Russian stock market is interpreted. VW emission scandal did affect stock performance of all companies across all sectors within the region. However, Energy sector's theta is normally distributed due to p-value higher than significance level of 5%. Anyhow, mean and standard deviation values differ from 0 and 1, therefore, we can conclude the event still affected Energy sector. For Paris Agreement, this event also affected all sectors, however, it is needed to underline that Consumer Staples, Energy, Financials and Materials sectors have theta value normally distributed, yet however, their respective means and standard deviations differ from 0

and 1, thus, the event actually has an effect on stock performance. As for COVID-19 outbreak, Russian stock market was also affected as a whole. However, again Energy and Materials sectors show p-value more than significance level of 5%, however, criterion for mean and standard deviation to be 0 and 1 takes place, thus, the event still affects these sectors.

Third, both markets were affected by each of the events as a whole. It is supported by aggregated tables 8 and 12. However, it can be seen that for VW emission scandal U.S. market shows a negative reaction with mean value of -0.097605, whilst Russian market shows a small positive reaction with mean value of 0.004316. For Paris Agreement event, reaction from U.S. market was negative with mean value standing at - 0.001772, as for the Russian market reaction was also negative with mean value at - 0.008629. COVID-19 outbreak had an impact on both markets as well, however, for U.S. market the reaction was negative with mean value of -0.014321, whilst Russian market shows positive reaction with mean value of 0.065579.

Considering everything, now it is needed to answer question aforementioned and, namely:

Q₁: Do events of this study affect stock performance of companies from the sample?

Q₂: Which sectors are less influenced in regard to these events?

Q₃: How do U.S. and Russian stock markets differ in regard to the reaction to these events?

First question is answered positively in regard to the statistical results aforementioned. However, it is needed to highlight that U.S. Consumer Discretionary sector was not affected by VW emission scandal and U.S. Communication Services sector was not affected by COVID-19 outbreak.

Second question is in part answered by the previous paragraph. Since environmental events of the study did not affect neither in positive nor in negative direction the stock performance of U.S. Consumer Discretionary and U.S. Communication Services, whilst other sectors both in U.S. and Russia showed abnormal returns, it is fair to conclude that these sectors are less influenced in regard to environmental events.

As for the last question, both markets are in line with the fact that events affected markets as a whole, however, Russian market, except for Paris Agreement ratification, shows a positive reaction to aforementioned events.

Conclusion

This paper was devoted to study the impact of environmental events on stock performance. That is done in order to reach the research goal on finding less influenced sectors of economy, in accordance with GICS classification, for investors to invest in the times of high uncertainty and in the light of unexpected events, such as COVID-19 outbreak.

The first chapter explains terms of "risk" and "risk management". Simultaneously, most important risk management techniques are described, in order to understand how investors manage their risks now.

In the second chapter, more narrowed look into environmental factors of company performance is done. In addition, climate risk factor is being assessed in order to better reflect possible implications of suck risks, which are presented in either direct impact on assets or stricter regulatory environment for companies. Also a process on how investors integrate ESG risks into company valuation now is described in accordance with CFA Institute, prominent investors society.

In the third chapter, the whole process of empirical study is described in accordance to financial academics, such as Robert Engle and Craig MacKinlay. Event study analysis is chosen as a best proxy for unexpected event's influence on stock performance.

As a result of the research, following conclusion are reached – events of the research do on average impact stock performance of the chosen data sample, and since this data sample is both large enough and representative enough in terms of sectors inclusion, a conclusion on the whole stock market can be inferred.

In addition, U.S. Consumer Discretionary and U.S. Communication Services show no abnormal returns under VW emission scandal and COVID-19 outbreak respectively. No effect for U.S. Consumer Discretionary for VW emission scandal is surprising, because this category also includes automobile industry. Possible explanation for that can be the geography and the fact that Volkswagen AG is a German auto maker, thus, U.S. Consumer Discretionary sector is not affected. However, a further deeper study on the sample of U.S. automakers can be done in order to test this hypothesis. No effect for U.S. Communication Services by COVID-19 outbreak can be explained by the fact that despite all possible restriction measures later in the year, people would still be able to use Facebook, Google and Netflix (which are constituents of this sector) and operations would carry on as it used to be. However, it is also an interesting topic for the further research, because some companies of this sector, such as Zoom showed a tremendous stock return. However, since Zoom is comparably young

company and it is not included neither into S&P 500 nor into S&P 100, that can explain the fact that this sector shows no effect on COVID-19 outbreak.

The developed insights would be especially useful for both investors and academic researches around the world due to several reasons. First, this study explores the reaction of one of the most important events of this century – namely, COVID-19 outbreak – and provides insights on stock performance across the board of different sectors. This one fact can be of highest importance for future research, after the COVID-19 pandemic is defeated and stock markets returns to the period of normal performance with less volatility. Second, environmental nature of all events of this study and actual impact on almost all sectors during most of the events show the utmost importance of climate change topic and forces investors to take that into account in their future investment decisions. Third, this study can serve as a fine example of using event study methodology not only for corporate events, but also for global events, which affect the stock markets around the world. Such reaction can be explained by the fact that nowadays world is globalized, supply chains can start in one country and end in the other, thus, making stock markets especially interrelated.

List of references

Ban Ki-Moon. (2016). Speech at Investor Summit on Climate Risk.

Berezinets, Irina, Yulia Ilina, Marat Smirnov, and Liliia Bulatova. "How Does Stock Market React to Dividend Surprises? Evidence from Emerging Markets of India and Russia." Journal of Asia-Pacific Business 18, no. 3 (2017): 153-179

Brealey, Richard A., Stewart C. Myers, and Franklin Allen. *Principles of Corporate Finance*. New York, NY: McGraw-Hill Education, 2020.

Damodaran, A. (2015). Applied Corporate Finance (4th ed.). Noboken, New Jersey: John Wiley & Sons

Damodaran, Aswath. *Strategic Risk Taking: a Framework for Risk Management*. Upper Saddle River, NJ: Pearson Education, 2010.

Engle, Robert F. "Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation." *Econometrica* 50, no. 4 (1982): 987-1007. Accessed May 18, 2020. doi:10.2307/1912773

Fabozzi, Frank J., Franco Modigliani, and Frank Joseph Jones. (2014). Foundations of financial markets and institutions. http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=1418493.

Hong, Harrison G. and Li, Frank Weikai and Xu, Jiangmin, Climate Risks and Market Efficiency (September 7, 2017). Journal of Econometrics, Forthcoming. Available at SSRN: https://ssrn.com/abstract=2776962 or http://dx.doi.org/10.2139/ssrn.2776962

Hull, John. *Risk Management and Financial Institutions*. Hoboken, NJ: John Wiley & Sons, Inc., 2018.

IFC. 2005. Who Cares Wins 2005 Conference Report: Investing for Long-Term Value

Jeroen Bos. (2014). *Using ESG factors for Equity Valuation.* CFA Institute Magazine. https://www.cfainstitute.org/-/media/documents/article/cfa-magazine/2014/cfm-v25-n6-5.ashx

Klimarev, N. V., & Studnikov, S. S. (2011). Methodological problem off usage event study analysis in financial studies. Herald of Moscow State University. Series 6. Economics, (6), 58-67.

MacKinlay, A. Craig. "Event Studies in Economics and Finance." Journal of Economic Literature 35, no. 1 (1997): 13-39. Accessed May 24, 2020. www.jstor.org/stable/2729691.

Matt McGrath. (2020). BBC. https://www.bbc.com/news/science-environment-52380157

P&G. (2019). Annual Report.

https://www.pginvestor.com/Cache/IRCache/e28f717a-9858-69a1-8783-00c4604463cd.PDF?O=PDF&T=&Y=&D=&FID=e28f717a-9858-69a1-8783-00c4604463cd&iid=4004124

Philipp Krueger, Zacharias Sautner, Laura T Starks, The Importance of Climate Risks for Institutional Investors, The Review of Financial Studies, Volume 33, Issue 3, March 2020, Pages 1067–1111

Robert F Engle, Stefano Giglio, Bryan Kelly, Heebum Lee, Johannes Stroebel, Hedging Climate Change News, The Review of Financial Studies, Volume 33, Issue 3, March 2020, Pages 1184–1216

Rosenbaum, J., & Pearl, J. (2013). Investment Banking (2nd ed.). Hoboken, New Jersey: John Wiley & Sons

S&P. (2019). The ESG Risk Atlas: Sector And Regional Rationales And Scores https://www.spglobal.com/_media/documents/ratingsdirect_theesgriskatlassectorandregionalrationalesandscores_41534468_may-15-2019.pdf

SEC. (2020). *Introduction to investing* https://www.investor.gov/introduction-investing/investing-basics/what-risk

Sharpe, William F. "Capital asset prices: A theory of market equilibrium under conditions of risk." The journal of finance 19, no. 3 (1964): 425-442.

Shashwat Alok, Nitin Kumar, Russ Wermers, Do Fund Managers Misestimate Climatic Disaster Risk, The Review of Financial Studies, Volume 33, Issue 3, March 2020, Pages 1146–1183

Vitaly L Okulov, Study of the Russian Stock Market Efficiency: The Market Reaction to the Publication of Analysts' Forecasts // Vestnik (Herald) of Saint Petersburg University. Management Series. 2010. № 3, pp. 3–22.

Appendices

AR-GARCH market models for the study with estimated coefficients

	μ	ϕ_1	ϕ_2	ϕ_3	ϕ_4	ϕ_5	λ	ω	α	β	R^2
AAPL	0.12					-0.02	-0.04	1.40	0.23	0.12	0.54
ABBV	0.13					0.03	0.03	0.11	0.07	0.89	0.37
ABT	0.10	-0.10			-0.10	0.00	0.06	0.09	0.06	0.86	0.41
ACN	0.15		-0.12			-0.01	0.16	0.09	0.26	0.70	0.45
ADBE	0.13					-0.01	0.22	0.28	0.31	0.61	0.46
AIG	0.08	-0.11				0.08	0.14	0.18	0.28	0.64	0.40
ALL	0.09	-0.13			-0.09		0.10	0.00	0.00	1.00	0.41
AMGN	0.19				-0.13	0.00	-0.01	0.43	0.04	0.79	0.38
AMT	0.07	-0.21				-0.02	0.05	0.06	0.02	0.94	0.44
AMZN	0.16				0.09	-0.03	0.14	4.44	0.00	0.00	0.40
AXP	-0.04				0.11	-0.16	0.02	0.12	0.06	0.88	0.41
BA	0.06					0.01	0.23	1.08	0.28	0.00	0.43
BAC	0.04	-0.24		0.17	0.10	0.04	-0.01	0.19	0.30	0.68	0.45
BIIB	0.26	-0.20				0.01	0.12	3.72	0.50	0.16	0.37
BK	0.10					-0.02	-0.09	0.17	0.24	0.67	0.42
BLK	0.04		0.12			-0.03	0.14	0.22	0.14	0.71	0.39
BMY	0.14	-0.12				0.02	0.10	0.04	0.00	0.98	0.44
BRK-B	0.07	-0.22				-0.03	0.09	0.12	0.17	0.68	0.41
C	0.08	-0.11		0.13	0.10	0.07	0.12	0.15	0.31	0.67	0.42
CAT	-0.07		0.10			0.05	0.07	0.04	0.09	0.91	0.47
CHTR	0.04					-0.07	0.10	0.08	0.01	0.96	0.41
CL	0.11	-0.24		-0.14	-0.08	0.01	0.01	0.43	0.75	0.00	0.47
CMCSA	0.05	0.15	-0.14			-0.06	0.13	0.08	0.06	0.89	0.39
COF	0.00					-0.07	0.00	0.01	0.00	1.00	0.43
COP	-0.25	-0.17		-0.11		0.05	0.22	0.17	0.27	0.71	0.33
COST	0.11					-0.10	0.05	0.61	0.20	0.14	0.53
CRM	0.17	-0.11	-0.11			-0.02	0.08	0.17	0.00	0.96	0.40
CSCO	0.08					0.07	0.15	0.70	0.69	0.00	0.36
CVS	0.13					0.01	0.13	0.15	0.05	0.78	0.45
CVX	-0.17	-0.13				0.05	0.16	0.15	0.20	0.75	0.46
DD	0.03				-0.10	-0.01	0.22	0.10	0.11	0.85	0.40
DHR	0.08	-0.12				0.03	0.07	0.11	0.15	0.75	0.35
DIS	0.04	-0.43				0.03	0.07	0.51	0.81	0.19	0.40
DUK	0.05	-0.10			0.12	-0.05	0.14	0.06	0.03	0.92	0.33
EMR	-0.09		0.15		-0.12	-0.03	0.17	0.13	0.18	0.75	0.33
EXC	0.05	-0.12			0.13	-0.11	0.07	0.05	0.02	0.95	0.38
F	-0.08			-0.10		0.10	0.14	0.42	0.23	0.56	0.30
FB	0.18		-0.18			0.03	-0.12	0.28	0.00	0.88	0.40
FDX	0.05					0.05	0.17	0.16	0.10	0.78	0.40
GD	0.11					0.03	0.15	0.23	0.04	0.77	0.45
GE	-0.04	-0.16				0.06	0.21	0.56	0.74	0.00	0.32
GILD	0.15					-0.03	0.01	0.23	0.06	0.87	0.30
GM	-0.07					0.00	0.12	0.17	0.04	0.88	0.44
GOOG	-0.06					-0.15	0.12	0.42	0.54	0.43	0.37
GOOGL	-0.05				-0.08	-0.16	0.12	1.27	0.73	0.00	0.38
GS	0.10	-0.17				0.11	0.11	0.11	0.26	0.69	0.36
HD	0.18		-0.11			0.02	0.12	1.00	0.07	0.16	0.42

HON	0.04	-0.12				-0.04	0.13	0.13	0.16	0.73	0.39
IBM	-0.06	-0.19				-0.02	0.11	0.17	0.30	0.65	0.43
INTC	0.02					0.09	0.16	0.95	0.20	0.39	0.32
JNJ	0.02	-0.14				0.00	0.09	0.08	0.12	0.79	0.39
JPM	0.11	-0.11				0.06	0.09	0.12	0.22	0.73	0.31
KMI	-0.07	0.13				-0.02	0.07	0.07	0.16	0.83	0.52
KO	0.04				0.13	-0.09	0.09	0.04	0.16	0.81	0.40
LLY	0.12			0.12		-0.03	0.03	0.08	0.09	0.86	0.38
LMT	0.13					-0.09	0.11	0.11	0.02	0.87	0.41
LOW	0.18					-0.05	0.17	0.04	0.00	0.97	0.38
MA	0.11	-0.15		-0.16		-0.01	0.11	0.05	0.05	0.93	0.41
MCD	0.02					-0.04	0.11	0.03	0.13	0.85	0.47
MDLZ	0.08				0.12	0.07	0.08	1.26	0.04	0.00	0.49
MDT	0.11		-0.10			-0.07	0.12	0.04	0.05	0.92	0.42
MET	0.05	-0.14		0.10	0.15	0.03	0.13	0.19	0.17	0.74	0.46
MMM	0.00	-0.14			0.10	0.01	0.13	0.16	0.16	0.69	0.43
MO	0.14					0.00	0.17	0.01	0.00	0.99	0.38
MRK	0.05					-0.12	0.18	0.17	0.12	0.76	0.39
MS	0.14	-0.15				0.00	0.03	0.22	0.24	0.68	0.37
MSFT	0.02				0.10	-0.16	0.17	0.19	0.22	0.75	0.41
NEE	0.06		0.09			-0.13	0.06	0.15	0.04	0.84	0.36
NFLX	0.24					0.01	0.33	0.15	0.00	0.99	0.33
NKE	0.26	-0.16		-0.12		0.13	0.10	0.56	0.93	0.07	0.43
NVDA	0.10					0.06	0.10	1.35	0.00	0.64	0.34
ORCL	-0.04	-0.23	-0.12			0.09	0.26	0.27	0.59	0.37	0.39
OXY	-0.08	-0.11	0.13			-0.06	0.20	0.06	0.07	0.91	0.40
PEP	0.07					-0.09	0.09	0.17	0.12	0.62	0.44
PFE	0.07			0.11		-0.01	0.12	0.09	0.07	0.82	0.43
PG	0.00					0.02	0.04	0.27	0.04	0.60	0.41
PM	0.02				0.04		0.07	0.01	0.00	1.00	0.34
QCOM	-0.15		-0.21		-0.14	-0.03	0.18	0.10	0.07	0.89	0.40
RTX	-0.05			0.10			0.16	0.00	0.00	1.00	0.38
SBUX	0.17					-0.09	0.06	0.03	0.00	0.98	0.31
SLB	-0.14				-0.12	0.10	0.29	0.24	0.22	0.70	0.42
SO	0.06	-0.12				-0.06	0.11	0.08	0.06	0.86	0.37
SPG	0.06	-0.13	0.10			-0.07	0.30	0.03	0.04	0.94	0.44
T	0.00					-0.04	0.13	0.17	0.05	0.77	0.38
TGT	0.11	-0.11				-0.06	0.16	0.07	0.05	0.90	0.33
TMO	0.05		-0.12			0.09	0.03	0.24	0.16	0.68	0.45
TXN	0.08		-0.10			0.04	0.14	1.54	0.33	0.00	0.37
UNH	0.17	-0.14			-0.10	-0.01	0.13	0.97	0.20	0.24	0.35
UNP	-0.08				-0.13	0.05	0.13	0.21	0.14	0.77	0.32
UPS	0.09	-0.19				0.06	0.04	0.33	0.78	0.22	0.44
USB	0.04	-0.11		0.12		-0.05	0.03	0.14	0.23	0.68	0.32
V	0.12		0.11			-0.05	0.10	0.06	0.00	0.97	0.48
VZ	0.01					-0.11	0.12	0.09	0.09	0.79	0.39
WBA	0.23					0.00	0.18	1.89	0.40	0.00	0.44
WFC	0.09					-0.06	0.05	0.12	0.31	0.60	0.40
WMT	-0.01	-0.11				-0.02	0.10	0.03	0.00	0.97	0.39
XOM	-0.10	-0.23			-0.12	-0.01	0.21	0.13	0.20	0.72	0.49
AFLT	-0.21					-0.04	0.86	0.11	0.00	0.98	0.51

	μ	ϕ_1	ϕ_2	ϕ_3	ϕ_4	ϕ_5	λ	ω	α	β	R^2
AKRN	0.25					0.09	0.62	0.14	0.11	0.86	0.31
ALRS	0.11	0.10				-0.01	0.70	2.76	0.31	0.29	0.43
APTK	-0.18	-0.41	-0.22	-0.13		0.05	-0.20	4.00	1.00	0.00	0.35
CHMF	0.35					0.17	0.74	0.27	0.05	0.91	0.44
FEES	-0.07					0.00	0.71	0.72	0.48	0.52	0.37
GAZP	-0.04					0.00	0.95	0.00	0.00	1.00	0.40
GMKN	0.06		-0.11	-0.09		-0.11	1.12	0.29	0.31	0.65	0.37
HYDR	0.02					0.06	0.81	0.13	0.07	0.90	0.38
IRAO	0.09				0.10	-0.09	0.65	0.12	0.15	0.84	0.45
LKOH	0.01				-0.07		1.13	0.04	0.21	0.79	0.38
MGNT	0.11					-0.04	1.07	2.26	0.22	0.00	0.33
MTSS	-0.10					-0.09	1.12	1.87	0.77	0.00	0.39
MVID	0.12					-0.05	0.53	3.24	0.29	0.21	0.37
NKNC	0.11	-0.28				-0.07	0.33	0.18	0.20	0.80	0.41
NLMK	0.19					0.05	0.80	0.18	0.07	0.88	0.37
NMTP	-0.03	0.14			0.12	0.11	0.26	0.12	0.07	0.93	0.40
NVTK	0.19					0.05	1.07	0.10	0.09	0.88	0.38
PHOR	0.27					0.06	0.47	1.38	0.19	0.52	0.39
PLZL	-0.05		-0.14	0.14		-0.01	0.28	1.27	0.78	0.22	0.37
POLY	-0.06					-0.06	0.34	0.79	0.14	0.74	0.38
PRTK	0.09	-0.22		-0.10	-0.10	-0.14	0.34	1.19	0.48	0.09	0.39
ROSN	-0.04				-0.05	-0.02	1.13	0.24	0.24	0.58	0.41
RSTI	-0.04	-0.32				-0.06	0.69	0.61	0.47	0.51	0.42
RTKM	0.07	-0.09		-0.11		0.05	0.59	0.48	0.26	0.58	0.39
SBER	-0.11			-0.09		-0.02	1.11	0.43	0.36	0.55	0.44
TATN	0.12	-0.07		-0.10		-0.02	1.43	0.56	0.19	0.64	0.30
UPRO	0.04	-0.12			-0.08	0.02	0.84	0.01	0.00	1.00	0.38
VTBR	-0.01					-0.02	0.84	0.25	0.23	0.71	0.39
YNDX	-0.17	-0.11				-0.04	0.77	4.22	0.12	0.00	0.45

Appendix 1. VW emission scandal coefficients for model

	μ	ϕ_1	ϕ_2	ϕ_3	ϕ_4	ϕ_5	λ	ω	α	β	R^2
AAPL	0.02					-0.02	0.29	0.76	0.08	0.61	0.32
ABBV	0.02					-0.05	0.25	0.03	0.10	0.89	0.40
ABT	0.00					0.05	0.27	1.52	0.03	0.33	0.42
ACN	0.12	-0.20				0.04	0.37	1.51	0.18	0.00	0.34
ADBE	0.10					-0.02	0.27	0.31	0.17	0.73	0.42
AIG	0.00	-0.12			-0.12	0.11	0.43	1.03	0.06	0.40	0.39
ALL	0.04			-0.08		0.09	0.24	0.00	0.00	0.99	0.40
AMGN	0.07	-0.17				-0.07	0.40	0.00	0.00	0.99	0.32
AMT	0.07	-0.09				0.06	0.54	0.00	0.00	0.99	0.35
AMZN	0.25			-0.13		-0.03	0.39	0.11	0.21	0.79	0.45
AXP	0.07				0.10	-0.16	0.46	1.20	0.68	0.00	0.38
BA	-0.04					0.03	0.54	0.20	0.15	0.77	0.40
BAC	-0.01					0.04	0.63	0.36	0.09	0.81	0.38
BIIB	0.03					0.01	0.34	0.39	0.00	0.92	0.47
BK	-0.04	-0.10				0.08	0.54	1.73	0.14	0.13	0.38
BLK	0.06	-0.13				-0.05	0.64	0.15	0.08	0.86	0.36
BMY	-0.04				-0.11	0.03	0.37	2.20	0.03	0.26	0.34
BRK-B	0.04	-0.25	-0.09			0.10	0.35	0.04	0.04	0.91	0.37
C	-0.02					0.02	0.74	0.47	0.17	0.71	0.46
CAT	0.10					0.01	0.70	0.09	0.02	0.94	0.45

CHTR	0.21		-0.12	-0.11		-0.02	0.32	1.04	0.06	0.65	0.35
CL	0.06	-0.19	-0.09		-0.06	0.10	0.33	0.00	0.00	1.00	0.43
CMCSA	0.05	-0.12				-0.02	0.13	0.10	0.14	0.77	0.46
COF	-0.03					0.00	0.70	0.30	0.03	0.87	0.42
COP	0.02					-0.07	0.95	0.30	0.10	0.86	0.42
COST	0.00			-0.14		0.15	0.12	0.71	0.04	0.45	0.37
CRM	-0.06					0.05	0.35	0.28	0.17	0.76	0.52
CSCO	0.08					0.10	0.42	0.06	0.06	0.92	0.42
CVS	-0.05					0.03	0.04	0.00	0.00	1.00	0.42
CVX	0.10	-0.19				0.03	0.59	0.04	0.10	0.88	0.41
DD	0.07					-0.03	0.38	0.06	0.10	0.88	0.48
DHR	0.20					-0.01	0.27	0.07	0.00	1.00	0.39
DIS	-0.08				-0.11	0.04	0.33	0.00	0.04	0.96	0.40
DUK	0.07					0.02	0.04	0.00	0.00	1.00	0.38
EMR	0.04				-0.10	0.03	0.66	0.00	0.00	1.00	0.41
EXC	0.03		0.13			0.07	0.29	0.00	0.00	1.00	0.37
F	-0.07					0.03	0.57	0.00	0.00	1.00	0.34
FB	0.13		-0.12			0.03	0.48	0.20	0.36	0.64	0.39
FDX	0.04					0.04	0.66	0.09	0.00	0.96	0.38
GD	0.05	-0.14		0.13		0.03	0.31	0.00	0.00	1.00	0.51
GE	0.00					-0.03	0.33	0.09	0.10	0.82	0.42
GILD	0.00	-0.15				0.10	0.25	1.44	0.31	0.28	0.38
GM	0.00					0.04	0.53	0.01	0.00	0.99	0.41
GOOG	0.08				-0.08	-0.02	0.25	0.00	0.00	1.00	0.29
GOOGL	0.07				-0.10		0.23	0.00	0.00	1.00	0.40
GS	-0.07	-0.10				0.06	0.65	0.05	0.03	0.95	0.36
HD	0.04				0.10	-0.04	0.14	0.17	0.20	0.69	0.44
HON	0.12	-0.15			-0.09	-0.07	0.31	0.14	0.30	0.63	0.43
IBM	0.05					-0.05	0.34	0.00	0.00	1.00	0.41
INTC	0.04					0.09	0.45	0.97	0.35	0.12	0.38
JNJ	0.11	-0.10		0.14		-0.01	0.10	0.02	0.07	0.90	0.37
JPM	0.01	-0.13				0.02	0.57	0.67	0.31	0.42	0.51
KMI	0.08					-0.03	0.87	0.25	0.14	0.83	0.38
KO	0.04	-0.16	-0.10			0.07	0.16	0.78	0.08	0.00	0.39
LLY	0.03	-0.21				0.04	0.20	0.00	0.00	0.99	0.34
LMT	0.06					0.09	0.10	0.01	0.00	0.99	0.39
LOW	0.02	-0.10				-0.04	0.28	0.39	0.05	0.72	0.41
MA	0.12	-0.17	-0.10			-0.09	0.36	0.03	0.13	0.85	0.38
MCD	0.22	-0.10			0.11	-0.02	0.16	0.40	0.91	0.09	0.42
MDLZ	0.01	-0.15			-0.14	0.09	0.32	0.48	0.11	0.70	0.48
MDT	0.09	-0.18				-0.03	0.34	0.01	0.00	0.99	0.32
MET	0.07			-0.08		0.02	0.41	2.00	0.46	0.09	0.41
MMM	0.11	-0.24				0.04	0.24	0.03	0.09	0.89	0.43
MO	0.07	-0.13		-0.06		0.14	0.06	0.00	0.00	1.00	0.38
MRK	0.12	-0.17	-0.18			0.10	0.21	0.09	0.00	0.94	0.34
MS	-0.04					0.05	0.74	0.35	0.10	0.82	0.35
MSFT	0.12					-0.12	0.32	0.68	0.73	0.27	0.31
NEE	0.12				-0.13	0.06	0.04	1.19	0.00	0.00	0.42
NFLX	-0.01	-0.10				-0.06	0.34	0.00	0.00	1.00	0.38
NKE	-0.09					-0.05	0.21	0.51	0.10	0.67	0.43
NVDA	0.57	-0.23	0.09	0.10		-0.12	0.45	2.60	0.75	0.00	0.39

ORCL	-0.02	-0.23				0.00	0.50	0.03	0.15	0.85	0.41
OXY	0.05	-0.15	-0.11			0.00	0.59	0.07	0.11	0.86	0.44
PEP	0.06	-0.13				0.09	0.21	0.00	0.00	1.00	0.30
PFE	0.04					-0.02	0.14	0.30	0.25	0.55	0.36
PG	0.11		-0.13		-0.09	0.02	0.16	0.06	0.07	0.86	0.33
PM	0.10				-0.11	0.11	0.16	0.91	0.09	0.00	0.39
QCOM	0.14			0.14		-0.08	0.50	0.00	0.00	1.00	0.39
RTX	0.02					0.07	0.43	0.27	0.17	0.60	0.45
SBUX	-0.07					-0.09	0.30	0.00	0.03	0.97	0.40
SLB	0.00	-0.18				-0.05	0.74	0.10	0.06	0.90	0.42
SO	0.09					-0.01	0.03	0.10	0.00	0.90	0.41
SPG	0.12			-0.11		0.11	0.31	0.52	0.40	0.32	0.38
T	0.15	-0.17			-0.09		0.14	0.65	0.11	0.00	0.47
TGT	-0.07		-0.11			0.04	0.08	0.29	0.13	0.76	0.44
TMO	0.09	-0.18				-0.05	0.38	0.13	0.04	0.89	0.41
TXN	0.13					-0.01	0.50	0.03	0.00	0.98	0.44
UNH	0.07	-0.10				-0.02	0.27	0.00	0.00	0.99	0.34
UNP	0.05					0.00	0.40	0.00	0.00	1.00	0.38
UPS	0.04	-0.09				-0.03	0.27	0.01	0.04	0.95	0.41
USB	0.00	-0.19			-0.14	0.01	0.48	0.10	0.10	0.84	0.35
V	0.13	-0.21				-0.13	0.41	0.07	0.22	0.76	0.42
VZ	0.07	-0.17		0.09		0.05	0.21	0.16	0.03	0.80	0.36
WBA	0.04	-0.15	-0.14	-0.11	-0.09	0.02	0.15	1.65	0.20	0.14	0.34
WFC	-0.07	-0.09			-0.10	0.03	0.55	0.09	0.03	0.92	0.38
WMT	0.06					0.01	0.11	1.40	0.36	0.00	0.27
XOM	0.13	-0.15				-0.02	0.36	0.05	0.11	0.87	0.45
AFLT	0.38			0.11		0.06	0.43	0.00	0.00	1.00	0.46
AKRN	0.11			-0.10		-0.04	0.25	2.46	0.19	0.00	0.39
ALRS	0.12					0.00	0.74	0.23	0.09	0.84	0.42
APTK	0.02				-0.08	-0.17	0.31	2.16	1.00	0.00	0.33
CHMF	0.06					-0.06	0.54	0.63	0.00	0.81	0.40
FEES	0.28					-0.03	0.64	0.11	0.06	0.92	0.40
GAZP	-0.06					0.02	1.14	0.09	0.07	0.82	0.48
GMKN	0.01					-0.02	0.75	0.20	0.09	0.80	0.52
HYDR	0.08		0.10			0.06	0.84	0.06	0.00	0.98	0.36
IRAO	0.34		-0.12			-0.16	0.48	2.87	0.51	0.00	0.45
LKOH	0.06	0.12	-0.06			0.02	1.27	1.17	0.05	0.00	0.44
MGNT	-0.09					-0.04	0.99	2.25	0.06	0.19	0.35
MTSS	0.11	-0.11				0.00	0.77	0.90	0.42	0.18	0.36
MVID	0.21					0.01	0.30	0.53	0.11	0.76	0.43
NKNC	0.40	-0.24	-0.10			-0.01	0.31	0.04	0.03	0.96	0.51
NLMK	0.08					0.00	0.66	0.63	0.08	0.74	0.36
NMTP	0.36			-0.13	-0.11	0.04	-0.04	0.02	0.00	1.00	0.41
NVTK	0.00	-0.12		-0.11		-0.02	1.01	1.02	0.07	0.25	0.38
PHOR	-0.01				-0.10	-0.01	0.27	0.00	0.00	0.99	0.40
PLZL	0.00		0.11			0.10	-0.04	0.04	0.26	0.74	0.32
POLY	0.14	-0.18		0.14		0.07	0.38	0.09	0.00	0.98	0.36
PRTK	0.28	0.13				-0.02	0.22	3.72	0.03	0.06	0.35
ROSN	0.09	0.07			-0.07	0.00	1.22	0.11	0.03	0.90	0.36
RSTI	0.18			-0.10		0.01	0.70	4.14	0.24	0.00	0.42
RTKM	-0.11	-0.09				0.06	0.70	0.00	0.00	0.99	0.37

SBER	0.16					-0.07	0.08	1.47	1.04	0.19	0.07	0.47
TATN	-0.01	-0.10	-0.12			-0.08	0.00	1.32	0.29	0.05	0.80	0.34
UPRO	0.05						0.05	0.51	1.01	0.07	0.54	0.39
VTBR	-0.06						0.04	0.94	0.46	0.21	0.51	0.35
YNDX	0.22		-0.09			-0.11	1.02	3.10	0.44	0.04		0.32

Appendix 2. Paris Agreement coefficients for model

	μ	ϕ_1	ϕ_2	ϕ_3	ϕ_4	ϕ_5	λ	ω	α	β	R^2
AAPL	0.36		-0.18			0.05	0.52	0.17	0.19	0.76	0.49
ABBV	0.05		-0.09	-0.14		-0.05	0.36	0.15	0.00	0.95	0.34
ABT	0.13		-0.15			-0.12	0.27	0.23	0.19	0.68	0.46
ACN	0.16		-0.16			0.08	0.22	0.18	0.09	0.75	0.47
ADBE	0.18		-0.16		-0.15	0.02	0.35	0.22	0.08	0.82	0.40
AIG	0.02				0.14	0.15	0.45	0.66	0.14	0.57	0.48
ALL	0.17	-0.24	-0.11			-0.06	0.24	0.07	0.00	0.93	0.44
AMGN	0.09	0.15				-0.08	0.40	0.09	0.04	0.90	0.42
AMT	0.20				-0.10	0.07	-0.04	0.28	0.15	0.64	0.40
AMZN	0.07					-0.02	0.37	0.13	0.21	0.73	0.39
AXP	0.09				0.10	-0.06	0.41	0.13	0.15	0.74	0.38
BA	-0.03					0.07	0.43	0.16	0.00	0.95	0.39
BAC	0.09					0.04	0.55	0.09	0.00	0.95	0.48
BIIB	-0.06					-0.05	0.88	6.49	0.00	0.26	0.45
BK	0.01		0.09			-0.06	0.33	0.25	0.00	0.88	0.37
BLK	0.14					-0.02	0.50	0.12	0.09	0.84	0.33
BMY	0.11					0.00	0.24	0.08	0.00	0.95	0.34
BRK-B	0.03					-0.01	0.36	0.04	0.02	0.93	0.46
C	0.13					-0.03	0.62	0.16	0.06	0.87	0.41
CAT	-0.02				0.20	0.01	0.83	0.07	0.00	0.97	0.39
CHTR	0.16					0.05	0.11	0.03	0.00	0.97	0.37
CL	0.06		-0.10	-0.11	0.10	0.05	0.16	0.19	0.13	0.69	0.36
CMCSA	0.08	-0.10				-0.07	0.19	0.06	0.00	0.96	0.35
COF	0.09					-0.07	0.57	0.10	0.01	0.95	0.41
COP	-0.09	-0.10	-0.09		0.08	-0.06	1.07	0.19	0.00	0.93	0.39
COST	0.14					0.01	-0.04	0.53	0.63	0.11	0.44
CRM	0.04			-0.11		-0.05	0.34	0.32	0.17	0.71	0.47
CSCO	0.02	0.11				-0.08	0.67	0.34	0.27	0.61	0.34
CVS	0.06				0.14	-0.07	0.38	0.00	0.00	1.00	0.36
CVX	0.02					-0.15	0.33	0.10	0.00	0.92	0.45
DD	-0.14			-0.09		0.03	1.11	4.42	0.00	0.00	0.47
DHR	0.14		-0.10			0.01	0.30	0.05	0.00	0.97	0.40
DIS	0.06		-0.15	0.15		-0.01	0.27	1.79	0.24	0.00	0.43
DUK	0.05	0.10	-0.17		-0.14	0.06	0.06	0.07	0.08	0.81	0.38
EMR	0.14		-0.14			-0.06	0.65	0.32	0.35	0.52	0.39
EXC	0.00					0.00	0.07	0.09	0.00	0.91	0.42
F	0.04					0.00	0.34	0.03	0.00	0.99	0.42
FB	0.17					-0.06	0.11	0.87	0.42	0.40	0.44
FDX	-0.05					-0.03	0.54	0.47	0.00	0.87	0.39
GD	0.02					-0.12	0.44	0.08	0.03	0.91	0.37
GE	0.08		-0.04	0.14		-0.06	0.92	0.11	0.00	0.98	0.36
GILD	-0.01					-0.13	0.37	0.05	0.00	0.97	0.37
GM	0.00				0.16	0.00	0.43	0.19	0.05	0.86	0.45
GOOG	0.12		-0.19			-0.06	0.36	0.00	0.00	0.99	0.45

GOOGL	0.13		-0.21		-0.04	-0.06	0.34	0.00	0.00	0.99	0.42
GS	0.06					0.05	0.57	0.08	0.00	0.95	0.27
HD	0.08	0.13				-0.03	0.27	0.09	0.00	0.92	0.41
HON	0.09	-0.11				0.03	0.55	0.10	0.04	0.87	0.44
IBM	0.00			0.10		0.03	0.48	0.07	0.00	0.95	0.38
INTC	0.05					-0.08	0.53	0.15	0.00	0.94	0.41
JNJ	0.04				-0.11	0.06	0.20	0.12	0.08	0.82	0.45
JPM	0.14					-0.06	0.49	0.15	0.05	0.84	0.31
KMI	0.06			-0.12		-0.06	0.38	0.05	0.00	0.95	0.33
KO	0.06		-0.20		-0.10	0.02	0.23	0.00	0.00	1.00	0.39
LLY	0.02					-0.02	0.38	0.09	0.00	0.94	0.35
LMT	0.12					-0.05	0.35	0.08	0.01	0.92	0.42
LOW	0.08		-0.14	0.05		-0.01	1.52	0.80	0.00		0.36
MA	0.28		-0.10	-0.14		-0.09	0.26	0.36	0.28	0.56	0.38
MCD	0.07		-0.09			0.00	-0.01	0.06	0.02	0.92	0.46
MDLZ	0.10					-0.03	0.14	0.04	0.02	0.94	0.43
MDT	0.10					-0.02	0.09	0.24	0.13	0.65	0.36
MET	0.07					0.04	0.59	0.10	0.06	0.87	0.39
MMM	-0.09		-0.08			0.00	0.55	0.23	0.00	0.91	0.38
MO	-0.05			0.11	0.11	-0.03	0.51	1.22	0.10	0.39	0.46
MRK	0.08		-0.12			-0.14	0.22	0.09	0.00	0.93	0.52
MS	0.06					0.02	0.58	0.06	0.00	0.97	0.34
MSFT	0.24		-0.13		-0.12	-0.09	0.24	0.20	0.21	0.67	0.33
NEE	0.17		-0.14			0.00	-0.06	0.05	0.02	0.91	0.31
NFLX	-0.03					-0.05	0.64	0.22	0.00	0.94	0.37
NKE	0.21			-0.11		-0.01	0.29	0.52	0.42	0.40	0.42
NVDA	0.17		-0.08			-0.02	0.81	0.07	0.00	0.98	0.39
ORCL	0.09	-0.19				0.05	0.33	0.10	0.17	0.80	0.35
OXY	-0.22		-0.11			-0.01	0.67	0.96	0.15	0.57	0.40
PEP	0.06			0.11		-0.03	0.18	0.47	0.25	0.21	0.40
PFE	-0.05		0.13	-0.11		0.07	0.28	0.91	0.38	0.00	0.39
PG	0.19	-0.10		-0.12	-0.10	-0.08	0.11	0.07	0.02	0.91	0.34
PM	0.11			0.12		0.04	0.07	0.12	0.04	0.91	0.32
QCOM	0.07				0.12	-0.02	0.73	3.29	0.07	0.38	0.32
RTX	0.08		-0.09			0.04	0.71	0.07	0.07	0.88	0.47
SBUX	0.13					0.01	0.13	0.11	0.00	0.92	0.38
SLB	-0.07	0.12	-0.09			0.05	1.05	0.16	0.01	0.94	0.42
SO	0.20		-0.10	-0.11	-0.10	-0.01	0.02	0.07	0.03	0.87	0.44
SPG	-0.08		-0.11		-0.11	0.06	0.15	0.12	0.00	0.91	0.47
T	0.14		-0.12			-0.12	0.27	0.06	0.00	0.95	0.33
TGT	0.30					-0.03	0.14	0.60	0.00	0.87	0.31
TMO	0.14			-0.13		0.02	0.61	0.22	0.13	0.76	0.39
TXN	0.12		-0.15			-0.07	0.51	0.13	0.00	0.94	0.44
UNH	0.08					0.01	0.12	1.46	0.06	0.41	0.39
UNP	0.00					-0.06	0.32	1.15	0.50	0.16	0.54
UPS	0.08					-0.06	0.35	0.17	0.00	0.92	0.37
USB	0.09	0.11				-0.01	0.36	0.10	0.07	0.83	0.41
V	0.21		-0.16	-0.09	-0.09	-0.10	0.13	0.34	0.39	0.41	0.30
VZ	0.06				-0.11	0.04	0.10	0.17	0.25	0.61	0.43
WBA	-0.16		-0.13			-0.01	0.42	1.73	0.16	0.34	0.36
WFC	0.07	-0.13				0.07	0.47	0.30	0.13	0.68	0.33

WMT	0.14					0.00	-0.06	0.09	0.19	0.72	0.44
XOM	-0.01					-0.09	0.42	0.40	0.28	0.46	0.41
AFLT	-0.01					-0.03	0.21	1.14	0.24	0.01	0.35
AKRN	0.03					0.08	0.09	0.03	0.12	0.77	0.39
ALRS	-0.07	0.16				0.00	0.42	0.04	0.05	0.91	0.35
APTK	0.39	-0.17		0.10		0.07	-0.62	2.22	1.00	0.00	0.35
CHMF	-0.04				0.07	0.10	0.79	0.00	0.00	1.00	0.38
FEES	0.09				0.11	-0.02	0.42	0.19	0.13	0.76	0.39
GAZP	-0.17	0.07				-0.06	1.75	0.32	0.52	0.48	0.50
GMKN	0.15					-0.03	0.74	0.15	0.05	0.83	0.41
HYDR	-0.01				0.14	-0.07	0.51	0.24	0.12	0.66	0.34
IRAO	0.00					0.08	0.57	0.12	0.13	0.83	0.44
LKOH	0.10		-0.09	-0.13		-0.06	0.89	0.10	0.07	0.83	0.47
MGNT	-0.10				0.08	0.01	0.66	0.00	0.00	0.99	0.33
MTSS	0.12					-0.08	0.57	0.01	0.00	0.99	0.43
MVID	0.03	-0.17	0.13			0.06	0.15	0.05	0.19	0.81	0.35
NKNC	0.31	-0.10				0.10	-0.14	0.71	0.00	0.92	0.44
NLMK	-0.04					0.01	0.64	1.05	0.15	0.26	0.35
NMTP	0.08		0.13	0.10		-0.07	0.09	0.61	0.23	0.19	0.37
NVTK	-0.05					-0.05	0.79	0.03	0.04	0.94	0.44
PHOR	0.03					-0.01	0.21	0.54	0.22	0.00	0.40
PLZL	0.16			-0.10		0.02	0.21	2.00	0.05	0.00	0.42
POLY	0.12					0.03	0.15	0.01	0.00	1.00	0.37
PRTK	0.05	-0.14			-0.15	-0.04	0.08	0.02	0.05	0.93	0.41
ROSN	-0.01		-0.08			0.06	0.80	0.08	0.00	0.90	0.38
RSTI	0.19					-0.01	0.37	0.59	0.16	0.66	0.27
RTKM	0.08	-0.17				0.04	0.19	0.39	0.11	0.49	0.36
SBER	-0.01					0.02	1.10	0.00	0.03	0.97	0.45
TATN	-0.01		-0.10			0.05	1.25	0.00	0.01	0.98	0.36
UPRO	0.06	-0.20		0.15		-0.04	0.19	0.00	0.00	0.99	0.50
VTBR	0.07	0.16				0.03	0.50	1.73	0.06	0.00	0.45
YNDX	0.12					0.03	0.74	0.02	0.00	1.00	0.36

Appendix 3. COVID-19 outbreak coefficients for model

Calculated statistics

US Companies

Event 2015.09.18

Communication Services

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.035862	-0.0358621	19.4113	-0.0081397
T0 - 24	-0.604453	-0.640316	38.8226	-0.102767
T0 - 23	0.600824	-0.0394916	58.2339	-0.00517507
T0 - 22	-0.082934	-0.122425	77.6452	-0.0138936
T0 - 21	0.872397	0.749971	97.0565	0.0761259
T0 - 20	-1.39076	-0.640789	116.468	-0.0593762
T0 - 19	-0.581389	-1.22218	135.879	-0.104847
T0 - 18	-0.274138	-1.49632	155.29	-0.120075
T0 - 17	1.25702	-0.239293	174.702	-0.0181043

T0 - 16	1.26094	1.02164	194.113	0.0733284
T0 - 15	0.413652	1.4353	213.524	0.098224
T0 - 14	-0.223943	1.21135	232.936	0.0793693
T0 - 13	-0.273734	0.937618	252.347	0.0590238
T0 - 12	-0.313587	0.624031	271.758	0.0378543
T0 - 11	-0.190953	0.433079	291.17	0.0253801
T0 - 10	-0.777033	-0.343955	310.581	-0.019517
T0 - 9	0.171769	-0.172186	329.992	-0.00947865
T0 - 8	-0.829433	-1.00162	349.404	-0.0535845
T0 - 7	1.45486	0.453246	368.815	0.023601
T0 - 6	0.0211612	0.474407	388.226	0.0240774
T0 - 5	-0.316944	0.157464	407.637	0.00779907
T0 - 4	-0.048053	0.10941	427.049	0.00529442
T0 - 3	0.280568	0.389978	446.46	0.0184565
T0 - 2	0.146022	0.536001	465.871	0.0248332
T0 - 1	0.634327	1.17033	485.283	0.0531264
T0	0.322768	1.4931	504.694	0.066462
T0 + 1	0.030065	1.52316	524.105	0.0665329
T0 + 2	-0.186224	1.33694	543.517	0.0573462
T0 + 3	-0.001738	1.3352	562.928	0.0562756
T0 + 4	0.520233	1.85543	582.339	0.0768878
T0 + 5	-0.936803	0.91863	601.751	0.0374483
T0 + 6	-0.424714	0.493917	621.162	0.0198176
T0 + 7	-0.72268	-0.228764	640.573	-0.00903863
T0 + 8	1.04527	0.81651	659.984	0.031783
T0 + 9	0.697019	1.51353	679.396	0.058067
T0 + 10	-0.360745	1.15278	698.807	0.0436083
T0 + 11	0.494385	1.64717	718.218	0.0614624
T0 + 12	-0.436315	1.21085	737.63	0.0445833
T0 + 13	-0.656812	0.554041	757.041	0.0201364
T0 + 14	0.467646	1.02169	776.452	0.0366658
T0 + 15	-0.29986	0.721828	795.864	0.0255867
T0 + 16	0.280165	1.00199	815.275	0.0350924
T0 + 17	0.622578	1.62457	834.686	0.0562312
T0 + 18	-0.062023	1.56255	854.098	0.0534663
T0 + 19	-0.875057	0.687492	873.509	0.0232613
T0 + 20	-0.041215	0.646276	892.92	0.0216278
T0 + 21	0.41041	1.05669	912.332	0.034984
T0 + 22	-0.83435	0.222337	931.743	0.00728388
T0 + 23	-0.621345	-0.399008	951.154	-0.0129377
T0 + 24	-0.147213	-0.546222	970.565	-0.017533
T0 + 25	1.5032	0.956976	989.977	0.030415

Consumer Discretionary

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.954254	0.954254	12.6508	0.268291
T0 - 24	0.216064	1.17032	25.3015	0.232665
T0 - 23	-0.090868	1.07945	37.9523	0.17522
T0 - 22	0.88983	1.96928	50.6031	0.276834
T0 - 21	0.822974	2.79225	63.2539	0.351084

T0 - 20	-0.249791	2.54246	75.9046	0.291824
T0 - 19	-0.952971	1.58949	88.5554	0.168908
T0 - 18	-0.949946	0.639545	101.206	0.0635723
T0 - 17	0.165907	0.805452	113.857	0.0754849
T0 - 16	0.691542	1.49699	126.508	0.133095
T0 - 15	0.0552352	1.55223	139.158	0.131583
T0 - 14	0.0105533	1.56278	151.809	0.126838
T0 - 13	0.476807	2.03959	164.46	0.159042
T0 - 12	0.172417	2.21201	177.111	0.166213
T0 - 11	0.462736	2.67474	189.762	0.194168
T0 - 10	-0.476202	2.19854	202.412	0.154531
T0 - 9	-0.196932	2.00161	215.063	0.136489
T0 - 8	-0.106961	1.89465	227.714	0.125555
T0 - 7	0.0372039	1.93185	240.365	0.124606
T0 - 6	0.260398	2.19225	253.015	0.137821
T0 - 5	0.727879	2.92013	265.666	0.179157
T0 - 4	-0.0020259	2.9181	278.317	0.174916
T0 - 3	0.157166	3.07527	290.968	0.180285
T0 - 2	0.26264	3.33791	303.618	0.191562
T0 - 1	0.252172	3.59008	316.269	0.201872
T0	-0.131753	3.45833	328.92	0.190687
T0 + 1	0.741107	4.19943	341.571	0.227222
T0 + 2	-0.161046	4.03839	354.222	0.214571
T0 + 3	0.0227075	4.0611	366.872	0.212024
T0 + 4	0.117947	4.17904	379.523	0.214515
T0 + 5	0.697683	4.87673	392.174	0.246257
T0 + 6	-0.437851	4.43888	404.825	0.220617
T0 + 7	-0.238229	4.20065	417.475	0.205589
T0 + 8	0.572556	4.7732	430.126	0.23015
T0 + 9	0.924037	5.69724	442.777	0.270752
T0 + 10	-0.0034710	5.69377	455.428	0.266803
T0 + 11	-0.735281	4.95849	468.078	0.229187
T0 + 12	-0.0550418	4.90345	480.729	0.223641
T0 + 13	0.0830539	4.9865	493.38	0.224494
T0 + 14	0.0898099	5.07631	506.031	0.225663
T0 + 15	0.0500453	5.12635	518.682	0.225091
T0 + 16	0.4802	5.60655	531.332	0.243228
T0 + 17	0.260363	5.86692	543.983	0.251546
T0 + 18	-0.519738	5.34718	556.634	0.226642
T0 + 19	-0.245028	5.10215	569.285	0.21384
T0 + 20	0.0869049	5.18906	581.935	0.215105
T0 + 21	0.528212	5.71727	594.586	0.234467
T0 + 22	-0.384627	5.33264	607.237	0.216403
T0 + 23	1.09868	6.43132	619.888	0.258311
T0 + 24	0.109237	6.54056	632.539	0.260059
T0 + 25	-0.515016	6.02554	645.189	0.237221

Consumer Staples

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.584282	-0.584282	9.2756	-0.191846

T0 - 24	-0.149546	-0.733829	18.5512	-0.170376
T0 - 23	-0.384778	-1.11861	27.8268	-0.212054
T0 - 22	-0.5128	-1.63141	37.1024	-0.267831
T0 - 21	-0.451706	-2.08311	46.378	-0.305884
T0 - 20	0.511841	-1.57127	55.6536	-0.210622
T0 - 19	-0.29267	-1.86394	64.9292	-0.231319
T0 - 18	-0.956812	-2.82075	74.2048	-0.327453
T0 - 17	-0.427513	-3.24827	83.4804	-0.355516
T0 - 16	0.348189	-2.90008	92.756	-0.301119
T0 - 15	-0.30693	-3.20701	102.032	-0.317492
T0 - 14	-0.220427	-3.42743	111.307	-0.324868
T0 - 13	-0.155428	-3.58286	120.583	-0.326278
T0 - 12	-0.0210961	-3.60396	129.858	-0.31626
T0 - 11	0.129582	-3.47438	139.134	-0.294551
T0 - 10	0.732384	-2.74199	148.41	-0.225079
T0 - 9	-0.679191	-3.42118	157.685	-0.272446
T0 - 8	0.436668	-2.98452	166.961	-0.230976
T0 - 7	-0.689951	-3.67447	176.236	-0.276787
T0 - 6	-0.319783	-3.99425	185.512	-0.293257
T0 - 5	0.161475	-3.83277	194.788	-0.27462
T0 - 4	-0.042975	-3.87575	204.063	-0.271315
T0 - 3	0.307085	-3.56866	213.339	-0.244327
T0 - 2	0.421042	-3.14762	222.614	-0.210963
T0 - 1	0.121605	-3.02602	231.89	-0.198715
T0	-0.154641	-3.18066	241.166	-0.204814
T0 + 1	0.51203	-2.66863	250.441	-0.16863
T0 + 2	-0.295653	-2.96428	259.717	-0.183937
T0 + 3	0.501935	-2.46235	268.992	-0.150134
T0 + 4	0.290794	-2.17155	278.268	-0.130178
T0 + 5	0.729172	-1.44238	287.544	-0.0850604
T0 + 6	0.480487	-0.961892	296.819	-0.0558316
T0 + 7	-0.0809753	-1.04287	306.095	-0.0596075
T0 + 8	-0.442021	-1.48489	315.37	-0.0836148
T0 + 9	-0.056542	-1.54143	324.646	-0.0855498
T0 + 10	0.259182	-1.28225	333.922	-0.0701698
T0 + 11	0.2206	-1.06165	343.197	-0.0573072
T0 + 12	-0.406449	-1.4681	352.473	-0.0781974
T0 + 13	0.272778	-1.19532	361.748	-0.0628465
T0 + 14	0.455017	-0.740303	371.024	-0.0384334
T0 + 15	0.255841	-0.484462	380.3	-0.0248426
T0 + 16	0.109483	-0.374979	389.575	-0.0189981
T0 + 17	-0.0671111	-0.44209	398.851	-0.0221363
T0 + 18	-1.05587	-1.49796	408.126	-0.0741485
T0 + 19	-0.0968101	-1.59477	417.402	-0.0780585
T0 + 20	0.512054	-1.08271	426.678	-0.052416
T0 + 21	0.510171	-0.572543	435.953	-0.0274213
T0 + 22	0.0135467	-0.558997	445.229	-0.0264922
T0 + 23	0.279557	-0.27944	454.504	-0.0131075
T0 + 24	0.68174	0.4023	463.78	0.0186808
T0 + 25	-0.872802	-0.470501	473.056	-0.0216324

Energy

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-1.015616	-1.015616	9.311929	-0.332820
T0 - 24	-0.114461	-1.130077	18.623857	-0.261862
T0 - 23	-0.372083	-1.502160	27.935786	-0.284208
T0 - 22	-0.146147	-1.648307	37.247714	-0.270077
T0 - 21	-1.512031	-3.160337	46.559643	-0.463157
T0 - 20	0.256680	-2.903657	55.871572	-0.388463
T0 - 19	0.220245	-2.683412	65.183500	-0.332367
T0 - 18	-0.799782	-3.483194	74.495429	-0.403564
T0 - 17	0.186568	-3.296626	83.807357	-0.360105
T0 - 16	-1.204524	-4.501150	93.119286	-0.466448
T0 - 15	2.683957	-1.817193	102.431215	-0.179550
T0 - 14	2.172798	0.355605	111.743143	0.033640
T0 - 13	2.514932	2.870536	121.055072	0.260898
T0 - 12	-0.130562	2.739974	130.367000	0.239973
T0 - 11	-1.244759	1.495216	139.678929	0.126514
T0 - 10	0.075027	1.570243	148.990857	0.128643
T0 - 9	-0.320940	1.249302	158.302786	0.099294
T0 - 8	-1.284791	-0.035489	167.614715	-0.002741
T0 - 7	-0.466120	-0.501608	176.926643	-0.037711
T0 - 6	0.292370	-0.209238	186.238572	-0.015332
T0 - 5	-0.912917	-1.122156	195.550500	-0.080246
T0 - 4	-0.108151	-1.230306	204.862429	-0.085957
T0 - 3	0.234725	-0.995581	214.174358	-0.068029
T0 - 2	1.793732	0.798152	223.486286	0.053390
T0 - 1	0.758953	1.557105	232.798215	0.102054
T0	-0.834037	0.723068	242.110143	0.046470
T0 + 1	0.248617	0.971685	251.422072	0.061281
T0 + 2	0.516099	1.487784	260.734001	0.092138
T0 + 3	-1.377406	0.110378	270.045929	0.006717
T0 + 4	1.111986	1.222364	279.357858	0.073134
T0 + 5	0.751244	1.973608	288.669786	0.116161
T0 + 6	-0.771296	1.202312	297.981715	0.069650
T0 + 7	-0.308186	0.894126	307.293644	0.051006
T0 + 8	1.213880	2.108006	316.605572	0.118471
T0 + 9	-0.155100	1.952905	325.917501	0.108175
T0 + 10	3.018024	4.970929	335.229429	0.271498
T0 + 11	1.416202	6.387131	344.541358	0.344100
T0 + 12	3.199552	9.586684	353.853286	0.509632
T0 + 13	0.265997	9.852681	363.165215	0.517014
T0 + 14	1.185447	11.038128	372.477144	0.571934
T0 + 15	-0.310904	10.727224	381.789072	0.549004
T0 + 16	-1.189795	9.537429	391.101001	0.482266
T0 + 17	0.130283	9.667713	400.412929	0.483136
T0 + 18	1.810139	11.477852	409.724858	0.567041
T0 + 19	-0.023262	11.454590	419.036787	0.559569
T0 + 20	-0.267632	11.186958	428.348715	0.540522
T0 + 21	-1.383760	9.803198	437.660644	0.468596
T0 + 22	0.760137	10.563335	446.972572	0.499644

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 + 23	-0.073441	10.489894	456.284501	0.491081
T0 + 24	0.287173	10.777067	465.596430	0.499454
T0 + 25	-1.356561	9.420506	474.908358	0.432284

Financials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.278201	0.278201	11.761720	0.081119
T0 - 24	0.186299	0.464500	23.523441	0.095771
T0 - 23	-0.419919	0.044581	35.285161	0.007505
T0 - 22	0.029546	0.074127	47.046882	0.010807
T0 - 21	0.041720	0.115847	58.808602	0.015106
T0 - 20	-0.058059	0.057788	70.570323	0.006879
T0 - 19	0.161527	0.219315	82.332043	0.024170
T0 - 18	-0.257086	-0.037771	94.093764	-0.003894
T0 - 17	0.102383	0.064612	105.855484	0.006280
T0 - 16	-0.469126	-0.404514	117.617205	-0.037299
T0 - 15	0.080304	-0.324211	129.378925	-0.028503
T0 - 14	-0.549209	-0.873419	141.140646	-0.073519
T0 - 13	0.472391	-0.401028	152.902366	-0.032432
T0 - 12	-0.494705	-0.895733	164.664087	-0.069804
T0 - 11	-0.627172	-1.522905	176.425807	-0.114655
T0 - 10	0.303706	-1.219199	188.187528	-0.088875
T0 - 9	-0.245109	-1.464308	199.949248	-0.103555
T0 - 8	-0.255887	-1.720195	211.710969	-0.118224
T0 - 7	0.376395	-1.343800	223.472689	-0.089892
T0 - 6	-0.244149	-1.587950	235.234410	-0.103535
T0 - 5	-0.367578	-1.955527	246.996130	-0.124428
T0 - 4	0.127489	-1.828038	258.757851	-0.113642
T0 - 3	0.179885	-1.648153	270.519571	-0.100207
T0 - 2	-0.178785	-1.826938	282.281292	-0.108738
T0 - 1	-1.374540	-3.201478	294.043012	-0.186700
T0	-0.348670	-3.550148	305.804733	-0.203013
T0 + 1	0.601081	-2.949067	317.566453	-0.165488
T0 + 2	-0.056606	-3.005673	329.328174	-0.165626
T0 + 3	0.247024	-2.758649	341.089894	-0.149370
T0 + 4	-0.401902	-3.160551	352.851615	-0.168255
T0 + 5	1.570941	-1.589610	364.613335	-0.083248
T0 + 6	0.284897	-1.304713	376.375056	-0.067252
T0 + 7	-0.122040	-1.426753	388.136776	-0.072420
T0 + 8	-0.952622	-2.379375	399.898497	-0.118984
T0 + 9	-0.041534	-2.420909	411.660217	-0.119319
T0 + 10	-1.529167	-3.950077	423.421938	-0.191964
T0 + 11	0.264376	-3.685701	435.183658	-0.176679
T0 + 12	0.005670	-3.680031	446.945379	-0.174070
T0 + 13	-0.102371	-3.782402	458.707099	-0.176604
T0 + 14	-0.599396	-4.381798	470.468820	-0.202017
T0 + 15	-0.823900	-5.205699	482.230540	-0.237056
T0 + 16	-0.051812	-5.257511	493.992261	-0.236548
T0 + 17	0.403353	-4.854157	505.753981	-0.215846
T0 + 18	-0.350806	-5.204963	517.515702	-0.228800

T0 + 19	0.843948	-4.361015	529.277422	-0.189560
T0 + 20	-0.163297	-4.524312	541.039143	-0.194508
T0 + 21	-0.518858	-5.043170	552.800863	-0.214496
T0 + 22	0.588865	-4.454305	564.562584	-0.187467
T0 + 23	-0.522067	-4.976372	576.324304	-0.207290
T0 + 24	-0.428937	-5.405309	588.086025	-0.222895
T0 + 25	0.667702	-4.737606	599.847745	-0.193437

Health Care

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.275862	-0.275862	18.550286	-0.064050
T0 - 24	-0.094420	-0.370281	37.100572	-0.060791
T0 - 23	0.184305	-0.185976	55.650858	-0.024930
T0 - 22	0.078871	-0.107105	74.201144	-0.012434
T0 - 21	0.280411	0.173306	92.751430	0.017995
T0 - 20	0.448321	0.621627	111.301716	0.058922
T0 - 19	0.159288	0.780915	129.852001	0.068530
T0 - 18	-0.183303	0.597612	148.402287	0.049057
T0 - 17	-0.208855	0.388757	166.952573	0.030087
T0 - 16	-0.069449	0.319308	185.502859	0.023444
T0 - 15	-0.595664	-0.276356	204.053145	-0.019346
T0 - 14	-0.619172	-0.895528	222.603431	-0.060022
T0 - 13	-0.982457	-1.877985	241.153717	-0.120933
T0 - 12	0.261848	-1.616137	259.704003	-0.100286
T0 - 11	-0.201877	-1.818014	278.254289	-0.108987
T0 - 10	-0.814370	-2.632385	296.804575	-0.152797
T0 - 9	0.203529	-2.428855	315.354861	-0.136773
T0 - 8	-0.046341	-2.475196	333.905147	-0.135456
T0 - 7	-0.342064	-2.817260	352.455432	-0.150063
T0 - 6	0.393609	-2.423651	371.005718	-0.125829
T0 - 5	0.099850	-2.323801	389.556004	-0.117737
T0 - 4	0.017782	-2.306020	408.106290	-0.114150
T0 - 3	-0.030874	-2.336894	426.656576	-0.113136
T0 - 2	-0.551300	-2.888193	445.206862	-0.136882
T0 - 1	1.501944	-1.386249	463.757148	-0.064372
T0	0.201241	-1.185009	482.307434	-0.053958
T0 + 1	-1.719848	-2.904857	500.857720	-0.129798
T0 + 2	0.664546	-2.240311	519.408006	-0.098300
T0 + 3	-0.123038	-2.363349	537.958292	-0.101895
T0 + 4	-0.784980	-3.148329	556.508578	-0.133458
T0 + 5	-2.094422	-5.242751	575.058863	-0.218627
T0 + 6	-1.005513	-6.248264	593.609149	-0.256454
T0 + 7	0.886928	-5.361336	612.159435	-0.216691
T0 + 8	0.068905	-5.292431	630.709721	-0.210737
T0 + 9	0.420394	-4.872037	649.260007	-0.191206
T0 + 10	0.413118	-4.458919	667.810293	-0.172545
T0 + 11	-1.320058	-5.778977	686.360579	-0.220584
T0 + 12	-2.159398	-7.938375	704.910865	-0.298995
T0 + 13	0.536259	-7.402116	723.461151	-0.275200
T0 + 14	-0.471091	-7.873207	742.011437	-0.289032

T0 + 15	0.198705	-7.674502	760.561723	-0.278281
T0 + 16	-0.403683	-8.078185	779.112009	-0.289410
T0 + 17	-0.383007	-8.461193	797.662294	-0.299586
T0 + 18	-0.043099	-8.504292	816.212580	-0.297671
T0 + 19	0.506332	-7.997960	834.762866	-0.276820
T0 + 20	0.470822	-7.527137	853.313152	-0.257677
T0 + 21	0.157568	-7.369569	871.863438	-0.249585
T0 + 22	-1.263455	-8.633025	890.413724	-0.289312
T0 + 23	0.214343	-8.418682	908.964010	-0.279236
T0 + 24	-1.466432	-9.885114	927.514296	-0.324580
T0 + 25	0.074906	-9.810208	946.064582	-0.318946

Industrials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.015067	0.015067	9.822868	0.004807
T0 - 24	0.197547	0.212614	19.645735	0.047969
T0 - 23	-0.132774	0.079840	29.468603	0.014708
T0 - 22	0.235835	0.315675	39.291471	0.050361
T0 - 21	-0.063344	0.252331	49.114338	0.036005
T0 - 20	0.166886	0.419217	58.937206	0.054606
T0 - 19	0.824519	1.243736	68.760073	0.149989
T0 - 18	0.818404	2.062139	78.582941	0.232624
T0 - 17	-0.110268	1.951872	88.405809	0.207592
T0 - 16	-1.006811	0.945061	98.228676	0.095354
T0 - 15	-0.291564	0.653496	108.051544	0.062868
T0 - 14	0.181521	0.835018	117.874412	0.076911
T0 - 13	-0.287938	0.547080	127.697279	0.048413
T0 - 12	0.532434	1.079514	137.520147	0.092055
T0 - 11	0.080809	1.160323	147.343014	0.095590
T0 - 10	-0.206157	0.954166	157.165882	0.076111
T0 - 9	0.089677	1.043843	166.988750	0.080778
T0 - 8	0.280012	1.323855	176.811617	0.099560
T0 - 7	0.393687	1.717542	186.634485	0.125722
T0 - 6	-0.651069	1.066473	196.457353	0.076088
T0 - 5	-0.126493	0.939980	206.280220	0.065447
T0 - 4	-0.109835	0.830144	216.103088	0.056471
T0 - 3	0.586258	1.416402	225.925956	0.094233
T0 - 2	-0.329527	1.086876	235.748823	0.070787
T0 - 1	-0.170487	0.916389	245.571691	0.058478
T0	-0.495467	0.420922	255.394558	0.026339
T0 + 1	-0.062462	0.358460	265.217426	0.022011
T0 + 2	-0.002155	0.356305	275.040294	0.021484
T0 + 3	-0.853967	-0.497662	284.863161	-0.029486
T0 + 4	-0.433839	-0.931501	294.686029	-0.054263
T0 + 5	0.690145	-0.241356	304.508897	-0.013831
T0 + 6	0.955251	0.713895	314.331764	0.040266
T0 + 7	0.943225	1.657120	324.154632	0.092040
T0 + 8	-0.390873	1.266247	333.977499	0.069288
T0 + 9	-0.571662	0.694586	343.800367	0.037460
T0 + 10	-0.030301	0.664284	353.623235	0.035325

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T0 + 11	0.992379	1.656663	363.446102	0.086899
T0 + 12	0.517997	2.174660	373.268970	0.112559
T0 + 13	0.208387	2.383047	383.091838	0.121753
T0 + 14	0.470763	2.853810	392.914705	0.143971
T0 + 15	0.020802	2.874612	402.737573	0.143241
T0 + 16	-0.116874	2.757738	412.560441	0.135772
T0 + 17	-0.342324	2.415413	422.383308	0.117527
T0 + 18	-0.618870	1.796544	432.206176	0.086416
T0 + 19	-0.448624	1.347920	442.029043	0.064112
T0 + 20	-0.793045	0.554875	451.851911	0.026103
T0 + 21	-0.036564	0.518311	461.674779	0.024123
T0 + 22	1.071218	1.589530	471.497646	0.073203
T0 + 23	1.364420	2.953950	481.320514	0.134644
T0 + 24	1.129447	4.083396	491.143382	0.184254
T0 + 25	-0.730744	3.352653	500.966249	0.149791

Information Technology

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.050735	0.050735	21.276781	0.010999
T0 - 24	0.153845	0.204579	42.553562	0.031361
T0 - 23	-0.495342	-0.290763	63.830344	-0.036394
T0 - 22	-0.371882	-0.662645	85.107125	-0.071829
T0 - 21	-0.070154	-0.732800	106.383906	-0.071047
T0 - 20	-0.292831	-1.025630	127.660687	-0.090774
T0 - 19	0.370129	-0.655501	148.937469	-0.053712
T0 - 18	0.765365	0.109864	170.214250	0.008421
T0 - 17	0.066479	0.176343	191.491031	0.012743
T0 - 16	0.519604	0.695947	212.767812	0.047712
T0 - 15	-0.784580	-0.088633	234.044594	-0.005794
T0 - 14	0.512688	0.424055	255.321375	0.026539
T0 - 13	-0.027521	0.396534	276.598156	0.023843
T0 - 12	-0.067255	0.329279	297.874937	0.019079
T0 - 11	-0.207842	0.121437	319.151719	0.006798
T0 - 10	0.109330	0.230768	340.428500	0.012507
T0 - 9	-0.277338	-0.046571	361.705281	-0.002449
T0 - 8	0.171524	0.124953	382.982062	0.006385
T0 - 7	-0.065545	0.059408	404.258844	0.002955
T0 - 6	0.539547	0.598955	425.535625	0.029035
T0 - 5	-0.172813	0.426142	446.812406	0.020160
T0 - 4	-0.024232	0.401911	468.089187	0.018577
T0 - 3	-0.355241	0.046670	489.365969	0.002110
T0 - 2	-0.608992	-0.562322	510.642750	-0.024884
T0 - 1	-0.023295	-0.585617	531.919531	-0.025392
T0	0.657840	0.072224	553.196312	0.003071
T0 + 1	0.449325	0.521549	574.473094	0.021760
T0 + 2	0.356541	0.878090	595.749875	0.035976
T0 + 3	0.353245	1.231335	617.026656	0.049571
T0 + 4	0.308556	1.539891	638.303437	0.060950
T0 + 5	0.497927	2.037818	659.580219	0.079347
T0 + 6	0.865912	2.903729	680.857000	0.111283
T0 + 7	0.131508	3.035237	702.133781	0.114547

T0 + 8	0.188917	3.224154	723.410562	0.119874
T0 + 9	-0.307373	2.916781	744.687344	0.106885
T0 + 10	-0.347325	2.569457	765.964125	0.092840
T0 + 11	0.209048	2.778505	787.240906	0.099028
T0 + 12	0.594534	3.373039	808.517687	0.118625
T0 + 13	-0.681502	2.691537	829.794469	0.093436
T0 + 14	-0.169475	2.522061	851.071250	0.086452
T0 + 15	0.044453	2.566515	872.348031	0.086896
T0 + 16	-0.011753	2.554762	893.624812	0.085462
T0 + 17	0.513775	3.068537	914.901594	0.101448
T0 + 18	1.060669	4.129206	936.178375	0.134954
T0 + 19	-0.641855	3.487351	957.455156	0.112703
T0 + 20	0.279714	3.767065	978.731937	0.120412
T0 + 21	0.030696	3.797761	1000.008719	0.120095
T0 + 22	-0.379738	3.418022	1021.285500	0.106955
T0 + 23	-0.111503	3.306520	1042.562281	0.102405
T0 + 24	1.211618	4.518138	1063.839062	0.138523
T0 + 25	0.491746	5.009884	1085.115844	0.152086

Materials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-1.294527	-1.294527	1.201999	-1.180753
T0 - 24	-0.487929	-1.782456	2.403998	-1.149613
T0 - 23	0.469967	-1.312488	3.605997	-0.691167
T0 - 22	-1.462969	-2.775457	4.807996	-1.265763
T0 - 21	0.119472	-2.655985	6.009995	-1.083399
T0 - 20	1.848636	-0.807349	7.211994	-0.300631
T0 - 19	2.005232	1.197884	8.413993	0.412965
T0 - 18	0.278394	1.476278	9.615992	0.476070
T0 - 17	-0.535811	0.940467	10.817991	0.285937
T0 - 16	-0.970972	-0.030505	12.019990	-0.008799
T0 - 15	2.742945	2.712440	13.221989	0.745953
T0 - 14	0.675832	3.388272	14.423988	0.892145
T0 - 13	0.702645	4.090917	15.625987	1.034896
T0 - 12	-0.697608	3.393308	16.827986	0.827194
T0 - 11	-1.129717	2.263591	18.029984	0.533090
T0 - 10	0.839087	3.102678	19.231983	0.707497
T0 - 9	1.097841	4.200519	20.433982	0.929237
T0 - 8	1.994786	6.195305	21.635981	1.331908
T0 - 7	1.098749	7.294054	22.837980	1.526301
T0 - 6	-1.193324	6.100730	24.039979	1.244270
T0 - 5	-1.027844	5.072886	25.241978	1.009702
T0 - 4	-0.810719	4.262167	26.443977	0.828833
T0 - 3	-0.097449	4.164717	27.645976	0.792081
T0 - 2	1.658391	5.823108	28.847975	1.084169
T0 - 1	-0.949625	4.873483	30.049974	0.889032
T0	0.299408	5.172891	31.251973	0.925326
T0 + 1	0.712491	5.885382	32.453972	1.033096
T0 + 2	0.868139	6.753521	33.655971	1.164124
T0 + 3	-2.156182	4.597339	34.857970	0.778674
T0 + 4	0.374037	4.971377	36.059969	0.827874

T0 + 5	0.093311	5.064688	37.261968	0.829697
T0 + 6	-1.357073	3.707615	38.463967	0.597816
T0 + 7	0.815530	4.523145	39.665966	0.718177
T0 + 8	2.172052	6.695197	40.867965	1.047302
T0 + 9	1.206946	7.902143	42.069964	1.218313
T0 + 10	1.150852	9.052995	43.271963	1.376224
T0 + 11	1.717780	10.770775	44.473962	1.615080
T0 + 12	2.364526	13.135301	45.675961	1.943552
T0 + 13	-0.616721	12.518580	46.877960	1.828398
T0 + 14	-0.455587	12.062992	48.079959	1.739695
T0 + 15	-0.850453	11.212539	49.281958	1.597203
T0 + 16	-1.160370	10.052170	50.483957	1.414761
T0 + 17	0.752111	10.804281	51.685955	1.502829
T0 + 18	2.239543	13.043824	52.887954	1.793604
T0 + 19	-1.133658	11.910166	54.089953	1.619420
T0 + 20	-0.728060	11.182105	55.291952	1.503809
T0 + 21	-0.528000	10.654106	56.493951	1.417477
T0 + 22	0.693105	11.347211	57.695950	1.493883
T0 + 23	0.284259	11.631470	58.897949	1.515600
T0 + 24	2.928293	14.559763	60.099948	1.878094
T0 + 25	-0.529935	14.029828	61.301947	1.791906

Real Estate

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.216359	0.216359	2.261529	0.143871
T0 - 24	0.306918	0.523277	4.523057	0.246046
T0 - 23	0.249634	0.772911	6.784586	0.296734
T0 - 22	-0.067758	0.705153	9.046114	0.234451
T0 - 21	0.049813	0.754966	11.307643	0.224513
T0 - 20	0.366963	1.121929	13.569171	0.304571
T0 - 19	0.768871	1.890800	15.830700	0.475221
T0 - 18	-1.725821	0.164979	18.092229	0.038787
T0 - 17	-1.657657	-1.492678	20.353757	-0.330860
T0 - 16	-0.490324	-1.983002	22.615286	-0.416987
T0 - 15	0.328881	-1.654120	24.876814	-0.331642
T0 - 14	-0.844726	-2.498846	27.138343	-0.479676
T0 - 13	-1.550713	-4.049559	29.399872	-0.746853
T0 - 12	-0.372318	-4.421877	31.661400	-0.785854
T0 - 11	-0.229459	-4.651336	33.922929	-0.798603
T0 - 10	0.343284	-4.308052	36.184457	-0.716176
T0 - 9	-0.145762	-4.453814	38.445986	-0.718301
T0 - 8	-0.293420	-4.747234	40.707514	-0.744052
T0 - 7	-1.045044	-5.792278	42.969043	-0.883632
T0 - 6	-0.947356	-6.739635	45.230572	-1.002121
T0 - 5	1.467634	-5.272001	47.492100	-0.765006
T0 - 4	0.271758	-5.000242	49.753629	-0.708890
T0 - 3	0.194049	-4.806193	52.015157	-0.666402
T0 - 2	0.451313	-4.354880	54.276686	-0.591112
T0 - 1	0.926590	-3.428290	56.538214	-0.455939
T0	0.606073	-2.822217	58.799743	-0.368046
T0 + 1	0.225775	-2.596442	61.061272	-0.332273

T0 + 2	-0.355736	-2.952177	63.322800	-0.370990
T0 + 3	0.040973	-2.911204	65.584329	-0.359478
T0 + 4	-0.975015	-3.886219	67.845857	-0.471808
T0 + 5	0.956099	-2.930120	70.107386	-0.349948
T0 + 6	0.066566	-2.863554	72.368915	-0.336612
T0 + 7	0.258325	-2.605229	74.630443	-0.301570
T0 + 8	-0.760683	-3.365912	76.891972	-0.383851
T0 + 9	0.710669	-2.655243	79.153500	-0.298448
T0 + 10	-0.092547	-2.747789	81.415029	-0.304531
T0 + 11	2.036796	-0.710993	83.676557	-0.077726
T0 + 12	0.067062	-0.643931	85.938086	-0.069462
T0 + 13	0.648929	0.004997	88.199615	0.000532
T0 + 14	0.117694	0.122692	90.461143	0.012900
T0 + 15	-0.143143	-0.020452	92.722672	-0.002124
T0 + 16	0.140712	0.120260	94.984200	0.012339
T0 + 17	-0.485728	-0.365468	97.245729	-0.037061
T0 + 18	-0.382161	-0.747629	99.507257	-0.074948
T0 + 19	0.519811	-0.227818	101.768786	-0.022583
T0 + 20	0.315385	0.087568	104.030315	0.008585
T0 + 21	1.278160	1.365727	106.291843	0.132469
T0 + 22	-0.114169	1.251558	108.553372	0.120124
T0 + 23	0.079743	1.331302	110.814900	0.126467
T0 + 24	0.860544	2.191845	113.076429	0.206122
T0 + 25	-1.428759	0.763086	115.337958	0.071054

Utilities

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.406221	0.406221	4.762211	0.186148
T0 - 24	0.435520	0.841741	9.524422	0.272747
T0 - 23	0.215087	1.056828	14.286633	0.279601
T0 - 22	-0.189364	0.867464	19.048844	0.198755
T0 - 21	1.241383	2.108847	23.811056	0.432171
T0 - 20	0.729617	2.838464	28.573267	0.531011
T0 - 19	0.388056	3.226520	33.335478	0.558832
T0 - 18	-1.663464	1.563056	38.097689	0.253236
T0 - 17	-3.052845	-1.489789	42.859900	-0.227562
T0 - 16	0.405402	-1.084387	47.622111	-0.157138
T0 - 15	-0.471758	-1.556145	52.384322	-0.215005
T0 - 14	-0.728209	-2.284353	57.146533	-0.302182
T0 - 13	-1.697560	-3.981914	61.908744	-0.506076
T0 - 12	-1.371518	-5.353431	66.670956	-0.655638
T0 - 11	-1.181432	-6.534863	71.433167	-0.773191
T0 - 10	0.814503	-5.720360	76.195378	-0.655329
T0 - 9	-0.678682	-6.399042	80.957589	-0.711191
T0 - 8	0.412398	-5.986644	85.719800	-0.646611
T0 - 7	-1.089652	-7.076297	90.482011	-0.743918
T0 - 6	-0.694928	-7.771224	95.244222	-0.796288
T0 - 5	0.447182	-7.324043	100.006433	-0.732381
T0 - 4	0.592063	-6.731980	104.768644	-0.657699
T0 - 3	-0.558614	-7.290594	109.530856	-0.696618
T0 - 2	0.919270	-6.371324	114.293067	-0.595964

T0 - 1	1.124739	-5.246585	119.055278	-0.480842
T0	-0.138703	-5.385289	123.817489	-0.483970
T0 + 1	0.028057	-5.357232	128.579700	-0.472448
T0 + 2	-1.996099	-7.353331	133.341911	-0.636797
T0 + 3	0.442180	-6.911151	138.104122	-0.588094
T0 + 4	1.156579	-5.754572	142.866333	-0.481447
T0 + 5	1.187351	-4.567221	147.628544	-0.375895
T0 + 6	0.520159	-4.047062	152.390756	-0.327839
T0 + 7	-0.005773	-4.052836	157.152967	-0.323294
T0 + 8	-0.003457	-4.056293	161.915178	-0.318776
T0 + 9	-1.198224	-5.254517	166.677389	-0.407000
T0 + 10	0.935870	-4.318647	171.439600	-0.329831
T0 + 11	0.622511	-3.696136	176.201811	-0.278447
T0 + 12	-0.672786	-4.368922	180.964022	-0.324772
T0 + 13	-0.614160	-4.983082	185.726233	-0.365647
T0 + 14	0.799566	-4.183516	190.488444	-0.303115
T0 + 15	-0.671818	-4.855334	195.250656	-0.347474
T0 + 16	0.995255	-3.860079	200.012867	-0.272940
T0 + 17	-0.152606	-4.012686	204.775078	-0.280412
T0 + 18	-0.232040	-4.244726	209.537289	-0.293237
T0 + 19	0.687855	-3.556871	214.299500	-0.242973
T0 + 20	-0.117798	-3.674670	219.061711	-0.248276
T0 + 21	-0.495604	-4.170274	223.823922	-0.278748
T0 + 22	0.553425	-3.616849	228.586133	-0.239224
T0 + 23	0.230411	-3.386438	233.348344	-0.221687
T0 + 24	0.578957	-2.807481	238.110556	-0.181940
T0 + 25	-2.441908	-5.249389	242.872767	-0.336837

Event 2016.11.04

Communication Services

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.458363	-0.458363	17.179786	-0.110586
T0 - 24	0.550104	0.091741	34.359571	0.015651
T0 - 23	-0.073024	0.018718	51.539357	0.002607
T0 - 22	-0.177062	-0.158344	68.719143	-0.019101
T0 - 21	-0.187569	-0.345913	85.898928	-0.037323
T0 - 20	-0.117006	-0.462919	103.078714	-0.045595
T0 - 19	-0.032627	-0.495546	120.258500	-0.045188
T0 - 18	-0.099019	-0.594565	137.438285	-0.050716
T0 - 17	-0.130850	-0.725415	154.618071	-0.058339
T0 - 16	-0.130356	-0.855770	171.797857	-0.065290
T0 - 15	0.112992	-0.742778	188.977642	-0.054032
T0 - 14	0.015281	-0.727498	206.157428	-0.050668
T0 - 13	2.076637	1.349139	223.337214	0.090277
T0 - 12	0.422278	1.771417	240.517000	0.114222
T0 - 11	-0.649180	1.122237	257.696785	0.069909
T0 - 10	-0.103183	1.019054	274.876571	0.061465
T0 - 9	0.155920	1.174974	292.056357	0.068754
T0 - 8	-0.493823	0.681151	309.236142	0.038735
T0 - 7	-0.859725	-0.178574	326.415928	-0.009884

T0 - 6	-0.169871	-0.348445	343.595714	-0.018798
T0 - 5	0.590142	0.241698	360.775499	0.012725
T0 - 4	-0.569458	-0.327761	377.955285	-0.016859
T0 - 3	-0.062887	-0.390647	395.135071	-0.019652
T0 - 2	-0.301689	-0.692337	412.314856	-0.034096
T0 - 1	-0.601059	-1.293395	429.494642	-0.062410
T0	-0.136403	-1.429798	446.674428	-0.067652
T0 + 1	0.472973	-0.956825	463.854213	-0.044426
T0 + 2	-0.868422	-1.825247	481.033999	-0.083221
T0 + 3	-2.012792	-3.838039	498.213785	-0.171950
T0 + 4	0.147816	-3.690223	515.393570	-0.162549
T0 + 5	-1.532767	-5.222990	532.573356	-0.226323
T0 + 6	0.440412	-4.782578	549.753142	-0.203976
T0 + 7	0.839546	-3.943032	566.932927	-0.165602
T0 + 8	0.148915	-3.794117	584.112713	-0.156987
T0 + 9	-0.426744	-4.220861	601.292499	-0.172131
T0 + 10	0.389646	-3.831215	618.472284	-0.154055
T0 + 11	0.767396	-3.063819	635.652070	-0.121522
T0 + 12	-0.181680	-3.245499	652.831856	-0.127023
T0 + 13	-0.076280	-3.321779	670.011641	-0.128330
T0 + 14	0.387538	-2.934241	687.191427	-0.111933
T0 + 15	0.684824	-2.249417	704.371213	-0.084756
T0 + 16	-1.289793	-3.539210	721.550999	-0.131757
T0 + 17	-0.338610	-3.877820	738.730784	-0.142674
T0 + 18	-0.189404	-4.067224	755.910570	-0.147932
T0 + 19	0.212547	-3.854677	773.090356	-0.138635
T0 + 20	0.704575	-3.150103	790.270141	-0.112056
T0 + 21	0.401101	-2.749001	807.449927	-0.096742
T0 + 22	-0.309758	-3.058759	824.629713	-0.106516
T0 + 23	0.085116	-2.973644	841.809498	-0.102490
T0 + 24	-0.129658	-3.103302	858.989284	-0.105884
T0 + 25	0.441130	-2.662171	876.169070	-0.089938

Consumer Discretionary

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.110080	0.110080	13.326406	0.030154
T0 - 24	0.256376	0.366455	26.652812	0.070982
T0 - 23	0.354837	0.721293	39.979218	0.114076
T0 - 22	-0.135454	0.585839	53.305624	0.080240
T0 - 21	0.032975	0.618814	66.632030	0.075809
T0 - 20	-0.153547	0.465266	79.958436	0.052032
T0 - 19	-0.689248	-0.223982	93.284842	-0.023190
T0 - 18	0.227526	0.003544	106.611248	0.000343
T0 - 17	0.284065	0.287609	119.937654	0.026262
T0 - 16	-0.009692	0.277917	133.264060	0.024075
T0 - 15	-0.095506	0.182410	146.590466	0.015066
T0 - 14	-0.835745	-0.653334	159.916872	-0.051664
T0 - 13	-0.567902	-1.221236	173.243278	-0.092784
T0 - 12	0.258922	-0.962314	186.569684	-0.070452
T0 - 11	0.168318	-0.793996	199.896090	-0.056159
T0 - 10	0.776070	-0.017926	213.222496	-0.001228

T0 - 9	0.564944	0.547018	226.548902	0.036343
T0 - 8	-1.561436	-1.014418	239.875308	-0.065497
T0 - 7	0.049217	-0.965201	253.201714	-0.060658
T0 - 6	-0.263397	-1.228599	266.528120	-0.075256
T0 - 5	-0.035654	-1.264252	279.854526	-0.075573
T0 - 4	-0.364664	-1.628917	293.180932	-0.095133
T0 - 3	-0.451885	-2.080802	306.507338	-0.118853
T0 - 2	0.473973	-1.606829	319.833744	-0.089848
T0 - 1	-0.293390	-1.900219	333.160150	-0.104106
T0	0.545241	-1.354977	346.486556	-0.072793
T0 + 1	-0.434990	-1.789968	359.812962	-0.094364
T0 + 2	-0.770861	-2.560829	373.139368	-0.132570
T0 + 3	0.736373	-1.824456	386.465774	-0.092806
T0 + 4	1.247113	-0.577343	399.792180	-0.028875
T0 + 5	-0.378340	-0.955683	413.118586	-0.047019
T0 + 6	-0.640858	-1.596541	426.444992	-0.077312
T0 + 7	0.866600	-0.729941	439.771398	-0.034808
T0 + 8	0.472690	-0.257252	453.097804	-0.012085
T0 + 9	0.071592	-0.185660	466.424210	-0.008597
T0 + 10	-0.286930	-0.472590	479.750616	-0.021576
T0 + 11	1.349099	0.876508	493.077022	0.039473
T0 + 12	0.096952	0.973460	506.403428	0.043258
T0 + 13	0.040084	1.013544	519.729834	0.044458
T0 + 14	-0.189560	0.823984	533.056240	0.035689
T0 + 15	0.013684	0.837668	546.382646	0.035836
T0 + 16	-0.318043	0.519625	559.709052	0.021964
T0 + 17	1.645815	2.165440	573.035458	0.090460
T0 + 18	-0.649562	1.515878	586.361864	0.062601
T0 + 19	0.290489	1.806367	599.688270	0.073764
T0 + 20	-0.501991	1.304376	613.014676	0.052683
T0 + 21	1.304084	2.608460	626.341082	0.104227
T0 + 22	-0.341477	2.266983	639.667488	0.089634
T0 + 23	0.039047	2.306030	652.993894	0.090242
T0 + 24	-0.469572	1.836458	666.320300	0.071144
T0 + 25	0.329197	2.165656	679.646706	0.083071

Consumer Staples

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.758112	0.758112	9.921723	0.240680
T0 - 24	-0.257153	0.500960	19.843445	0.112459
T0 - 23	-0.443639	0.057321	29.765168	0.010506
T0 - 22	-0.552701	-0.495380	39.686891	-0.078635
T0 - 21	-0.256743	-0.752123	49.608613	-0.106785
T0 - 20	0.162336	-0.589787	59.530336	-0.076441
T0 - 19	-0.613577	-1.203364	69.452059	-0.144396
T0 - 18	0.169730	-1.033635	79.373781	-0.116019
T0 - 17	0.333180	-0.700455	89.295504	-0.074125
T0 - 16	0.062357	-0.638097	99.217227	-0.064061
T0 - 15	0.071036	-0.567062	109.138949	-0.054280
T0 - 14	-0.137809	-0.704871	119.060672	-0.064599
T0 - 13	-0.178680	-0.883551	128.982395	-0.077798

T0 - 12	-0.681024	-1.564576	138.904117	-0.132751
T0 - 11	0.240238	-1.324338	148.825840	-0.108557
T0 - 10	0.246971	-1.077366	158.747563	-0.085509
T0 - 9	0.738690	-0.338677	168.669285	-0.026078
T0 - 8	0.437113	0.098437	178.591008	0.007366
T0 - 7	0.399015	0.497452	188.512731	0.036231
T0 - 6	-0.244907	0.252546	198.434453	0.017928
T0 - 5	0.782403	1.034949	208.356176	0.071699
T0 - 4	0.081727	1.116676	218.277899	0.075583
T0 - 3	-0.144094	0.972582	228.199621	0.064383
T0 - 2	0.389786	1.362369	238.121344	0.088287
T0 - 1	-0.193715	1.168654	248.043067	0.074203
T0	-0.856590	0.312064	257.964790	0.019430
T0 + 1	0.783275	1.095339	267.886512	0.066923
T0 + 2	-2.021228	-0.925889	277.808235	-0.055550
T0 + 3	-2.897276	-3.823165	287.729958	-0.225388
T0 + 4	-0.038529	-3.861694	297.651680	-0.223833
T0 + 5	-0.402459	-4.264154	307.573403	-0.243141
T0 + 6	0.272844	-3.991310	317.495126	-0.223999
T0 + 7	0.250619	-3.740691	327.416848	-0.206729
T0 + 8	-0.423642	-4.164332	337.338571	-0.226732
T0 + 9	-0.395665	-4.559997	347.260294	-0.244702
T0 + 10	0.183868	-4.376129	357.182016	-0.231550
T0 + 11	0.301155	-4.074974	367.103739	-0.212682
T0 + 12	-0.614433	-4.689407	377.025462	-0.241509
T0 + 13	0.353484	-4.335923	386.947184	-0.220422
T0 + 14	0.644462	-3.691461	396.868907	-0.185300
T0 + 15	-0.023796	-3.715258	406.790630	-0.184206
T0 + 16	-1.666052	-5.381310	416.712352	-0.263615
T0 + 17	-0.307302	-5.688612	426.634075	-0.275409
T0 + 18	0.681159	-5.007453	436.555798	-0.239661
T0 + 19	-0.641928	-5.649381	446.477520	-0.267363
T0 + 20	-0.038950	-5.688331	456.399243	-0.266264
T0 + 21	0.720941	-4.967389	466.320966	-0.230031
T0 + 22	-0.497708	-5.465098	476.242688	-0.250429
T0 + 23	0.840484	-4.624614	486.164411	-0.209741
T0 + 24	0.753392	-3.871221	496.086134	-0.173808
T0 + 25	0.023748	-3.847473	506.007856	-0.171040

Energy

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.052660	0.052660	20.439863	0.011648
T0 - 24	0.110470	0.163130	40.879726	0.025514
T0 - 23	-0.607751	-0.444621	61.319589	-0.056779
T0 - 22	0.555115	0.110494	81.759452	0.012220
T0 - 21	0.487783	0.598277	102.199315	0.059180
T0 - 20	-0.087454	0.510823	122.639178	0.046127
T0 - 19	0.327152	0.837975	143.079041	0.070056
T0 - 18	0.175296	1.013271	163.518905	0.079239
T0 - 17	-0.391493	0.621778	183.958768	0.045843
T0 - 16	-0.570919	0.050859	204.398631	0.003557

T0 - 15	-0.489879	-0.439020	224.838494	-0.029278
T0 - 14	-0.269779	-0.708799	245.278357	-0.045258
T0 - 13	-0.684415	-1.393214	265.718220	-0.085469
T0 - 12	1.585997	0.192783	286.158083	0.011396
T0 - 11	0.170406	0.363189	306.597946	0.020742
T0 - 10	-0.666419	-0.303231	327.037809	-0.016768
T0 - 9	0.027271	-0.275960	347.477672	-0.014804
T0 - 8	-0.145172	-0.421132	367.917535	-0.021955
T0 - 7	0.327318	-0.093813	388.357398	-0.004760
T0 - 6	0.406351	0.312538	408.797261	0.015458
T0 - 5	0.465443	0.777981	429.237124	0.037551
T0 - 4	-1.129172	-0.351191	449.676988	-0.016561
T0 - 3	0.329411	-0.021780	470.116851	-0.001005
T0 - 2	-0.501833	-0.523613	490.556714	-0.023641
T0 - 1	0.956713	0.433100	510.996577	0.019159
T0	-1.388281	-0.955181	531.436440	-0.041434
T0 + 1	-0.106567	-1.061747	551.876303	-0.045196
T0 + 2	0.071172	-0.990575	572.316166	-0.041407
T0 + 3	-0.522561	-1.513135	592.756029	-0.062150
T0 + 4	-1.840434	-3.353569	613.195892	-0.135428
T0 + 5	0.323369	-3.030201	633.635755	-0.120379
T0 + 6	2.019633	-1.010567	654.075618	-0.039514
T0 + 7	-0.648160	-1.658727	674.515481	-0.063867
T0 + 8	-1.372877	-3.031604	694.955344	-0.114999
T0 + 9	1.170419	-1.861185	715.395207	-0.069585
T0 + 10	0.888361	-0.972824	735.835070	-0.035863
T0 + 11	-0.381387	-1.354211	756.274934	-0.049243
T0 + 12	0.102356	-1.251855	776.714797	-0.044918
T0 + 13	-0.769583	-2.021438	797.154660	-0.071596
T0 + 14	-0.377477	-2.398915	817.594523	-0.083897
T0 + 15	-1.279372	-3.678286	838.034386	-0.127062
T0 + 16	5.022774	1.344487	858.474249	0.045887
T0 + 17	0.038907	1.383394	878.914112	0.046663
T0 + 18	-0.260841	1.122553	899.353975	0.037432
T0 + 19	-0.242305	0.880248	919.793838	0.029024
T0 + 20	-0.696707	0.183541	940.233701	0.005986
T0 + 21	-1.358922	-1.175381	960.673564	-0.037922
T0 + 22	0.101777	-1.073604	981.113427	-0.034276
T0 + 23	0.028122	-1.045481	1001.553290	-0.033035
T0 + 24	1.175973	0.130492	1021.993153	0.004082
T0 + 25	0.678994	0.809485	1042.433016	0.025072

Financials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.655447	0.655447	17.610841	0.156188
T0 - 24	0.064866	0.720314	35.221682	0.121371
T0 - 23	1.127519	1.847832	52.832524	0.254221
T0 - 22	1.005457	2.853289	70.443365	0.339958
T0 - 21	-0.078476	2.774814	88.054206	0.295705
T0 - 20	0.656089	3.430903	105.665047	0.333767
T0 - 19	0.010023	3.440926	123.275888	0.309910

T0 - 18	0.586368	4.027294	140.886729	0.339296
T0 - 17	-0.085845	3.941449	158.497571	0.313072
T0 - 16	-0.513153	3.428296	176.108412	0.258338
T0 - 15	0.492979	3.921274	193.719253	0.281735
T0 - 14	0.276996	4.198270	211.330094	0.288795
T0 - 13	0.033730	4.232001	228.940935	0.279695
T0 - 12	0.606505	4.838505	246.551776	0.308146
T0 - 11	0.965658	5.804164	264.162618	0.357112
T0 - 10	0.265825	6.069988	281.773459	0.361608
T0 - 9	-0.362040	5.707948	299.384300	0.329887
T0 - 8	0.432589	6.140538	316.995141	0.344890
T0 - 7	0.852243	6.992780	334.605982	0.382281
T0 - 6	0.812997	7.805777	352.216824	0.415921
T0 - 5	0.041626	7.847403	369.827665	0.408062
T0 - 4	-0.014763	7.832640	387.438506	0.397930
T0 - 3	0.547126	8.379766	405.049347	0.416369
T0 - 2	0.133334	8.513100	422.660188	0.414087
T0 - 1	0.523206	9.036306	440.271029	0.430656
T0	-0.371722	8.664584	457.881871	0.404922
T0 + 1	-0.517727	8.146857	475.492712	0.373610
T0 + 2	2.789465	10.936322	493.103553	0.492495
T0 + 3	3.423787	14.360109	510.714394	0.635431
T0 + 4	0.681731	15.041840	528.325235	0.654411
T0 + 5	2.526332	17.568171	545.936077	0.751892
T0 + 6	-0.804972	16.763200	563.546918	0.706142
T0 + 7	-1.314967	15.448233	581.157759	0.640814
T0 + 8	0.697192	16.145425	598.768600	0.659812
T0 + 9	0.568576	16.714001	616.379441	0.673219
T0 + 10	-0.632975	16.081026	633.990282	0.638664
T0 + 11	-0.083340	15.997686	651.601124	0.626709
T0 + 12	0.624542	16.622228	669.211965	0.642551
T0 + 13	-0.333358	16.288870	686.822806	0.621539
T0 + 14	-0.574157	15.714713	704.433647	0.592088
T0 + 15	-0.369502	15.345211	722.044488	0.571072
T0 + 16	1.829179	17.174391	739.655329	0.631490
T0 + 17	2.490070	19.664460	757.266171	0.714591
T0 + 18	-1.027269	18.637192	774.877012	0.669521
T0 + 19	0.295223	18.932415	792.487853	0.672527
T0 + 20	0.384604	19.317018	810.098694	0.678689
T0 + 21	-0.109416	19.207602	827.709535	0.667627
T0 + 22	0.965478	20.173080	845.320377	0.693844
T0 + 23	-0.725439	19.447640	862.931218	0.662032
T0 + 24	-0.673729	18.773911	880.542059	0.632674
T0 + 25	-0.588599	18.185312	898.152900	0.606800

Health Care

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.264664	0.264664	34.310105	0.045184
T0 - 24	0.141397	0.406060	68.620210	0.049019
T0 - 23	0.211316	0.617377	102.930315	0.060853
T0 - 22	-0.140786	0.476591	137.240420	0.040682

T0 - 21	-0.367301	0.109289	171.550525	0.008344
T0 - 20	0.270370	0.379659	205.860630	0.026461
T0 - 19	-0.587201	-0.207542	240.170735	-0.013392
T0 - 18	-0.978049	-1.185591	274.480840	-0.071561
T0 - 17	-0.396816	-1.582407	308.790945	-0.090050
T0 - 16	0.183276	-1.399130	343.101050	-0.075535
T0 - 15	-0.630940	-2.030070	377.411155	-0.104497
T0 - 14	-0.123457	-2.153526	411.721260	-0.106133
T0 - 13	0.520479	-1.633047	446.031365	-0.077324
T0 - 12	-0.701146	-2.334193	480.341470	-0.106503
T0 - 11	0.994508	-1.339686	514.651575	-0.059054
T0 - 10	-0.780128	-2.119813	548.961680	-0.090475
T0 - 9	-0.657965	-2.777778	583.271785	-0.115017
T0 - 8	-0.087808	-2.865586	617.581890	-0.115310
T0 - 7	0.006903	-2.858683	651.891995	-0.111964
T0 - 6	0.839446	-2.019237	686.202100	-0.077083
T0 - 5	-2.365274	-4.384511	720.512205	-0.163343
T0 - 4	-0.534610	-4.919121	754.822310	-0.179046
T0 - 3	0.149718	-4.769402	789.132415	-0.169781
T0 - 2	-0.028801	-4.798204	823.442519	-0.167210
T0 - 1	-0.582262	-5.380466	857.752624	-0.183713
T0	1.311536	-4.068930	892.062729	-0.136233
T0 + 1	-0.939495	-5.008425	926.372834	-0.164554
T0 + 2	2.681809	-2.326616	960.682939	-0.075065
T0 + 3	1.173743	-1.152873	994.993044	-0.036549
T0 + 4	-1.071280	-2.224153	1029.303149	-0.069325
T0 + 5	-0.751669	-2.975822	1063.613254	-0.091246
T0 + 6	-0.504067	-3.479889	1097.923359	-0.105022
T0 + 7	-0.219739	-3.699628	1132.233464	-0.109949
T0 + 8	-0.383753	-4.083381	1166.543569	-0.119555
T0 + 9	-0.778479	-4.861860	1200.853674	-0.140300
T0 + 10	-0.685258	-5.547118	1235.163779	-0.157836
T0 + 11	-1.891408	-7.438526	1269.473884	-0.208773
T0 + 12	-0.073590	-7.512115	1303.783989	-0.208046
T0 + 13	0.038640	-7.473475	1338.094094	-0.204305
T0 + 14	-0.609297	-8.082772	1372.404199	-0.218182
T0 + 15	0.546453	-7.536319	1406.714304	-0.200935
T0 + 16	-0.500399	-8.036718	1441.024409	-0.211711
T0 + 17	-0.564615	-8.601333	1475.334514	-0.223934
T0 + 18	0.604809	-7.996524	1509.644619	-0.205809
T0 + 19	-0.890816	-8.887341	1543.954724	-0.226180
T0 + 20	0.021544	-8.865797	1578.264829	-0.223166
T0 + 21	-1.973962	-10.839759	1612.574934	-0.269935
T0 + 22	-0.355683	-11.195441	1646.885039	-0.275873
T0 + 23	0.783487	-10.411954	1681.195144	-0.253935
T0 + 24	0.512484	-9.899470	1715.505249	-0.239010
T0 + 25	0.257488	-9.641982	1749.815354	-0.230500

Industrials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.172549	-0.172549	11.452011	-0.050988

T0 - 24	0.114853	-0.057696	22.904022	-0.012056
T0 - 23	-0.432605	-0.490300	34.356033	-0.083649
T0 - 22	0.272561	-0.217739	45.808044	-0.032171
T0 - 21	-0.378498	-0.596237	57.260055	-0.078794
T0 - 20	-0.917476	-1.513713	68.712066	-0.182611
T0 - 19	-0.637410	-2.151123	80.164077	-0.240257
T0 - 18	0.243238	-1.907885	91.616088	-0.199327
T0 - 17	-0.189353	-2.097238	103.068099	-0.206579
T0 - 16	0.332167	-1.765071	114.520110	-0.164938
T0 - 15	0.087721	-1.677351	125.972121	-0.149447
T0 - 14	0.010244	-1.667107	137.424132	-0.142211
T0 - 13	-0.475978	-2.143085	148.876144	-0.175641
T0 - 12	-0.075310	-2.218395	160.328155	-0.175200
T0 - 11	-0.697168	-2.915563	171.780166	-0.222452
T0 - 10	-0.211608	-3.127171	183.232177	-0.231021
T0 - 9	0.047775	-3.079395	194.684188	-0.220699
T0 - 8	0.724635	-2.354761	206.136199	-0.164010
T0 - 7	0.654271	-1.700490	217.588210	-0.115281
T0 - 6	-0.419572	-2.120061	229.040221	-0.140085
T0 - 5	0.740397	-1.379664	240.492232	-0.088966
T0 - 4	-0.089959	-1.469623	251.944243	-0.092588
T0 - 3	0.080303	-1.389320	263.396254	-0.085605
T0 - 2	0.152865	-1.236455	274.848265	-0.074582
T0 - 1	0.238948	-0.997507	286.300276	-0.058953
T0	0.137594	-0.859913	297.752287	-0.049834
T0 + 1	0.292585	-0.567328	309.204298	-0.032263
T0 + 2	1.794842	1.227514	320.656309	0.068550
T0 + 3	2.008797	3.236312	332.108320	0.177587
T0 + 4	0.450394	3.686705	343.560331	0.198901
T0 + 5	0.517778	4.204484	355.012342	0.223147
T0 + 6	-0.806296	3.398188	366.464353	0.177514
T0 + 7	-0.601538	2.796651	377.916364	0.143860
T0 + 8	-0.418476	2.378175	389.368375	0.120521
T0 + 9	0.276117	2.654292	400.820386	0.132579
T0 + 10	-0.427959	2.226333	412.272397	0.109647
T0 + 11	0.108556	2.334889	423.724409	0.113429
T0 + 12	0.629767	2.964656	435.176420	0.142116
T0 + 13	-0.040550	2.924106	446.628431	0.138363
T0 + 14	0.037382	2.961488	458.080442	0.138369
T0 + 15	0.026496	2.987985	469.532453	0.137894
T0 + 16	0.505677	3.493662	480.984464	0.159300
T0 + 17	1.028041	4.521703	492.436475	0.203764
T0 + 18	-0.177930	4.343773	503.888486	0.193508
T0 + 19	-0.659047	3.684726	515.340497	0.162315
T0 + 20	-0.403110	3.281616	526.792508	0.142978
T0 + 21	0.500278	3.781894	538.244519	0.163012
T0 + 22	-1.031762	2.750132	549.696530	0.117298
T0 + 23	-0.223510	2.526622	561.148541	0.106660
T0 + 24	-0.036678	2.489944	572.600552	0.104055
T0 + 25	-0.590330	1.899614	584.052563	0.078603

Information Technology

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.213095	-0.213095	22.557798	-0.044867
T0 - 24	-0.232372	-0.445467	45.115595	-0.066321
T0 - 23	0.204627	-0.240840	67.673393	-0.029277
T0 - 22	-0.267056	-0.507896	90.231190	-0.053468
T0 - 21	0.224307	-0.283589	112.788988	-0.026703
T0 - 20	0.028589	-0.255000	135.346785	-0.021919
T0 - 19	0.001403	-0.253597	157.904583	-0.020181
T0 - 18	-0.166293	-0.419890	180.462381	-0.031257
T0 - 17	-0.266682	-0.686573	203.020178	-0.048186
T0 - 16	-0.284019	-0.970592	225.577976	-0.064623
T0 - 15	0.780076	-0.190515	248.135773	-0.012094
T0 - 14	-0.123927	-0.314442	270.693571	-0.019112
T0 - 13	-0.362346	-0.676788	293.251369	-0.039521
T0 - 12	-0.548843	-1.225631	315.809166	-0.068968
T0 - 11	0.161797	-1.063834	338.366964	-0.057834
T0 - 10	0.213119	-0.850715	360.924761	-0.044779
T0 - 9	0.660701	-0.190015	383.482559	-0.009703
T0 - 8	0.106088	-0.083927	406.040356	-0.004165
T0 - 7	0.037332	-0.046595	428.598154	-0.002251
T0 - 6	0.019292	-0.027303	451.155952	-0.001285
T0 - 5	0.411551	0.384248	473.713749	0.017654
T0 - 4	0.220442	0.604690	496.271547	0.027144
T0 - 3	-0.204816	0.399874	518.829344	0.017555
T0 - 2	0.172934	0.572808	541.387142	0.024618
T0 - 1	0.050265	0.623072	563.944939	0.026237
T0	-0.186623	0.436449	586.502737	0.018022
T0 + 1	-0.276305	0.160144	609.060535	0.006489
T0 + 2	-1.532571	-1.372427	631.618332	-0.054609
T0 + 3	-1.521818	-2.894245	654.176130	-0.113159
T0 + 4	2.494890	-0.399355	676.733927	-0.015351
T0 + 5	-1.862026	-2.261381	699.291725	-0.085515
T0 + 6	0.249478	-2.011904	721.849523	-0.074883
T0 + 7	1.171498	-0.840405	744.407320	-0.030802
T0 + 8	-0.124679	-0.965084	766.965118	-0.034848
T0 + 9	0.470024	-0.495060	789.522915	-0.017619
T0 + 10	-0.149525	-0.644586	812.080713	-0.022619
T0 + 11	-0.109347	-0.753932	834.638510	-0.026097
T0 + 12	-1.035806	-1.789738	857.196308	-0.061129
T0 + 13	-0.047152	-1.836891	879.754106	-0.061930
T0 + 14	0.651031	-1.185859	902.311903	-0.039478
T0 + 15	-0.426332	-1.612192	924.869701	-0.053012
T0 + 16	-0.785390	-2.397582	947.427498	-0.077893
T0 + 17	-2.609040	-5.006623	969.985296	-0.160754
T0 + 18	0.334096	-4.672526	992.543093	-0.148312
T0 + 19	0.591935	-4.080591	1015.100891	-0.128076
T0 + 20	-0.064689 %	-4.145280 %	1037.658689	-0.128685
T0 + 21	0.486314	-3.658966	1060.216486	-0.112373
T0 + 22	-0.244830	-3.903796	1082.774284	-0.118636
T0 + 23	-0.569545	-4.473340	1105.332081	-0.134551

T0 + 24	-0.274888	-4.748228	1127.889879	-0.141383
T0 + 25	0.729008	-4.019221	1150.447677	-0.118497

Materials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.728764	-0.728764	2.068607	-0.506697
T0 - 24	1.531735	0.802971	4.137214	0.394771
T0 - 23	-0.660182	0.142788	6.205821	0.057318
T0 - 22	1.139775	1.282564	8.274428	0.445872
T0 - 21	1.751719	3.034283	10.343035	0.943479
T0 - 20	-0.751678	2.282605	12.411642	0.647912
T0 - 19	0.304692	2.587298	14.480249	0.679921
T0 - 18	1.252597	3.839895	16.548856	0.943920
T0 - 17	-0.483985	3.355910	18.617462	0.777768
T0 - 16	-0.398837	2.957072	20.686069	0.650164
T0 - 15	0.824002	3.781074	22.754676	0.792647
T0 - 14	-0.127286	3.653789	24.823283	0.733354
T0 - 13	0.301922	3.955710	26.891890	0.762805
T0 - 12	0.068140	4.023850	28.960497	0.747720
T0 - 11	0.048889	4.072740	31.029104	0.731143
T0 - 10	0.325377	4.398117	33.097711	0.764483
T0 - 9	-0.338550	4.059567	35.166318	0.684568
T0 - 8	0.291827	4.351394	37.234925	0.713104
T0 - 7	-0.501244	3.850150	39.303532	0.614132
T0 - 6	1.780515	5.630664	41.372139	0.875398
T0 - 5	-0.744053	4.886612	43.440746	0.741411
T0 - 4	-0.404182	4.482430	45.509353	0.664451
T0 - 3	0.630055	5.112484	47.577960	0.741189
T0 - 2	0.383359	5.495843	49.646567	0.779991
T0 - 1	-0.269745	5.226098	51.715174	0.726722
T0	-1.607269	3.618829	53.783781	0.493449
T0 + 1	-0.673955	2.944875	55.852387	0.394045
T0 + 2	-0.422730	2.522145	57.920994	0.331400
T0 + 3	0.080416	2.602561	59.989601	0.336018
T0 + 4	-0.665808	1.936753	62.058208	0.245853
T0 + 5	-0.373149	1.563604	64.126815	0.195257
T0 + 6	-1.435422	0.128182	66.195422	0.015755
T0 + 7	0.266001	0.394184	68.264029	0.047709
T0 + 8	-0.164522	0.229662	70.332636	0.027385
T0 + 9	-0.040228	0.189434	72.401243	0.022263
T0 + 10	0.718246	0.907680	74.469850	0.105182
T0 + 11	0.167816	1.075496	76.538457	0.122933
T0 + 12	-0.686788	0.388708	78.607064	0.043842
T0 + 13	-0.186457	0.202251	80.675671	0.022518
T0 + 14	0.830914	1.033165	82.744278	0.113580
T0 + 15	-0.685315	0.347850	84.812885	0.037771
T0 + 16	3.417835	3.765685	86.881492	0.403999
T0 + 17	1.126744	4.892429	88.950099	0.518742
T0 + 18	-1.216130	3.676299	91.018705	0.385341
T0 + 19	0.277823	3.954122	93.087312	0.409831
T0 + 20	-0.171632	3.782490	95.155919	0.387757

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 + 21	-0.149134	3.633356	97.224526	0.368485
T0 + 22	0.555779	4.189134	99.293133	0.420402
T0 + 23	0.065007	4.254142	101.361740	0.422547
T0 + 24	1.208147	5.462288	103.430347	0.537094
T0 + 25	-1.448981	4.013307	105.498954	0.390731

Real Estate

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.993500	-0.993500	1.793533	-0.741845
T0 - 24	-1.449868	-2.443368	3.587066	-1.290088
T0 - 23	-1.112258	-3.555626	5.380600	-1.532854
T0 - 22	-2.601443	-6.157070	7.174133	-2.298737
T0 - 21	0.681546	-5.475524	8.967666	-1.828462
T0 - 20	0.361603	-5.113921	10.761199	-1.558919
T0 - 19	0.146881	-4.967040	12.554733	-1.401825
T0 - 18	0.230166	-4.736874	14.348266	-1.250524
T0 - 17	1.908190	-2.828684	16.141799	-0.704058
T0 - 16	0.507282	-2.321401	17.935332	-0.548145
T0 - 15	-0.316672	-2.638073	19.728865	-0.593931
T0 - 14	0.167663	-2.470410	21.522399	-0.532505
T0 - 13	-0.076975	-2.547385	23.315932	-0.527555
T0 - 12	0.227119	-2.320266	25.109465	-0.463041
T0 - 11	-0.479545	-2.799811	26.902998	-0.539794
T0 - 10	0.122697	-2.677114	28.696532	-0.499749
T0 - 9	0.187088	-2.490026	30.490065	-0.450946
T0 - 8	0.259447	-2.230579	32.283598	-0.392579
T0 - 7	-2.616787	-4.847365	34.077131	-0.830375
T0 - 6	-1.268657	-6.116023	35.870664	-1.021173
T0 - 5	0.416909	-5.699114	37.664198	-0.928631
T0 - 4	1.260602	-4.438512	39.457731	-0.706596
T0 - 3	-1.071366	-5.509878	41.251264	-0.857874
T0 - 2	-1.474542	-6.984420	43.044797	-1.064560
T0 - 1	0.517501	-6.466919	44.838331	-0.965768
T0	-0.206113	-6.673032	46.631864	-0.977196
T0 + 1	0.103989	-6.569044	48.425397	-0.943986
T0 + 2	-4.787731	-11.356775	50.218930	-1.602586
T0 + 3	-1.611887	-12.968662	52.012464	-1.798214
T0 + 4	0.142160	-12.826502	53.805997	-1.748610
T0 + 5	-0.307025	-13.133527	55.599530	-1.761351
T0 + 6	-0.671766	-13.805293	57.393063	-1.822283
T0 + 7	0.558161	-13.247132	59.186596	-1.721909
T0 + 8	-1.099021	-14.346153	60.980130	-1.837136
T0 + 9	-0.081315	-14.427468	62.773663	-1.820964
T0 + 10	-0.575993	-15.003461	64.567196	-1.867177
T0 + 11	1.234336	-13.769125	66.360729	-1.690249
T0 + 12	-0.933985	-14.703110	68.154263	-1.780995
T0 + 13	0.232845	-14.470265	69.947796	-1.730173
T0 + 14	-0.144396	-14.614661	71.741329	-1.725457
T0 + 15	0.098977	-14.515684	73.534862	-1.692742
T0 + 16	-2.404825	-16.920509	75.328395	-1.949549
T0 + 17	-1.217442	-18.137951	77.121929	-2.065377

T0 + 18	1.310099	-16.827853	78.915462	-1.894295
T0 + 19	-0.427099	-17.254951	80.708995	-1.920670
T0 + 20	-1.178355	-18.433306	82.502528	-2.029409
T0 + 21	0.488093	-17.945213	84.296062	-1.954542
T0 + 22	-0.177009	-18.122222	86.089595	-1.953152
T0 + 23	-0.312206	-18.434428	87.883128	-1.966423
T0 + 24	1.184955	-17.249473	89.676661	-1.821529
T0 + 25	0.716685	-16.532788	91.470194	-1.728647

Utilities

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-1.083981	-1.083981	4.708641	-0.499544
T0 - 24	-1.107568	-2.191549	9.417283	-0.714148
T0 - 23	-2.112919	-4.304468	14.125924	-1.145278
T0 - 22	-0.456836	-4.761304	18.834566	-1.097105
T0 - 21	-0.236603	-4.997907	23.543207	-1.030043
T0 - 20	0.666781	-4.331126	28.251849	-0.814849
T0 - 19	0.677347	-3.653779	32.960490	-0.636422
T0 - 18	-0.705786	-4.359565	37.669132	-0.710314
T0 - 17	1.192022	-3.167543	42.377773	-0.486579
T0 - 16	1.389298	-1.778245	47.086415	-0.259146
T0 - 15	-0.584478	-2.362723	51.795056	-0.328298
T0 - 14	0.346465	-2.016258	56.503697	-0.268230
T0 - 13	0.560913	-1.455345	61.212339	-0.186014
T0 - 12	-0.474837	-1.930182	65.920980	-0.237731
T0 - 11	-0.117922	-2.048105	70.629622	-0.243702
T0 - 10	-0.636168	-2.684272	75.338263	-0.309256
T0 - 9	0.360209	-2.324063	80.046905	-0.259762
T0 - 8	0.571519	-1.752544	84.755546	-0.190364
T0 - 7	0.402827	-1.349717	89.464188	-0.142698
T0 - 6	-0.330214	-1.679930	94.172829	-0.173113
T0 - 5	0.201245	-1.478686	98.881470	-0.148703
T0 - 4	1.817154	0.338468	103.590112	0.033255
T0 - 3	-1.789127	-1.450659	108.298753	-0.139397
T0 - 2	-0.980614	-2.431273	113.007395	-0.228707
T0 - 1	0.351409	-2.079864	117.716036	-0.191698
T0	0.276653	-1.803210	122.424678	-0.162972
T0 + 1	0.232100	-1.571111	127.133319	-0.139340
T0 + 2	-4.765014	-6.336125	131.841961	-0.551819
T0 + 3	-3.191845	-9.527971	136.550602	-0.815368
T0 + 4	-0.563098	-10.091068	141.259244	-0.849041
T0 + 5	0.548536	-9.542532	145.967885	-0.789832
T0 + 6	1.751796	-7.790736	150.676526	-0.634681
T0 + 7	-0.749290	-8.540027	155.385168	-0.685101
T0 + 8	-0.360154	-8.900181	160.093809	-0.703415
T0 + 9	-0.454257	-9.354438	164.802451	-0.728678
T0 + 10	0.686989	-8.667448	169.511092	-0.665721
T0 + 11	-0.143370	-8.810818	174.219734	-0.667525
T0 + 12	-0.183632	-8.994450	178.928375	-0.672411
T0 + 13	0.960389	-8.034061	183.637017	-0.592864
T0 + 14	1.786277	-6.247784	188.345658	-0.455248

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 + 15	0.186684	-6.061100	193.054299	-0.436226
T0 + 16	-3.106801	-9.167901	197.762941	-0.651925
T0 + 17	-0.904636	-10.072537	202.471582	-0.707875
T0 + 18	1.192474	-8.880062	207.180224	-0.616938
T0 + 19	0.090166	-8.789896	211.888865	-0.603851
T0 + 20	-0.351472	-9.141368	216.597507	-0.621133
T0 + 21	0.856234	-8.285134	221.306148	-0.556933
T0 + 22	0.365472	-7.919662	226.014790	-0.526791
T0 + 23	0.597374	-7.322288	230.723431	-0.482060
T0 + 24	0.402365	-6.919923	235.432073	-0.450992
T0 + 25	1.374593	-5.545330	240.140714	-0.357845

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Communication Services

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.056126	0.056126	15.066471	0.014460
T0 - 24	0.601794	0.657919	30.132941	0.119854
T0 - 23	0.059182	0.717101	45.199412	0.106663
T0 - 22	-0.454209	0.262892	60.265883	0.033864
T0 - 21	-0.031838	0.231055	75.332353	0.026621
T0 - 20	0.234182	0.465236	90.398824	0.048932
T0 - 19	-0.217638	0.247598	105.465295	0.024110
T0 - 18	-0.346859	-0.099261	120.531765	-0.009041
T0 - 17	0.527503	0.428242	135.598236	0.036776
T0 - 16	0.641606	1.069848	150.664707	0.087160
T0 - 15	0.370025	1.439873	165.731177	0.111846
T0 - 14	-0.295607	1.144266	180.797648	0.085100
T0 - 13	-0.086912	1.057354	195.864119	0.075551
T0 - 12	0.084519	1.141872	210.930589	0.078623
T0 - 11	0.015365	1.157237	225.997060	0.076979
T0 - 10	0.156291	1.313528	241.063531	0.084601
T0 - 9	-0.434707	0.878820	256.130001	0.054912
T0 - 8	0.272845	1.151666	271.196472	0.069933
T0 - 7	0.187654	1.339319	286.262943	0.079159
T0 - 6	-0.003892	1.335427	301.329414	0.076931
T0 - 5	0.012278	1.347705	316.395884	0.075767
T0 - 4	-0.090510	1.257195	331.462355	0.069053
T0 - 3	-0.160248	1.096947	346.528826	0.058927
T0 - 2	0.022761	1.119708	361.595296	0.058883
T0 - 1	-0.961722	0.157986	376.661767	0.008140
T0	-0.401045	-0.243059	391.728238	-0.012281
T0 + 1	1.336757	1.093698	406.794708	0.054226
T0 + 2	0.545006	1.638704	421.861179	0.079784
T0 + 3	-0.477627	1.161077	436.927650	0.055546
T0 + 4	-1.244831	-0.083754	451.994120	-0.003939
T0 + 5	0.474319	0.390565	467.060591	0.018072
T0 + 6	0.501315	0.891880	482.127062	0.040619
T0 + 7	0.090048	0.981928	497.193532	0.044037
T0 + 8	-0.793807	0.188121	512.260003	0.008312
T0 + 9	0.165559	0.353679	527.326474	0.015402

T0 + 10	0.286119	0.639799	542.392944	0.027472
T0 + 11	-0.196140	0.443659	557.459415	0.018791
T0 + 12	0.538488	0.982147	572.525886	0.041047
T0 + 13	-0.080973	0.901173	587.592356	0.037177
T0 + 14	0.037309	0.938482	602.658827	0.038229
T0 + 15	-0.152626	0.785856	617.725298	0.031619
T0 + 16	0.855546	1.641402	632.791768	0.065251
T0 + 17	0.270498	1.911899	647.858239	0.075115
T0 + 18	0.563589	2.475488	662.924710	0.096145
T0 + 19	0.343493	2.818981	677.991180	0.108263
T0 + 20	-0.890154	1.928827	693.057651	0.073267
T0 + 21	-0.397011	1.531816	708.124122	0.057564
T0 + 22	-0.497323	1.034492	723.190592	0.038468
T0 + 23	-0.367459	0.667033	738.257063	0.024550
T0 + 24	0.556210	1.223244	753.323534	0.044568
T0 + 25	0.534839	1.758083	768.390004	0.063423

Consumer Discretionary

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.514043	0.514043	15.020118	0.132636
T0 - 24	-0.082519	0.431525	30.040237	0.078732
T0 - 23	-0.502744	-0.071220	45.060355	-0.010610
T0 - 22	-0.534712	-0.605932	60.080474	-0.078173
T0 - 21	0.164060	-0.441873	75.100592	-0.050989
T0 - 20	0.066292	-0.375580	90.120711	-0.039563
T0 - 19	0.118431	-0.257149	105.140829	-0.025078
T0 - 18	-0.204206	-0.461355	120.160948	-0.042088
T0 - 17	-0.143058	-0.604414	135.181066	-0.051985
T0 - 16	-0.382916	-0.987330	150.201185	-0.080561
T0 - 15	-0.048268	-1.035599	165.221303	-0.080567
T0 - 14	0.123893	-0.911705	180.241422	-0.067909
T0 - 13	-0.174403	-1.086108	195.261540	-0.077726
T0 - 12	-0.384873	-1.470982	210.281659	-0.101439
T0 - 11	0.244432	-1.226550	225.301777	-0.081715
T0 - 10	-0.865932	-2.092481	240.321896	-0.134979
T0 - 9	-0.168999	-2.261480	255.342014	-0.141525
T0 - 8	0.434260	-1.827221	270.362133	-0.111127
T0 - 7	-0.199401	-2.026621	285.382251	-0.119966
T0 - 6	-0.046076	-2.072697	300.402370	-0.119587
T0 - 5	0.198807	-1.873890	315.422488	-0.105511
T0 - 4	-0.528191	-2.402081	330.442607	-0.132142
T0 - 3	0.196017	-2.206063	345.462725	-0.118691
T0 - 2	-0.292378	-2.498442	360.482844	-0.131591
T0 - 1	-0.094924	-2.593366	375.502962	-0.133831
T0	-0.584904	-3.178269	390.523081	-0.160830
T0 + 1	1.100122	-2.078147	405.543199	-0.103195
T0 + 2	0.565185	-1.512963	420.563318	-0.073776
T0 + 3	0.282815	-1.230148	435.583436	-0.058942
T0 + 4	-1.424768	-2.654916	450.603555	-0.125070
T0 + 5	-0.962435	-3.617351	465.623673	-0.167638
T0 + 6	0.060054	-3.557298	480.643792	-0.162259

T0 + 7	0.181429	-3.375869	495.663910	-0.151632
T0 + 8	0.496429	-2.879440	510.684029	-0.127418
T0 + 9	0.642187	-2.237253	525.704147	-0.097576
T0 + 10	0.393645	-1.843608	540.724266	-0.079283
T0 + 11	-0.564256	-2.407864	555.744384	-0.102140
T0 + 12	-0.027916	-2.435780	570.764503	-0.101955
T0 + 13	-0.135604	-2.571384	585.784621	-0.106242
T0 + 14	0.674248	-1.897136	600.804740	-0.077398
T0 + 15	-0.418298	-2.315435	615.824858	-0.093305
T0 + 16	0.217002	-2.098433	630.844977	-0.083548
T0 + 17	-0.644677	-2.743110	645.865095	-0.107937
T0 + 18	0.022503	-2.720607	660.885214	-0.105829
T0 + 19	-0.220717	-2.941324	675.905332	-0.113136
T0 + 20	0.047385	-2.893938	690.925451	-0.110097
T0 + 21	0.136300	-2.757638	705.945569	-0.103789
T0 + 22	-0.727460	-3.485098	720.965687	-0.129795
T0 + 23	-0.402899	-3.887997	735.985806	-0.143315
T0 + 24	-0.554422	-4.442419	751.005924	-0.162106
T0 + 25	1.629482	-2.812936	766.026043	-0.101634

Consumer Staples

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.072891	-0.072891	12.555633	-0.020571
T0 - 24	0.087063	0.014171	25.111267	0.002828
T0 - 23	0.194608	0.208780	37.666900	0.034018
T0 - 22	-0.316486	-0.107707	50.222533	-0.015198
T0 - 21	-0.046334	-0.154040	62.778167	-0.019442
T0 - 20	-0.123790	-0.277830	75.333800	-0.032010
T0 - 19	0.307577	0.029747	87.889434	0.003173
T0 - 18	-0.104167	-0.074420	100.445067	-0.007425
T0 - 17	-1.233822	-1.308242	113.000700	-0.123069
T0 - 16	0.102187	-1.206055	125.556334	-0.107634
T0 - 15	-0.604912	-1.810967	138.111967	-0.154097
T0 - 14	0.131143	-1.679825	150.667600	-0.136853
T0 - 13	-0.176263	-1.856088	163.223234	-0.145281
T0 - 12	0.081111	-1.774977	175.778867	-0.133878
T0 - 11	0.152512	-1.622464	188.334500	-0.118225
T0 - 10	0.449864	-1.172601	200.890134	-0.082731
T0 - 9	-0.359103	-1.531704	213.445767	-0.104841
T0 - 8	-0.088943	-1.620647	226.001401	-0.107803
T0 - 7	0.594435	-1.026211	238.557034	-0.066442
T0 - 6	0.022734	-1.003478	251.112667	-0.063325
T0 - 5	-0.276888	-1.280365	263.668301	-0.078851
T0 - 4	-0.191911	-1.472276	276.223934	-0.088585
T0 - 3	0.770509	-0.701767	288.779567	-0.041296
T0 - 2	-0.437834	-1.139601	301.335201	-0.065649
T0 - 1	-0.553936	-1.693538	313.890834	-0.095588
T0	0.816091	-0.877447	326.446467	-0.048564
T0 + 1	0.411173	-0.466274	339.002101	-0.025324
T0 + 2	-0.540979	-1.007252	351.557734	-0.053720
T0 + 3	-0.189321	-1.196573	364.113368	-0.062708

T0 + 4	-0.049830	-1.246404	376.669001	-0.064221
T0 + 5	0.470743	-0.775661	389.224634	-0.039316
T0 + 6	0.421535	-0.354126	401.780268	-0.017667
T0 + 7	-0.107232	-0.461358	414.335901	-0.022665
T0 + 8	-0.721889	-1.183247	426.891534	-0.057269
T0 + 9	-0.179998	-1.363245	439.447168	-0.065031
T0 + 10	0.602865	-0.760380	452.002801	-0.035765
T0 + 11	-0.016480	-0.776860	464.558434	-0.036043
T0 + 12	-0.132838	-0.909697	477.114068	-0.041647
T0 + 13	-0.517445	-1.427142	489.669701	-0.064493
T0 + 14	0.216153	-1.210989	502.225335	-0.054037
T0 + 15	1.136662	-0.074327	514.780968	-0.003276
T0 + 16	-0.617339	-0.691666	527.336601	-0.030120
T0 + 17	0.056612	-0.635053	539.892235	-0.027331
T0 + 18	-1.132934	-1.767987	552.447868	-0.075220
T0 + 19	-1.708169	-3.476156	565.003501	-0.146243
T0 + 20	2.780530	-0.695627	577.559135	-0.028945
T0 + 21	0.200430	-0.495196	590.114768	-0.020385
T0 + 22	2.592562	2.097366	602.670401	0.085435
T0 + 23	0.175718	2.273084	615.226035	0.091643
T0 + 24	0.581136	2.854220	627.781668	0.113916
T0 + 25	0.617415	3.471635	640.337302	0.137192

Energy

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.464070	0.464070	11.561029	0.136485
T0 - 24	-0.440345	0.023725	23.122057	0.004934
T0 - 23	0.273588	0.297313	34.683086	0.050484
T0 - 22	1.447529	1.744842	46.244115	0.256583
T0 - 21	0.077512	1.822354	57.805144	0.239690
T0 - 20	-0.408800	1.413554	69.366172	0.169722
T0 - 19	-0.129037	1.284517	80.927201	0.142788
T0 - 18	0.762991	2.047508	92.488230	0.212903
T0 - 17	1.791561	3.839069	104.049259	0.376363
T0 - 16	0.735646	4.574715	115.610287	0.425467
T0 - 15	-1.957178	2.617537	127.171316	0.232112
T0 - 14	0.470834	3.088371	138.732345	0.262205
T0 - 13	0.056097	3.144468	150.293374	0.256494
T0 - 12	-0.555019	2.589448	161.854402	0.203538
T0 - 11	0.393289	2.982737	173.415431	0.226502
T0 - 10	-0.678260	2.304477	184.976460	0.169439
T0 - 9	-0.821440	1.483037	196.537489	0.105786
T0 - 8	-1.049865	0.433172	208.098517	0.030028
T0 - 7	-2.005159	-1.571987	219.659546	-0.106065
T0 - 6	-0.783621	-2.355608	231.220575	-0.154914
T0 - 5	0.158508	-2.197100	242.781604	-0.141007
T0 - 4	0.034964	-2.162136	254.342632	-0.135573
T0 - 3	-0.809849	-2.971985	265.903661	-0.182257
T0 - 2	-0.701999	-3.673984	277.464690	-0.220563
T0 - 1	-0.984852	-4.658835	289.025719	-0.274037
T0	0.567055	-4.091781	300.586747	-0.236008

T0 + 1	-0.688366	-4.780147	312.147776	-0.270558
T0 + 2	-1.107773	-5.887920	323.708805	-0.327254
T0 + 3	-1.684836	-7.572755	335.269834	-0.413577
T0 + 4	2.299913	-5.272843	346.830862	-0.283130
T0 + 5	-0.916884	-6.189726	358.391891	-0.326958
T0 + 6	0.095722	-6.094005	369.952920	-0.316832
T0 + 7	-1.282057	-7.376062	381.513949	-0.377632
T0 + 8	1.105285	-6.270777	393.074977	-0.316289
T0 + 9	1.100339	-5.170437	404.636006	-0.257037
T0 + 10	-0.084907	-5.255344	416.197035	-0.257603
T0 + 11	-0.494154	-5.749499	427.758064	-0.277991
T0 + 12	-0.278160	-6.027659	439.319092	-0.287580
T0 + 13	0.815463	-5.212196	450.880121	-0.245465
T0 + 14	0.155843	-5.056354	462.441150	-0.235131
T0 + 15	0.202423	-4.853931	474.002179	-0.222948
T0 + 16	-2.626261	-7.480191	485.563207	-0.339461
T0 + 17	-3.001068	-10.481259	497.124236	-0.470090
T0 + 18	-1.276370	-11.757629	508.685265	-0.521309
T0 + 19	2.167117	-9.590512	520.246294	-0.420472
T0 + 20	-1.494995	-11.085507	531.807322	-0.480705
T0 + 21	0.531889	-10.553618	543.368351	-0.452746
T0 + 22	-2.532800	-13.086418	554.929380	-0.555523
T0 + 23	-0.170088	-13.256506	566.490409	-0.556971
T0 + 24	-4.503872	-17.760379	578.051437	-0.738701
T0 + 25	-18.22713	-35.987510	589.612466	-1.482069

Financials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.300591	-0.300591	14.760782	-0.078239
T0 - 24	-0.511016	-0.811607	29.521565	-0.149374
T0 - 23	-0.624336	-1.435943	44.282347	-0.215785
T0 - 22	-0.292768	-1.728711	59.043130	-0.224977
T0 - 21	0.023188	-1.705524	73.803912	-0.198526
T0 - 20	-0.051120	-1.756644	88.564694	-0.186661
T0 - 19	-0.150168	-1.906812	103.325477	-0.187588
T0 - 18	0.254072	-1.652740	118.086259	-0.152091
T0 - 17	-0.283443	-1.936184	132.847041	-0.167985
T0 - 16	-0.497567	-2.433751	147.607824	-0.200319
T0 - 15	0.055033	-2.378718	162.368606	-0.186677
T0 - 14	0.163169	-2.215548	177.129389	-0.166470
T0 - 13	-0.279668	-2.495216	191.890171	-0.180128
T0 - 12	0.052909	-2.442307	206.650953	-0.169895
T0 - 11	-0.125475	-2.567782	221.411736	-0.172567
T0 - 10	-0.713375	-3.281158	236.172518	-0.213507
T0 - 9	-0.327113	-3.608271	250.933301	-0.227782
T0 - 8	0.001520	-3.606750	265.694083	-0.221271
T0 - 7	-0.841829	-4.448579	280.454865	-0.265638
T0 - 6	0.522757	-3.925822	295.215648	-0.228487
T0 - 5	-0.365117	-4.290939	309.976430	-0.243718
T0 - 4	-0.096381	-4.387320	324.737212	-0.243463
T0 - 3	-0.283987	-4.671308	339.497995	-0.253524

T0 - 2	-0.125741	-4.797049	354.258777	-0.254867
T0 - 1	-0.205925	-5.002974	369.019560	-0.260438
T0	0.956257	-4.046717	383.780342	-0.206567
T0 + 1	-0.215947	-4.262664	398.541124	-0.213523
T0 + 2	-0.126711	-4.389375	413.301907	-0.215908
T0 + 3	-0.472586	-4.861961	428.062689	-0.234995
T0 + 4	1.019944	-3.842016	442.823472	-0.182576
T0 + 5	-0.132406	-3.974423	457.584254	-0.185797
T0 + 6	0.077667	-3.896756	472.345036	-0.179297
T0 + 7	-0.644382	-4.541138	487.105819	-0.205756
T0 + 8	0.281301	-4.259836	501.866601	-0.190151
T0 + 9	-0.599984	-4.859820	516.627383	-0.213812
T0 + 10	-0.283172	-5.142992	531.388166	-0.223105
T0 + 11	-0.625732	-5.768723	546.148948	-0.246845
T0 + 12	-0.572244	-6.340967	560.909731	-0.267737
T0 + 13	0.374838	-5.966129	575.670513	-0.248660
T0 + 14	0.002305	-5.963823	590.431295	-0.245437
T0 + 15	-0.129671	-6.093495	605.192078	-0.247696
T0 + 16	-0.567715	-6.661210	619.952860	-0.267531
T0 + 17	-0.629783	-7.290993	634.713643	-0.289399
T0 + 18	0.406302	-6.884690	649.474425	-0.270149
T0 + 19	-1.520534	-8.405224	664.235207	-0.326128
T0 + 20	-0.830826	-9.236050	678.995990	-0.354448
T0 + 21	-0.937723	-10.173773	693.756772	-0.386259
T0 + 22	-1.203004	-11.376777	708.517554	-0.427409
T0 + 23	-1.387403	-12.764180	723.278337	-0.474614
T0 + 24	-1.407882	-14.172062	738.039119	-0.521667
T0 + 25	-2.385968	-16.558030	752.799902	-0.603488

Health Care

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.013714	0.013714	29.281755	0.002534
T0 - 24	-0.060787	-0.047073	58.563510	-0.006151
T0 - 23	0.375902	0.328829	87.845264	0.035084
T0 - 22	0.066554	0.395382	117.127019	0.036533
T0 - 21	-0.063945	0.331438	146.408774	0.027392
T0 - 20	-0.504363	-0.172925	175.690529	-0.013046
T0 - 19	0.012971	-0.159955	204.972283	-0.011172
T0 - 18	-0.257006	-0.416960	234.254038	-0.027243
T0 - 17	-0.655783	-1.072743	263.535793	-0.066081
T0 - 16	0.179380	-0.893363	292.817548	-0.052207
T0 - 15	0.054456	-0.838907	322.099303	-0.046743
T0 - 14	0.069839	-0.769068	351.381057	-0.041028
T0 - 13	0.114333	-0.654735	380.662812	-0.033558
T0 - 12	-0.732871	-1.387606	409.944567	-0.068534
T0 - 11	0.910128	-0.477478	439.226322	-0.022783
T0 - 10	0.579623	0.102145	468.508077	0.004719
T0 - 9	-0.598346	-0.496201	497.789831	-0.022240
T0 - 8	-0.373593	-0.869794	527.071586	-0.037886
T0 - 7	0.156608	-0.713186	556.353341	-0.030236
T0 - 6	0.162094	-0.551092	585.635096	-0.022772

T0 - 5	-0.701852	-1.252943	614.916850	-0.050527
T0 - 4	-1.173689	-2.426633	644.198605	-0.095608
T0 - 3	0.954208	-1.472425	673.480360	-0.056738
T0 - 2	-0.594945	-2.067370	702.762115	-0.077986
T0 - 1	-0.123389	-2.190758	732.043870	-0.080970
T0	-0.792132	-2.982890	761.325624	-0.108107
T0 + 1	-0.737878	-3.720768	790.607379	-0.132328
T0 + 2	0.565382	-3.155386	819.889134	-0.110198
T0 + 3	0.508720	-2.646665	849.170889	-0.090824
T0 + 4	1.765067	-0.881599	878.452643	-0.029745
T0 + 5	0.272206	-0.609392	907.734398	-0.020226
T0 + 6	0.114067	-0.495326	937.016153	-0.016181
T0 + 7	-0.082382	-0.577708	966.297908	-0.018585
T0 + 8	-0.011446	-0.589154	995.579663	-0.018672
T0 + 9	-0.769773	-1.358926	1024.861417	-0.042449
T0 + 10	-0.621648	-1.980574	1054.143172	-0.061002
T0 + 11	-0.015241	-1.995815	1083.424927	-0.060635
T0 + 12	-0.204263	-2.200078	1112.706682	-0.065955
T0 + 13	-0.170614	-2.370692	1141.988436	-0.070153
T0 + 14	-0.279925	-2.650617	1171.270191	-0.077449
T0 + 15	1.131317	-1.519299	1200.551946	-0.043848
T0 + 16	-0.380360	-1.899660	1229.833701	-0.054169
T0 + 17	0.568410	-1.331250	1259.115456	-0.037517
T0 + 18	-0.030975	-1.362225	1288.397210	-0.037951
T0 + 19	-0.893817	-2.256042	1317.678965	-0.062150
T0 + 20	1.505079	-0.750963	1346.960720	-0.020462
T0 + 21	-0.028396	-0.779359	1376.242475	-0.021008
T0 + 22	1.963629	1.184271	1405.524230	0.031589
T0 + 23	0.772044	1.956314	1434.805984	0.051647
T0 + 24	1.362553	3.318868	1464.087739	0.086737
T0 + 25	0.175658	3.494526	1493.369494	0.090428

Industrials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-1.335637	-1.335637	21.331335	-0.289187
T0 - 24	-0.102070	-1.437707	42.662669	-0.220113
T0 - 23	-0.178282	-1.615989	63.994004	-0.202008
T0 - 22	0.983146	-0.632843	85.325339	-0.068510
T0 - 21	-0.438220	-1.071063	106.656674	-0.103710
T0 - 20	-0.203503	-1.274566	127.988008	-0.112662
T0 - 19	-0.025527	-1.300093	149.319343	-0.106394
T0 - 18	-0.103524	-1.403617	170.650678	-0.107447
T0 - 17	1.774742	0.371126	191.982013	0.026785
T0 - 16	-0.289749	0.081376	213.313347	0.005572
T0 - 15	-0.173775	-0.092399	234.644682	-0.006032
T0 - 14	-0.382200	-0.474598	255.976017	-0.029664
T0 - 13	-0.608199	-1.082797	277.307352	-0.065023
T0 - 12	0.236993	-0.845804	298.638686	-0.048944
T0 - 11	0.301145	-0.544659	319.970021	-0.030449
T0 - 10	-0.482519	-1.027177	341.301356	-0.055600
T0 - 9	-0.133356	-1.160533	362.632691	-0.060943

T0 - 8	-0.448913	-1.609446	383.964025	-0.082136
T0 - 7	-0.671977	-2.281423	405.295360	-0.113324
T0 - 6	-0.877548	-3.158972	426.626695	-0.152940
T0 - 5	0.842334	-2.316637	447.958030	-0.109456
T0 - 4	0.719917	-1.596720	469.289364	-0.073707
T0 - 3	-0.375132	-1.971852	490.620699	-0.089023
T0 - 2	-0.858677	-2.830529	511.952034	-0.125099
T0 - 1	0.895923	-1.934606	533.283369	-0.083775
T0	-0.760292	-2.694898	554.614703	-0.114432
T0 + 1	-0.435936	-3.130834	575.946038	-0.130458
T0 + 2	-1.360357	-4.491191	597.277373	-0.183770
T0 + 3	-0.036171	-4.527362	618.608708	-0.182028
T0 + 4	1.079503	-3.447859	639.940042	-0.136295
T0 + 5	0.161558	-3.286301	661.271377	-0.127796
T0 + 6	-0.121833	-3.408133	682.602712	-0.130447
T0 + 7	-0.564538	-3.972671	703.934047	-0.149733
T0 + 8	0.364005	-3.608666	725.265381	-0.133998
T0 + 9	0.311900	-3.296767	746.596716	-0.120655
T0 + 10	-0.355422	-3.652189	767.928051	-0.131793
T0 + 11	-0.471107	-4.123296	789.259386	-0.146769
T0 + 12	-0.473131	-4.596427	810.590720	-0.161443
T0 + 13	-0.338624	-4.935051	831.922055	-0.171100
T0 + 14	0.241411	-4.693640	853.253390	-0.160683
T0 + 15	0.536922	-4.156718	874.584725	-0.140556
T0 + 16	-0.202314	-4.359031	895.916059	-0.145632
T0 + 17	-0.212563	-4.571595	917.247394	-0.150947
T0 + 18	1.474701	-3.096893	938.578729	-0.101086
T0 + 19	0.616517	-2.480376	959.910064	-0.080058
T0 + 20	-2.876592	-5.356968	981.241398	-0.171014
T0 + 21	0.631044	-4.725924	1002.572733	-0.149255
T0 + 22	-0.964080	-5.690003	1023.904068	-0.177821
T0 + 23	-0.689279	-6.379282	1045.235403	-0.197317
T0 + 24	1.268416	-5.110866	1066.566737	-0.156495
T0 + 25	-2.421613	-7.532479	1087.898072	-0.228373

Information Technology

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.091291	0.091291	22.489630	0.019250
T0 - 24	0.358272	0.449563	44.979260	0.067032
T0 - 23	0.065512	0.515075	67.468889	0.062707
T0 - 22	-0.044695	0.470379	89.958519	0.049594
T0 - 21	0.025748	0.496127	112.448149	0.046786
T0 - 20	-0.188357	0.307770	134.937779	0.026495
T0 - 19	0.021183	0.328953	157.427409	0.026218
T0 - 18	-0.166443	0.162511	179.917039	0.012116
T0 - 17	0.270322	0.432833	202.406668	0.030423
T0 - 16	-0.129268	0.303565	224.896298	0.020242
T0 - 15	0.565294	0.868860	247.385928	0.055241
T0 - 14	0.069233	0.938092	269.875558	0.057104
T0 - 13	0.373298	1.311391	292.365188	0.076695
T0 - 12	0.291789	1.603180	314.854817	0.090350

T0 - 11	-0.391876	1.211304	337.344447	0.065950
T0 - 10	-0.346589	0.864715	359.834077	0.045585
T0 - 9	0.212582	1.077297	382.323707	0.055096
T0 - 8	0.308827	1.386124	404.813337	0.068893
T0 - 7	0.425940	1.812064	427.302967	0.087661
T0 - 6	0.525377	2.337441	449.792596	0.110213
T0 - 5	0.111930	2.449371	472.282226	0.112708
T0 - 4	0.725655	3.175026	494.771856	0.142740
T0 - 3	-0.351466	2.823560	517.261486	0.124149
T0 - 2	0.423296	3.246856	539.751116	0.139755
T0 - 1	-0.370833	2.876023	562.240745	0.121292
T0	0.255953	3.131976	584.730375	0.129521
T0 + 1	0.066461	3.198437	607.220005	0.129797
T0 + 2	0.483818	3.682256	629.709635	0.146738
T0 + 3	0.314260	3.996516	652.199265	0.156492
T0 + 4	-0.267532	3.728984	674.688895	0.143562
T0 + 5	0.003662	3.732646	697.178524	0.141366
T0 + 6	-0.484107	3.248539	719.668154	0.121094
T0 + 7	0.439591	3.688130	742.157784	0.135381
T0 + 8	-0.078531	3.609599	764.647414	0.130535
T0 + 9	0.202014	3.811613	787.137044	0.135857
T0 + 10	-0.546941	3.264672	809.626673	0.114735
T0 + 11	0.440744	3.705415	832.116303	0.128453
T0 + 12	0.255743	3.961158	854.605933	0.135500
T0 + 13	0.662246	4.623404	877.095563	0.156113
T0 + 14	-0.339845	4.283559	899.585193	0.142818
T0 + 15	-0.629663	3.653896	922.074823	0.120330
T0 + 16	0.474029	4.127925	944.564452	0.134312
T0 + 17	0.509581	4.637506	967.054082	0.149128
T0 + 18	0.809473	5.446979	989.543712	0.173156
T0 + 19	1.639730	7.086709	1012.033342	0.222765
T0 + 20	-1.251725	5.834984	1034.522972	0.181413
T0 + 21	-0.141748	5.693236	1057.012601	0.175113
T0 + 22	-1.082285	4.610951	1079.502231	0.140339
T0 + 23	0.580999	5.191951	1101.991861	0.156402
T0 + 24	-0.078332	5.113619	1124.481491	0.152494
T0 + 25	2.687464	7.801083	1146.971121	0.230345

Materials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.294018	-0.294018	3.997059	-0.147063
T0 - 24	-0.468148	-0.762165	7.994119	-0.269565
T0 - 23	-0.933311	-1.695477	11.991178	-0.489622
T0 - 22	0.717413	-0.978063	15.988237	-0.244606
T0 - 21	-0.051793	-1.029856	19.985296	-0.230368
T0 - 20	-0.467880	-1.497736	23.982356	-0.305836
T0 - 19	0.412375	-1.085361	27.979415	-0.205189
T0 - 18	-1.678703	-2.764064	31.976474	-0.488802
T0 - 17	-0.537638	-3.301702	35.973533	-0.550486
T0 - 16	-1.116406	-4.418108	39.970593	-0.698821
T0 - 15	-0.515600	-4.933708	43.967652	-0.744058

T0 - 14	-1.532578	-6.466286	47.964711	-0.933671
T0 - 13	-1.646195	-8.112480	51.961770	-1.125412
T0 - 12	0.610912	-7.501568	55.958830	-1.002808
T0 - 11	-0.100112	-7.601680	59.955889	-0.981734
T0 - 10	1.534783	-6.066897	63.952948	-0.758641
T0 - 9	0.084710	-5.982187	67.950007	-0.725714
T0 - 8	-0.737225	-6.719411	71.947067	-0.792181
T0 - 7	0.837457	-5.881954	75.944126	-0.674955
T0 - 6	-1.643235	-7.525190	79.941185	-0.841651
T0 - 5	-0.427039	-7.952228	83.938244	-0.867978
T0 - 4	-0.883851	-8.836079	87.935304	-0.942276
T0 - 3	-1.665484	-10.501563	91.932363	-1.095266
T0 - 2	0.039434	-10.462129	95.929422	-1.068179
T0 - 1	-0.261895	-10.724024	99.926481	-1.072797
T0	-8.641340	-19.365364	103.923541	-1.899629
T0 + 1	-0.658523	-20.023886	107.920600	-1.927508
T0 + 2	0.562882	-19.461004	111.917659	-1.839568
T0 + 3	0.270084	-19.190919	115.914718	-1.782487
T0 + 4	1.250460	-17.940460	119.911778	-1.638335
T0 + 5	-0.784990	-18.725450	123.908837	-1.682213
T0 + 6	-1.465131	-20.190580	127.905896	-1.785268
T0 + 7	-2.406847	-22.597427	131.902955	-1.967577
T0 + 8	1.729532	-20.867896	135.900015	-1.790065
T0 + 9	0.902208	-19.965687	139.897074	-1.688029
T0 + 10	-1.142904	-21.108591	143.894133	-1.759696
T0 + 11	-0.675249	-21.783840	147.891192	-1.791279
T0 + 12	1.301444	-20.482395	151.888252	-1.661953
T0 + 13	-0.090573	-20.572968	155.885311	-1.647762
T0 + 14	-1.028726	-21.601694	159.882370	-1.708392
T0 + 15	0.994795	-20.606899	163.879429	-1.609720
T0 + 16	-2.313855	-22.920754	167.876489	-1.769025
T0 + 17	-0.016973	-22.937727	171.873548	-1.749629
T0 + 18	1.329248	-21.608479	175.870607	-1.629399
T0 + 19	-3.592615	-25.201095	179.867666	-1.879070
T0 + 20	-0.391360	-25.592455	183.864726	-1.887395
T0 + 21	0.421469	-25.170985	187.861785	-1.836458
T0 + 22	-3.140654	-28.311640	191.858844	-2.043968
T0 + 23	0.115010	-28.196630	195.855903	-2.014786
T0 + 24	-2.464432	-30.661062	199.852963	-2.168862
T0 + 25	-2.107227	-32.768289	203.850022	-2.295083

Real Estate

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	1.386683	1.386683	2.437323	0.888220
T0 - 24	1.536212	2.922895	4.874647	1.323859
T0 - 23	0.608113	3.531008	7.311970	1.305815
T0 - 22	-0.645813	2.885195	9.749293	0.924036
T0 - 21	0.183117	3.068312	12.186616	0.878937
T0 - 20	0.814758	3.883070	14.623940	1.015414
T0 - 19	0.451602	4.334672	17.061263	1.049423
T0 - 18	0.270841	4.605513	19.498586	1.042981

T0 - 17	-1.007401	3.598112	21.935909	0.768240
T0 - 16	0.187117	3.785229	24.373233	0.766718
T0 - 15	-1.007096	2.778133	26.810556	0.536538
T0 - 14	-0.624323	2.153810	29.247879	0.398254
T0 - 13	1.296571	3.450381	31.685202	0.612969
T0 - 12	0.923057	4.373438	34.122526	0.748691
T0 - 11	0.445913	4.819351	36.559849	0.797051
T0 - 10	0.082430	4.901781	38.997172	0.784942
T0 - 9	-0.567468	4.334313	41.434495	0.673347
T0 - 8	-0.373463	3.960850	43.871819	0.597992
T0 - 7	1.303177	5.264027	46.309142	0.773543
T0 - 6	-1.424176	3.839851	48.746465	0.549975
T0 - 5	0.992291	4.832142	51.183788	0.675419
T0 - 4	-0.345377	4.486765	53.621112	0.612725
T0 - 3	-0.286396	4.200370	56.058435	0.561005
T0 - 2	-1.117864	3.082506	58.495758	0.403034
T0 - 1	-0.905500	2.177006	60.933081	0.278890
T0	-0.795442	1.381563	63.370405	0.173551
T0 + 1	-1.358795	0.022768	65.807728	0.002807
T0 + 2	0.241728	0.264497	68.245051	0.032017
T0 + 3	1.442761	1.707258	70.682374	0.203069
T0 + 4	0.443826	2.151084	73.119698	0.251559
T0 + 5	0.092261	2.243345	75.557021	0.258083
T0 + 6	0.487998	2.731342	77.994344	0.309275
T0 + 7	1.468869	4.200211	80.431667	0.468336
T0 + 8	1.572212	5.772423	82.868991	0.634106
T0 + 9	-1.284362	4.488062	85.306314	0.485924
T0 + 10	0.992837	5.480899	87.743637	0.585119
T0 + 11	0.071164	5.552063	90.180960	0.584651
T0 + 12	-0.179043	5.373020	92.618284	0.558303
T0 + 13	-2.150014	3.223006	95.055607	0.330577
T0 + 14	1.292664	4.515670	97.492930	0.457336
T0 + 15	1.241097	5.756768	99.930253	0.575878
T0 + 16	0.518384	6.275151	102.367577	0.620216
T0 + 17	-1.697613	4.577538	104.804900	0.447138
T0 + 18	-2.234226	2.343312	107.242223	0.226281
T0 + 19	-1.724383	0.618929	109.679546	0.059099
T0 + 20	2.064401	2.683330	112.116870	0.253419
T0 + 21	0.048582	2.731912	114.554193	0.255247
T0 + 22	0.256640	2.988552	116.991516	0.276302
T0 + 23	-0.584799	2.403753	119.428839	0.219956
T0 + 24	0.424194	2.827948	121.866163	0.256171
T0 + 25	-2.814474	0.013474	124.303486	0.001208

Utilities

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.126070	0.126070	3.277377	0.069639
T0 - 24	-0.895293	-0.769222	6.554754	-0.300451
T0 - 23	0.616685	-0.152537	9.832131	-0.048647
T0 - 22	-1.090260	-1.242797	13.109508	-0.343247
T0 - 21	0.157881	-1.084916	16.386885	-0.268008

T0 - 20	-0.003903	-1.088819	19.664262	-0.245537
T0 - 19	0.546887	-0.541932	22.941639	-0.113144
T0 - 18	0.061374	-0.480558	26.219016	-0.093851
T0 - 17	-0.615515	-1.096073	29.496393	-0.201816
T0 - 16	0.219331	-0.876742	32.773770	-0.153147
T0 - 15	-0.199061	-1.075803	36.051147	-0.179173
T0 - 14	0.353369	-0.722434	39.328524	-0.115198
T0 - 13	0.097673	-0.624761	42.605901	-0.095715
T0 - 12	0.593287	-0.031474	45.883278	-0.004646
T0 - 11	0.114672	0.083198	49.160655	0.011866
T0 - 10	1.204468	1.287666	52.438031	0.177820
T0 - 9	0.199417	1.487083	55.715408	0.199227
T0 - 8	0.743170	2.230253	58.992785	0.290372
T0 - 7	1.165078	3.395331	62.270162	0.430271
T0 - 6	0.416384	3.811715	65.547539	0.470806
T0 - 5	0.642988	4.454703	68.824916	0.536965
T0 - 4	0.670373	5.125076	72.102293	0.603567
T0 - 3	0.655399	5.780475	75.379670	0.665789
T0 - 2	0.006735	5.787211	78.657047	0.652530
T0 - 1	0.317370	6.104581	81.934424	0.674408
T0	0.949833	7.054414	85.211801	0.764207
T0 + 1	0.061502	7.115916	88.489178	0.756460
T0 + 2	0.139895	7.255812	91.766555	0.757432
T0 + 3	-1.410463	5.845348	95.043932	0.599581
T0 + 4	-0.112740	5.732609	98.321309	0.578134
T0 + 5	-0.168270	5.564339	101.598686	0.552039
T0 + 6	-0.101026	5.463312	104.876063	0.533480
T0 + 7	0.027748	5.491060	108.153440	0.528003
T0 + 8	0.740120	6.231180	111.430817	0.590293
T0 + 9	-0.159077	6.072103	114.708194	0.566946
T0 + 10	1.678596	7.750699	117.985571	0.713553
T0 + 11	0.497919	8.248618	121.262948	0.749061
T0 + 12	0.853317	9.101935	124.540325	0.815603
T0 + 13	-1.505018	7.596917	127.817702	0.671958
T0 + 14	0.769337	8.366253	131.095079	0.730698
T0 + 15	0.194039	8.560293	134.372456	0.738471
T0 + 16	-1.257969	7.302324	137.649833	0.622405
T0 + 17	-0.567778	6.734546	140.927210	0.567298
T0 + 18	-3.025036	3.709510	144.204587	0.308906
T0 + 19	-2.825021	0.884488	147.481964	0.072832
T0 + 20	4.175365	5.059853	150.759340	0.412094
T0 + 21	-0.428296	4.631557	154.036717	0.373177
T0 + 22	4.779303	9.410860	157.314094	0.750318
T0 + 23	-0.445926	8.964934	160.591471	0.707434
T0 + 24	-1.078141	7.886793	163.868848	0.616101
T0 + 25	-5.035651	2.851143	167.146225	0.220532

Russian Companies

Event 2015.09.18

Communication Services

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.402895	-0.402895	12.544509	-0.113754
T0 - 24	-0.922328	-1.325223	25.089018	-0.264574
T0 - 23	0.956089	-0.369134	37.633528	-0.060172
T0 - 22	0.123343	-0.245792	50.178037	-0.034699
T0 - 21	-0.358741	-0.604533	62.722546	-0.076332
T0 - 20	-1.535751	-2.140284	75.267055	-0.246700
T0 - 19	-0.103092	-2.243377	87.811564	-0.239401
T0 - 18	-2.044585	-4.287962	100.356073	-0.428035
T0 - 17	0.595833	-3.692129	112.900583	-0.347479
T0 - 16	-1.882029	-5.574157	125.445092	-0.497683
T0 - 15	1.745782	-3.828375	137.989601	-0.325905
T0 - 14	1.084410	-2.743966	150.534110	-0.223646
T0 - 13	-0.415036	-3.159001	163.078619	-0.247372
T0 - 12	-0.284766	-3.443767	175.623128	-0.259862
T0 - 11	0.140262	-3.303505	188.167638	-0.240826
T0 - 10	0.199526	-3.103980	200.712147	-0.219095
T0 - 9	-0.387377	-3.491356	213.256656	-0.239080
T0 - 8	-0.967861	-4.459217	225.801165	-0.296753
T0 - 7	0.370373	-4.088844	238.345674	-0.264848
T0 - 6	0.309286	-3.779557	250.890184	-0.238616
T0 - 5	-0.025512	-3.805069	263.434693	-0.234437
T0 - 4	3.931294	0.126225	275.979202	0.007598
T0 - 3	0.150070	0.276295	288.523711	0.016266
T0 - 2	2.697123	2.973418	301.068220	0.171366
T0 - 1	-0.396336	2.577082	313.612729	0.145523
T0	-0.504507	2.072574	326.157239	0.114762
T0 + 1	0.300096	2.372670	338.701748	0.128922
T0 + 2	-0.635147	1.737524	351.246257	0.092710
T0 + 3	-0.502452	1.235072	363.790766	0.064754
T0 + 4	-0.375958	0.859114	376.335275	0.044286
T0 + 5	-0.334840	0.524274	388.879784	0.026586
T0 + 6	-1.728338	-1.204065	401.424294	-0.060096
T0 + 7	-0.355111	-1.559176	413.968803	-0.076632
T0 + 8	0.457120	-1.102057	426.513312	-0.053363
T0 + 9	0.027615	-1.074442	439.057821	-0.051277
T0 + 10	1.122335	0.047893	451.602330	0.002254
T0 + 11	2.808571	2.856464	464.146839	0.132587
T0 + 12	-1.181639	1.674825	476.691349	0.076710
T0 + 13	-2.063322	-0.388498	489.235858	-0.017564
T0 + 14	-1.510840	-1.899337	501.780367	-0.084790
T0 + 15	-0.134653	-2.033990	514.324876	-0.089687
T0 + 16	0.641371	-1.392619	526.869385	-0.060671
T0 + 17	3.556711	2.164092	539.413895	0.093178
T0 + 18	0.392300	2.556392	551.958404	0.108811
T0 + 19	0.481444	3.037835	564.502913	0.127859

T0 + 20	-0.049165	2.988670	577.047422	0.124415
T0 + 21	1.941916	4.930586	589.591931	0.203059
T0 + 22	-1.248095	3.682491	602.136440	0.150070
T0 + 23	0.048907	3.731398	614.680950	0.150504
T0 + 24	0.127873	3.859271	627.225459	0.154097
T0 + 25	-0.197690	3.661581	639.769968	0.144763

Consumer Staples

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.502811	-0.502811	33.135656	-0.087349
T0 - 24	0.538171	0.035359	66.271311	0.004344
T0 - 23	-0.479791	-0.444432	99.406967	-0.044576
T0 - 22	2.691347	2.246916	132.542623	0.195168
T0 - 21	0.400968	2.647883	165.678279	0.205715
T0 - 20	-0.787368	1.860516	198.813934	0.131950
T0 - 19	0.025934	1.886450	231.949590	0.123865
T0 - 18	-2.107520	-0.221071	265.085246	-0.013578
T0 - 17	1.669313	1.448242	298.220902	0.083863
T0 - 16	0.417234	1.865476	331.356557	0.102481
T0 - 15	1.367012	3.232488	364.492213	0.169314
T0 - 14	0.484529	3.717017	397.627869	0.186404
T0 - 13	2.149312	5.866329	430.763525	0.282649
T0 - 12	0.344494	6.210823	463.899180	0.288362
T0 - 11	-1.378042	4.832781	497.034836	0.216772
T0 - 10	-0.217050	4.615732	530.170492	0.200462
T0 - 9	-0.132478	4.483254	563.306148	0.188895
T0 - 8	-0.754292	3.728961	596.441803	0.152688
T0 - 7	-0.654869	3.074093	629.577459	0.122516
T0 - 6	-0.200227	2.873865	662.713115	0.111636
T0 - 5	0.408501	3.282366	695.848771	0.124431
T0 - 4	-0.426673	2.855693	728.984426	0.105768
T0 - 3	0.935925	3.791618	762.120082	0.137345
T0 - 2	-0.066455	3.725163	795.255738	0.132097
T0 - 1	-0.587720	3.137443	828.391394	0.109008
T0	0.636003	3.773446	861.527049	0.128559
T0 + 1	0.220277	3.993723	894.662705	0.133521
T0 + 2	0.130895	4.124618	927.798361	0.135412
T0 + 3	0.069502	4.194120	960.934017	0.135299
T0 + 4	0.383522	4.577642	994.069672	0.145189
T0 + 5	1.431287	6.008929	1027.205328	0.187486
T0 + 6	-0.320540	5.688389	1060.340984	0.174689
T0 + 7	0.403041	6.091430	1093.476639	0.184211
T0 + 8	0.007910	6.099339	1126.612295	0.181717
T0 + 9	-0.129333	5.970006	1159.747951	0.175304
T0 + 10	-0.147307	5.822699	1192.883607	0.168587
T0 + 11	-0.887929	4.934770	1226.019262	0.140935
T0 + 12	-0.550251	4.384519	1259.154918	0.123561
T0 + 13	-0.260590	4.123929	1292.290574	0.114718
T0 + 14	0.280070	4.403999	1325.426230	0.120968
T0 + 15	-1.676493	2.727506	1358.561885	0.073999
T0 + 16	0.154897	2.882403	1391.697541	0.077265

T0 + 17	0.492853	3.375256	1424.833197	0.089418
T0 + 18	-0.301929	3.073327	1457.968853	0.080489
T0 + 19	0.419418	3.492745	1491.104508	0.090451
T0 + 20	-0.319276	3.173469	1524.240164	0.081284
T0 + 21	-0.690788	2.482681	1557.375820	0.062911
T0 + 22	-0.140756	2.341924	1590.511476	0.058722
T0 + 23	1.266949	3.608873	1623.647131	0.089562
T0 + 24	0.055776	3.664649	1656.782787	0.090033
T0 + 25	0.143856	3.808506	1689.918443	0.092645

Energy

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.316982	0.316982	9.070436	0.105250
T0 - 24	-0.114043	0.202940	18.140872	0.047647
T0 - 23	-0.036683	0.166257	27.211308	0.031872
T0 - 22	0.093337	0.259594	36.281744	0.043097
T0 - 21	-0.424611	-0.165017	45.352180	-0.024504
T0 - 20	-0.518985	-0.684003	54.422616	-0.092719
T0 - 19	-0.958353	-1.642356	63.493052	-0.206112
T0 - 18	0.046124	-1.596232	72.563488	-0.187386
T0 - 17	-0.346662	-1.942894	81.633924	-0.215037
T0 - 16	0.931777	-1.011117	90.704360	-0.106166
T0 - 15	0.803313	-0.207805	99.774796	-0.020804
T0 - 14	0.366631	0.158826	108.845232	0.015224
T0 - 13	0.445760	0.604586	117.915668	0.055677
T0 - 12	-0.635147	-0.030561	126.986104	-0.002712
T0 - 11	-0.072545	-0.103106	136.056539	-0.008839
T0 - 10	-0.306879	-0.409986	145.126975	-0.034033
T0 - 9	-0.523075	-0.933061	154.197411	-0.075140
T0 - 8	-0.089476	-1.022537	163.267847	-0.080026
T0 - 7	0.259733	-0.762804	172.338283	-0.058106
T0 - 6	0.076697	-0.686107	181.408719	-0.050940
T0 - 5	-0.100248	-0.786355	190.479155	-0.056976
T0 - 4	0.224497	-0.561857	199.549591	-0.039774
T0 - 3	0.059122	-0.502735	208.620027	-0.034807
T0 - 2	-0.048442	-0.551177	217.690463	-0.037357
T0 - 1	0.234577	-0.316600	226.760899	-0.021025
T0	0.388625	0.072025	235.831335	0.004690
T0 + 1	-1.390577	-1.318552	244.901771	-0.084256
T0 + 2	-0.349153	-1.667704	253.972207	-0.104647
T0 + 3	0.416010	-1.251695	263.042643	-0.077177
T0 + 4	0.246819	-1.004876	272.113079	-0.060917
T0 + 5	-0.059402	-1.064278	281.183515	-0.063469
T0 + 6	0.092595	-0.971683	290.253951	-0.057034
T0 + 7	0.044145	-0.927538	299.324387	-0.053612
T0 + 8	0.267849	-0.659689	308.394823	-0.037565
T0 + 9	-0.698353	-1.358042	317.465259	-0.076219
T0 + 10	-0.407849	-1.765891	326.535695	-0.097723
T0 + 11	0.951134	-0.814757	335.606131	-0.044475
T0 + 12	0.355029	-0.459728	344.676567	-0.024763
T0 + 13	0.336109	-0.123619	353.747003	-0.006573

T0 + 14	-0.790314	-0.913933	362.817439	-0.047981
T0 + 15	0.572691	-0.341242	371.887875	-0.017695
T0 + 16	-0.704995	-1.046237	380.958311	-0.053603
T0 + 17	-0.191617	-1.237854	390.028747	-0.062679
T0 + 18	-0.526613	-1.764467	399.099183	-0.088323
T0 + 19	-0.585417	-2.349884	408.169618	-0.116312
T0 + 20	-0.016387	-2.366271	417.240054	-0.115843
T0 + 21	0.199060	-2.167211	426.310490	-0.104963
T0 + 22	-0.490463	-2.657674	435.380926	-0.127370
T0 + 23	0.419476	-2.238197	444.451362	-0.106166
T0 + 24	0.193667	-2.044531	453.521798	-0.096005
T0 + 25	-0.406145	-2.450676	462.592234	-0.113943

Financials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.044087	0.044087	7.337680	0.016276
T0 - 24	0.052498	0.096585	14.675361	0.025212
T0 - 23	-0.591063	-0.494478	22.013041	-0.105392
T0 - 22	0.072669	-0.421809	29.350722	-0.077859
T0 - 21	0.277182	-0.144627	36.688402	-0.023877
T0 - 20	-0.708470	-0.853097	44.026082	-0.128571
T0 - 19	-0.223921	-1.077018	51.363763	-0.150278
T0 - 18	-0.751480	-1.828498	58.701443	-0.238655
T0 - 17	2.899622	1.071124	66.039124	0.131807
T0 - 16	-0.068176	1.002947	73.376804	0.117084
T0 - 15	-0.045929	0.957018	80.714485	0.106523
T0 - 14	-0.794614	0.162404	88.052165	0.017307
T0 - 13	-1.507751	-1.345346	95.389845	-0.137747
T0 - 12	-0.133566	-1.478912	102.727526	-0.145915
T0 - 11	0.001895	-1.477017	110.065206	-0.140786
T0 - 10	0.363435	-1.113582	117.402887	-0.102774
T0 - 9	0.566519	-0.547063	124.740567	-0.048982
T0 - 8	1.474030	0.926967	132.078247	0.080658
T0 - 7	-0.819858	0.107109	139.415928	0.009071
T0 - 6	-0.007462	0.099646	146.753608	0.008226
T0 - 5	0.380956	0.480602	154.091289	0.038717
T0 - 4	0.003227	0.483829	161.428969	0.038080
T0 - 3	0.634764	1.118593	168.766650	0.086105
T0 - 2	0.432930	1.551523	176.104330	0.116916
T0 - 1	-0.096901	1.454623	183.442010	0.107399
T0	-0.443027	1.011596	190.779691	0.073239
T0 + 1	1.138809	2.150405	198.117371	0.152777
T0 + 2	0.380434	2.530839	205.455052	0.176566
T0 + 3	0.793591	3.324430	212.792732	0.227897
T0 + 4	1.227483	4.551913	220.130412	0.306799
T0 + 5	0.186255	4.738168	227.468093	0.314159
T0 + 6	0.939994	5.678162	234.805773	0.370556
T0 + 7	-0.233222	5.444940	242.143454	0.349910
T0 + 8	-0.345719	5.099221	249.481134	0.322838
T0 + 9	0.479596	5.578816	256.818814	0.348120
T0 + 10	-0.142234	5.436583	264.156495	0.334499

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 + 11	0.076278	5.512861	271.494175	0.334578
T0 + 12	0.573409	6.086270	278.831856	0.364485
T0 + 13	2.676018	8.762288	286.169536	0.517971
T0 + 14	3.468610	12.230898	293.507217	0.713919
T0 + 15	0.807481	13.038379	300.844897	0.751713
T0 + 16	2.231085	15.269464	308.182577	0.869801
T0 + 17	-1.270384	13.999080	315.520258	0.788108
T0 + 18	0.812697	14.811777	322.857938	0.824331
T0 + 19	0.550021	15.361799	330.195619	0.845389
T0 + 20	0.152515	15.514314	337.533299	0.844451
T0 + 21	-0.583808	14.930506	344.870979	0.803982
T0 + 22	0.679926	15.610432	352.208660	0.831792
T0 + 23	-0.138890	15.471542	359.546340	0.815936
T0 + 24	-0.595179	14.876363	366.884021	0.776663
T0 + 25	1.717117	16.593481	374.221701	0.857774

Industrials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.110463	0.110463	13.511512	0.030051
T0 - 24	-1.942180	-1.831717	27.023024	-0.352364
T0 - 23	-3.417137	-5.248853	40.534535	-0.824426
T0 - 22	-0.130710	-5.379563	54.046047	-0.731754
T0 - 21	1.475283	-3.904280	67.557559	-0.475011
T0 - 20	-0.944094	-4.848374	81.069071	-0.538479
T0 - 19	-2.039100	-6.887475	94.580582	-0.708205
T0 - 18	-2.052975	-8.940449	108.092094	-0.859929
T0 - 17	2.188647	-6.751802	121.603606	-0.612275
T0 - 16	1.155009	-5.596793	135.115118	-0.481490
T0 - 15	-0.465528	-6.062321	148.626629	-0.497268
T0 - 14	0.956635	-5.105686	162.138141	-0.400970
T0 - 13	2.376734	-2.728952	175.649653	-0.205908
T0 - 12	-0.853788	-3.582739	189.161165	-0.260495
T0 - 11	-0.193796	-3.776535	202.672677	-0.265275
T0 - 10	-0.807167	-4.583702	216.184188	-0.311749
T0 - 9	0.368984	-4.214718	229.695700	-0.278094
T0 - 8	-0.394498	-4.609217	243.207212	-0.295555
T0 - 7	0.530817	-4.078399	256.718724	-0.254543
T0 - 6	-0.275654	-4.354054	270.230235	-0.264866
T0 - 5	0.558165	-3.795888	283.741747	-0.225347
T0 - 4	-0.426929	-4.222817	297.253259	-0.244928
T0 - 3	-0.229590	-4.452407	310.764771	-0.252568
T0 - 2	-0.284491	-4.736898	324.276283	-0.263049
T0 - 1	-0.750865	-5.487764	337.787794	-0.298589
T0	1.327210	-4.160554	351.299306	-0.221979
T0 + 1	-0.447378	-4.607931	364.810818	-0.241253
T0 + 2	0.160233	-4.447698	378.322330	-0.228667
T0 + 3	0.996816	-3.450882	391.833841	-0.174333
T0 + 4	-1.001342	-4.452224	405.345353	-0.221139
T0 + 5	0.088132	-4.364091	418.856865	-0.213236
T0 + 6	0.023136	-4.340955	432.368377	-0.208765
T0 + 7	0.158001	-4.182954	445.879888	-0.198095

T0 + 8	1.782450	-2.400505	459.391400	-0.111998
T0 + 9	1.956063	-0.444442	472.902912	-0.020438
T0 + 10	4.507988	4.063546	486.414424	0.184248
T0 + 11	-0.933184	3.130362	499.925936	0.140004
T0 + 12	-0.314734	2.815629	513.437447	0.124260
T0 + 13	-0.217307	2.598322	526.948959	0.113190
T0 + 14	1.196917	3.795239	540.460471	0.163252
T0 + 15	0.981788	4.777027	553.971983	0.202962
T0 + 16	1.524770	6.301797	567.483494	0.264538
T0 + 17	-0.396480	5.905316	580.995006	0.244995
T0 + 18	1.858941	7.764257	594.506518	0.318436
T0 + 19	1.410563	9.174820	608.018030	0.372083
T0 + 20	1.760759	10.935579	621.529541	0.438643
T0 + 21	0.314182	11.249761	635.041053	0.446419
T0 + 22	1.923065	13.172826	648.552565	0.517257
T0 + 23	-0.586041	12.586785	662.064077	0.489176
T0 + 24	1.768806	14.355591	675.575589	0.552312
T0 + 25	-1.107080	13.248512	689.087100	0.504696

Materials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.199201	0.199201	54.314733	0.027029
T0 - 24	-0.222343	-0.023142	108.629466	-0.002220
T0 - 23	0.456739	0.433597	162.944199	0.033968
T0 - 22	-0.559181	-0.125584	217.258932	-0.008520
T0 - 21	0.492516	0.366931	271.573665	0.022266
T0 - 20	0.481560	0.848491	325.888398	0.047002
T0 - 19	2.274099	3.122590	380.203131	0.160143
T0 - 18	-0.235139	2.887451	434.517864	0.138519
T0 - 17	-2.670542	0.216909	488.832597	0.009811
T0 - 16	0.256157	0.473066	543.147330	0.020298
T0 - 15	-2.188377	-1.715311	597.462063	-0.070176
T0 - 14	0.385454	-1.329857	651.776796	-0.052090
T0 - 13	1.047893	-0.281964	706.091529	-0.010611
T0 - 12	1.181772	0.899807	760.406262	0.032631
T0 - 11	0.305266	1.205073	814.720995	0.042219
T0 - 10	0.091697	1.296771	869.035728	0.043989
T0 - 9	-0.241473	1.055298	923.350461	0.034729
T0 - 8	2.245812	3.301109	977.665194	0.105576
T0 - 7	0.672031	3.973141	1031.979927	0.123680
T0 - 6	1.169814	5.142954	1086.294660	0.156041
T0 - 5	0.248908	5.391863	1140.609393	0.159651
T0 - 4	0.083259	5.475122	1194.924126	0.158388
T0 - 3	-0.752932	4.722190	1249.238859	0.133604
T0 - 2	-1.515650	3.206540	1303.553592	0.088812
T0 - 1	0.261488	3.468028	1357.868325	0.094114
T0	0.440741	3.908769	1412.183058	0.104015
T0 + 1	-0.327365	3.581404	1466.497791	0.093522
T0 + 2	-0.764569	2.816835	1520.812524	0.072231
T0 + 3	-0.325738	2.491097	1575.127257	0.062767
T0 + 4	-1.346822	1.144275	1629.441990	0.028347

T0 + 5	-1.177063	-0.032788	1683.756723	-0.000799
T0 + 6	-0.371858	-0.404645	1738.071456	-0.009706
T0 + 7	1.060963	0.656317	1792.386189	0.015502
T0 + 8	1.698951	2.355268	1846.700923	0.054808
T0 + 9	-0.681619	1.673649	1901.015656	0.038386
T0 + 10	0.237589	1.911238	1955.330389	0.043222
T0 + 11	-1.639885	0.271353	2009.645122	0.006053
T0 + 12	-0.868939	-0.597586	2063.959855	-0.013154
T0 + 13	-2.862498	-3.460084	2118.274588	-0.075179
T0 + 14	-0.373241	-3.833325	2172.589321	-0.082241
T0 + 15	-2.561504	-6.394829	2226.904054	-0.135512
T0 + 16	0.899006	-5.495823	2281.218787	-0.115067
T0 + 17	0.623964	-4.871859	2335.533520	-0.100810
T0 + 18	0.373019	-4.498840	2389.848253	-0.092027
T0 + 19	0.519362	-3.979479	2444.162986	-0.080494
T0 + 20	-1.519615	-5.499093	2498.477719	-0.110015
T0 + 21	1.640657	-3.858436	2552.792452	-0.076367
T0 + 22	-0.601069	-4.459505	2607.107185	-0.087339
T0 + 23	-0.285103	-4.744608	2661.421918	-0.091969
T0 + 24	-0.106735	-4.851343	2715.736651	-0.093093
T0 + 25	-0.423971	-5.275314	2770.051384	-0.100232

Utilities

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.333272	-0.333272	33.954972	-0.057194
T0 - 24	0.001916	-0.331357	67.909944	-0.040210
T0 - 23	-1.107307	-1.438664	101.864915	-0.142543
T0 - 22	0.030929	-1.407735	135.819887	-0.120792
T0 - 21	0.344347	-1.063388	169.774859	-0.081612
T0 - 20	-0.863129	-1.926516	203.729831	-0.134973
T0 - 19	-0.969691	-2.896207	237.684802	-0.187858
T0 - 18	-2.406126	-5.302333	271.639774	-0.321714
T0 - 17	2.412073	-2.890260	305.594746	-0.165335
T0 - 16	0.254712	-2.635548	339.549718	-0.143027
T0 - 15	1.526582	-1.108966	373.504689	-0.057381
T0 - 14	-0.223826	-1.332793	407.459661	-0.066027
T0 - 13	-0.321925	-1.654717	441.414633	-0.078759
T0 - 12	0.380526	-1.274191	475.369605	-0.058441
T0 - 11	0.267361	-1.006830	509.324576	-0.044613
T0 - 10	-0.522775	-1.529606	543.279548	-0.065625
T0 - 9	0.474312	-1.055294	577.234520	-0.043924
T0 - 8	-0.927686	-1.982980	611.189492	-0.080210
T0 - 7	0.818630	-1.164350	645.144463	-0.045841
T0 - 6	0.582588	-0.581761	679.099435	-0.022324
T0 - 5	0.406438	-0.175324	713.054407	-0.006566
T0 - 4	-0.426301	-0.601625	747.009379	-0.022012
T0 - 3	-0.614572	-1.216197	780.964350	-0.043520
T0 - 2	-1.223972	-2.440169	814.919322	-0.085480
T0 - 1	-0.004177	-2.444346	848.874294	-0.083896
T0	-0.041202	-2.485548	882.829266	-0.083653
T0 + 1	1.618419	-0.867130	916.784238	-0.028639

T0 + 2	-0.748377	-1.615507	950.739209	-0.052394
T0 + 3	0.899726	-0.715780	984.694181	-0.022810
T0 + 4	0.593071	-0.122709	1018.649153	-0.003845
T0 + 5	1.025844	0.903135	1052.604125	0.027837
T0 + 6	-0.871153	0.031982	1086.559096	0.000970
T0 + 7	0.082320	0.114302	1120.514068	0.003415
T0 + 8	-0.070644	0.043659	1154.469040	0.001285
T0 + 9	0.509502	0.553161	1188.424012	0.016046
T0 + 10	-0.359798	0.193362	1222.378983	0.005531
T0 + 11	0.847012	1.040374	1256.333955	0.029352
T0 + 12	-0.743471	0.296904	1290.288927	0.008266
T0 + 13	-1.081353	-0.784450	1324.243899	-0.021557
T0 + 14	0.364846	-0.419604	1358.198870	-0.011386
T0 + 15	0.303081	-0.116523	1392.153842	-0.003123
T0 + 16	-1.475463	-1.591986	1426.108814	-0.042156
T0 + 17	0.931331	-0.660655	1460.063786	-0.017290
T0 + 18	-0.549237	-1.209893	1494.018757	-0.031302
T0 + 19	-0.578100	-1.787993	1527.973729	-0.045741
T0 + 20	2.513091	0.725098	1561.928701	0.018347
T0 + 21	-0.009712	0.715386	1595.883673	0.017908
T0 + 22	1.398642	2.114028	1629.838644	0.052365
T0 + 23	3.776134	5.890162	1663.793616	0.144403
T0 + 24	-0.034929	5.855233	1697.748588	0.142104
T0 + 25	-0.267276	5.587958	1731.703560	0.134282

Event 2016.11.04

Communication Services

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.022581	0.022581	8.848429	0.007591
T0 - 24	0.222182	0.244764	17.696859	0.058183
T0 - 23	-0.362086	-0.117322	26.545288	-0.022771
T0 - 22	1.317764	1.200442	35.393717	0.201780
T0 - 21	-0.020233	1.180208	44.242147	0.177435
T0 - 20	-0.326920	0.853288	53.090576	0.117108
T0 - 19	-0.744928	0.108360	61.939006	0.013768
T0 - 18	-0.012848	0.095512	70.787435	0.011352
T0 - 17	-1.423424	-1.327913	79.635864	-0.148804
T0 - 16	-0.860091	-2.188003	88.484294	-0.232603
T0 - 15	-0.423053	-2.611056	97.332723	-0.264659
T0 - 14	-0.678893	-3.289950	106.181152	-0.319275
T0 - 13	0.853749	-2.436201	115.029582	-0.227148
T0 - 12	-0.073517	-2.509718	123.878011	-0.225490
T0 - 11	-0.162327	-2.672045	132.726441	-0.231934
T0 - 10	-0.962146	-3.634191	141.574870	-0.305432
T0 - 9	0.009544	-3.624647	150.423299	-0.295534
T0 - 8	-0.918104	-4.542751	159.271729	-0.359956
T0 - 7	-0.831185	-5.373936	168.120158	-0.414460
T0 - 6	0.998459	-4.375478	176.968587	-0.328910

T0 - 5	0.195237	-4.180241	185.817017	-0.306661
T0 - 4	0.702537	-3.477704	194.665446	-0.249257
T0 - 3	0.458364	-3.019340	203.513876	-0.211648
T0 - 2	-0.264713	-3.284052	212.362305	-0.225357
T0 - 1	-0.737816	-4.021868	221.210734	-0.270411
T0	0.817529	-3.204339	230.059164	-0.211261
T0 + 1	-1.013388	-4.217728	238.907593	-0.272875
T0 + 2	-0.356091	-4.573819	247.756022	-0.290581
T0 + 3	-0.570972	-5.144791	256.604452	-0.321170
T0 + 4	-0.923714	-6.068504	265.452881	-0.372467
T0 + 5	-0.084536	-6.153040	274.301311	-0.371515
T0 + 6	-0.929974	-7.083015	283.149740	-0.420930
T0 + 7	0.121239	-6.961775	291.998169	-0.407408
T0 + 8	-1.407003	-8.368778	300.846599	-0.482491
T0 + 9	1.741110	-6.627668	309.695028	-0.376612
T0 + 10	-0.458713	-7.086381	318.543457	-0.397045
T0 + 11	-1.216032	-8.302414	327.391887	-0.458850
T0 + 12	1.047789	-7.254624	336.240316	-0.395631
T0 + 13	0.020569	-7.234055	345.088746	-0.389418
T0 + 14	-0.364890	-7.598945	353.937175	-0.403915
T0 + 15	0.541333	-7.057612	362.785604	-0.370538
T0 + 16	-0.778544	-7.836156	371.634034	-0.406486
T0 + 17	1.001161	-6.834995	380.482463	-0.350405
T0 + 18	0.458857	-6.376137	389.330892	-0.323146
T0 + 19	-0.333452	-6.709589	398.179322	-0.336246
T0 + 20	0.858375	-5.851214	407.027751	-0.290024
T0 + 21	0.616703	-5.234511	415.876180	-0.256681
T0 + 22	-0.762747	-5.997258	424.724610	-0.291004
T0 + 23	0.096248	-5.901010	433.573039	-0.283397
T0 + 24	-0.086800	-5.987810	442.421469	-0.284675
T0 + 25	-0.124894	-6.112704	451.269898	-0.287750

Consumer Staples

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.137767	-0.137767	17.467826	-0.032963
T0 - 24	0.070778	-0.066989	34.935652	-0.011334
T0 - 23	0.090688	0.023700	52.403478	0.003274
T0 - 22	-0.718587	-0.694888	69.871305	-0.083131
T0 - 21	0.802239	0.107351	87.339131	0.011487
T0 - 20	-0.596850	-0.489499	104.806957	-0.047814
T0 - 19	-0.158900	-0.648399	122.274783	-0.058637
T0 - 18	-0.633556	-1.281955	139.742609	-0.108445
T0 - 17	-1.145664	-2.427620	157.210435	-0.193615
T0 - 16	-0.093080	-2.520700	174.678262	-0.190722
T0 - 15	-0.438441	-2.959141	192.146088	-0.213476
T0 - 14	0.006494	-2.952647	209.613914	-0.203940
T0 - 13	1.295178	-1.657469	227.081740	-0.109990
T0 - 12	0.348782	-1.308687	244.549566	-0.083686
T0 - 11	0.509553	-0.799134	262.017392	-0.049369
T0 - 10	-0.806197	-1.605331	279.485219	-0.096025
T0 - 9	0.499144	-1.106187	296.953045	-0.064193

T0 - 8	0.735992	-0.370195	314.420871	-0.020877
T0 - 7	1.320305	0.950110	331.888697	0.052153
T0 - 6	-1.131689	-0.181579	349.356523	-0.009715
T0 - 5	-0.045177	-0.226756	366.824349	-0.011839
T0 - 4	-0.334926	-0.561682	384.292175	-0.028652
T0 - 3	-0.357189	-0.918871	401.760002	-0.045843
T0 - 2	1.183984	0.265112	419.227828	0.012948
T0 - 1	-0.403551	-0.138438	436.695654	-0.006625
T0	-1.528657	-1.667095	454.163480	-0.078227
T0 + 1	-0.682049	-2.349144	471.631306	-0.108170
T0 + 2	-1.797034	-4.146178	489.099132	-0.187478
T0 + 3	0.386608	-3.759570	506.566959	-0.167040
T0 + 4	0.127261	-3.632310	524.034785	-0.158673
T0 + 5	-0.582031	-4.214341	541.502611	-0.181105
T0 + 6	0.291174	-3.923167	558.970437	-0.165937
T0 + 7	1.395423	-2.527744	576.438263	-0.105283
T0 + 8	-1.022240	-3.549983	593.906089	-0.145669
T0 + 9	1.275539	-2.274445	611.373915	-0.091986
T0 + 10	-0.254848	-2.529293	628.841742	-0.100862
T0 + 11	0.358704	-2.170588	646.309568	-0.085380
T0 + 12	-0.439279	-2.609867	663.777394	-0.101299
T0 + 13	-0.017577	-2.627444	681.245220	-0.100666
T0 + 14	-0.063875	-2.691320	698.713046	-0.101816
T0 + 15	-0.300348	-2.991668	716.180872	-0.111790
T0 + 16	0.488672	-2.502996	733.648699	-0.092409
T0 + 17	-1.246916	-3.749912	751.116525	-0.136826
T0 + 18	0.670873	-3.079039	768.584351	-0.111063
T0 + 19	-0.059166	-3.138205	786.052177	-0.111932
T0 + 20	-0.110255	-3.248460	803.520003	-0.114599
T0 + 21	-0.364628	-3.613088	820.987829	-0.126099
T0 + 22	-0.523673	-4.136761	838.455656	-0.142863
T0 + 23	-1.071478	-5.208240	855.923482	-0.178022
T0 + 24	-0.309533	-5.517773	873.391308	-0.186706
T0 + 25	1.854337	-3.663436	890.859134	-0.122739

Energy

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.341809	0.341809	6.983488	0.129344
T0 - 24	-0.381563	-0.039754	13.966976	-0.010637
T0 - 23	0.410869	0.371115	20.950464	0.081080
T0 - 22	0.018789	0.389905	27.933952	0.073772
T0 - 21	-0.318647	0.071258	34.917440	0.012059
T0 - 20	0.472305	0.543563	41.900928	0.083973
T0 - 19	0.495664	1.039226	48.884416	0.148636
T0 - 18	0.544497	1.583723	55.867905	0.211884
T0 - 17	0.445915	2.029638	62.851393	0.256012
T0 - 16	0.706533	2.736171	69.834881	0.327421
T0 - 15	-0.201858	2.534313	76.818369	0.289153
T0 - 14	-0.429345	2.104968	83.801857	0.229942
T0 - 13	-0.244495	1.860473	90.785345	0.195261
T0 - 12	-0.092416	1.768057	97.768833	0.178812

T0 - 11	0.071640	1.839697	104.752321	0.179748
T0 - 10	0.233163	2.072860	111.735809	0.196098
T0 - 9	-0.121867	1.950993	118.719297	0.179059
T0 - 8	0.043911	1.994904	125.702785	0.177930
T0 - 7	-0.366754	1.628151	132.686273	0.141345
T0 - 6	-0.163914	1.464236	139.669761	0.123897
T0 - 5	0.216302	1.680538	146.653249	0.138772
T0 - 4	0.803771	2.484309	153.636738	0.200428
T0 - 3	0.670108	3.154417	160.620226	0.248897
T0 - 2	-0.326770	2.827647	167.603714	0.218415
T0 - 1	-0.288323	2.539324	174.587202	0.192182
T0	0.775545	3.314868	181.570690	0.246005
T0 + 1	-0.811805	2.503063	188.554178	0.182286
T0 + 2	0.131736	2.634799	195.537666	0.188422
T0 + 3	0.242119	2.876919	202.521154	0.202159
T0 + 4	-0.959637	1.917282	209.504642	0.132461
T0 + 5	-0.127912	1.789370	216.488130	0.121614
T0 + 6	0.439166	2.228535	223.471618	0.149076
T0 + 7	0.672134	2.900669	230.455106	0.191076
T0 + 8	0.936572	3.837241	237.438594	0.249025
T0 + 9	-0.512435	3.324806	244.422082	0.212665
T0 + 10	0.741293	4.066100	251.405570	0.256443
T0 + 11	-1.034493	3.031607	258.389059	0.188597
T0 + 12	0.330336	3.361943	265.372547	0.206377
T0 + 13	-1.340894	2.021048	272.356035	0.122464
T0 + 14	-0.254155	1.766893	279.339523	0.105717
T0 + 15	-0.046117	1.720777	286.323011	0.101694
T0 + 16	0.266518	1.987295	293.306499	0.116038
T0 + 17	0.423755	2.411050	300.289987	0.139135
T0 + 18	0.109135	2.520185	307.273475	0.143771
T0 + 19	0.930774	3.450960	314.256963	0.194669
T0 + 20	0.344127	3.795086	321.240451	0.211742
T0 + 21	0.170717	3.965804	328.223939	0.218900
T0 + 22	-1.381682	2.584121	335.207427	0.141142
T0 + 23	-0.205607	2.378514	342.190915	0.128579
T0 + 24	-0.442559	1.935955	349.174403	0.103603
T0 + 25	0.686105	2.622060	356.157892	0.138938

Financials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.921168	-0.921168	3.057544	-0.526808
T0 - 24	0.614272	-0.306896	6.115088	-0.124105
T0 - 23	-0.449946	-0.756842	9.172632	-0.249895
T0 - 22	-0.450412	-1.207254	12.230176	-0.345209
T0 - 21	-0.201044	-1.408297	15.287720	-0.360183
T0 - 20	0.093034	-1.315263	18.345264	-0.307079
T0 - 19	0.086733	-1.228530	21.402808	-0.265552
T0 - 18	-0.617075	-1.845604	24.460352	-0.373170
T0 - 17	-0.919774	-2.765379	27.517896	-0.527166
T0 - 16	-0.335299	-3.100677	30.575440	-0.560751
T0 - 15	0.100741	-2.999936	33.632984	-0.517284

T0 - 14	0.286805	-2.713131	36.690528	-0.447913
T0 - 13	-0.084927	-2.798058	39.748072	-0.443812
T0 - 12	0.897793	-1.900264	42.805616	-0.290445
T0 - 11	-0.563756	-2.464021	45.863160	-0.363842
T0 - 10	0.295917	-2.168104	48.920704	-0.309980
T0 - 9	0.753564	-1.414540	51.978248	-0.196202
T0 - 8	0.247045	-1.167495	55.035792	-0.157374
T0 - 7	-0.329582	-1.497076	58.093336	-0.196418
T0 - 6	-1.643618	-3.140694	61.150880	-0.401628
T0 - 5	0.034581	-3.106114	64.208424	-0.387634
T0 - 4	-1.498974	-4.605087	67.265968	-0.561488
T0 - 3	-0.314595	-4.919682	70.323513	-0.586660
T0 - 2	-0.536099	-5.455782	73.381057	-0.636891
T0 - 1	0.574279	-4.881503	76.438601	-0.558338
T0	0.837100	-4.044403	79.496145	-0.453609
T0 + 1	0.246986	-3.797416	82.553689	-0.417946
T0 + 2	-0.063732	-3.861149	85.611233	-0.417303
T0 + 3	-1.566687	-5.427835	88.668777	-0.576423
T0 + 4	-0.249425	-5.677260	91.726321	-0.592778
T0 + 5	-0.086687	-5.763947	94.783865	-0.592042
T0 + 6	0.091250	-5.672697	97.841409	-0.573493
T0 + 7	-0.716430	-6.389127	100.898953	-0.636060
T0 + 8	-1.131402	-7.520529	103.956497	-0.737603
T0 + 9	0.193834	-7.326695	107.014041	-0.708252
T0 + 10	0.401644	-6.925050	110.071585	-0.660063
T0 + 11	-0.047017	-6.972068	113.129129	-0.655503
T0 + 12	-0.730664	-7.702732	116.186673	-0.714606
T0 + 13	0.687780	-7.014952	119.244217	-0.642401
T0 + 14	0.047744	-6.967208	122.301761	-0.630003
T0 + 15	-0.013008	-6.980217	125.359305	-0.623434
T0 + 16	-0.519780	-7.499997	128.416849	-0.661836
T0 + 17	-1.772665	-9.272662	131.474393	-0.808693
T0 + 18	-0.177099	-9.449760	134.531937	-0.814719
T0 + 19	-0.773194	-10.222954	137.589481	-0.871533
T0 + 20	-0.882938	-11.105892	140.647025	-0.936458
T0 + 21	-0.195134	-11.301026	143.704569	-0.942720
T0 + 22	0.742126	-10.558900	146.762113	-0.871589
T0 + 23	4.635131	-5.923769	149.819657	-0.483965
T0 + 24	-0.591012	-6.514781	152.877201	-0.526900
T0 + 25	-0.629971	-7.144752	155.934745	-0.572158

Industrials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-1.057203	-1.057203	9.664056	-0.340078
T0 - 24	0.847642	-0.209560	19.328112	-0.047667
T0 - 23	0.316035	0.106475	28.992168	0.019775
T0 - 22	-1.923326	-1.816851	38.656225	-0.292220
T0 - 21	0.494394	-1.322457	48.320281	-0.190247
T0 - 20	-1.444560	-2.767017	57.984337	-0.363376
T0 - 19	-1.350881	-4.117898	67.648393	-0.500665
T0 - 18	5.915339	1.797441	77.312449	0.204423

T0 - 17	0.079049	1.876490	86.976505	0.201208
T0 - 16	-0.734926	1.141565	96.640562	0.116124
T0 - 15	-0.964269	0.177296	106.304618	0.017196
T0 - 14	1.179417	1.356713	115.968674	0.125985
T0 - 13	-0.094636	1.262076	125.632730	0.112599
T0 - 12	0.358853	1.620930	135.296786	0.139354
T0 - 11	1.633014	3.253944	144.960842	0.270262
T0 - 10	1.456722	4.710666	154.624899	0.378828
T0 - 9	0.604664	5.315330	164.288955	0.414692
T0 - 8	-1.066392	4.248938	173.953011	0.322155
T0 - 7	-0.544002	3.704936	183.617067	0.273416
T0 - 6	-1.286489	2.418446	193.281123	0.173957
T0 - 5	4.325396	6.743842	202.945179	0.473389
T0 - 4	3.836184	10.580027	212.609235	0.725597
T0 - 3	1.629658	12.209685	222.273292	0.818956
T0 - 2	-2.492300	9.717385	231.937348	0.638064
T0 - 1	-1.838194	7.879192	241.601404	0.506911
T0	-1.900490	5.978702	251.265460	0.377173
T0 + 1	-2.502796	3.475905	260.929516	0.215182
T0 + 2	2.618951	6.094856	270.593572	0.370514
T0 + 3	0.642436	6.737292	280.257629	0.402445
T0 + 4	0.320700	7.057992	289.921685	0.414516
T0 + 5	0.533779	7.591771	299.585741	0.438614
T0 + 6	-0.407001	7.184771	309.249797	0.408562
T0 + 7	0.502375	7.687146	318.913853	0.430456
T0 + 8	-2.119115	5.568030	328.577909	0.307173
T0 + 9	1.028544	6.596574	338.241966	0.358678
T0 + 10	-0.193511	6.403064	347.906022	0.343287
T0 + 11	-2.241544	4.161520	357.570078	0.220075
T0 + 12	-0.335221	3.826300	367.234134	0.199668
T0 + 13	-2.458701	1.367598	376.898190	0.070444
T0 + 14	1.359373	2.726971	386.562246	0.138698
T0 + 15	-0.566069	2.160902	396.226303	0.108558
T0 + 16	1.524597	3.685499	405.890359	0.182933
T0 + 17	0.790065	4.475564	415.554415	0.219550
T0 + 18	-1.967259	2.508306	425.218471	0.121639
T0 + 19	0.983699	3.492004	434.882527	0.167451
T0 + 20	0.780478	4.272482	444.546583	0.202638
T0 + 21	-0.138037	4.134444	454.210639	0.193994
T0 + 22	0.616063	4.750508	463.874696	0.220567
T0 + 23	-1.050502	3.700005	473.538752	0.170030
T0 + 24	0.576179	4.276184	483.202808	0.194532
T0 + 25	0.615129	4.891313	492.866864	0.220323

Materials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.582785	-0.582785	29.058628	-0.108111
T0 - 24	-0.343117	-0.925902	58.117257	-0.121454
T0 - 23	-0.119510	-1.045412	87.175885	-0.111967
T0 - 22	-0.407037	-1.452449	116.234513	-0.134720
T0 - 21	-0.113829	-1.566278	145.293142	-0.129941

T0 - 20	0.232534	-1.333744	174.351770	-0.101009
T0 - 19	0.193709	-1.140035	203.410398	-0.079934
T0 - 18	0.274004	-0.866031	232.469026	-0.056800
T0 - 17	0.156200	-0.709831	261.527655	-0.043893
T0 - 16	0.057174	-0.652657	290.586283	-0.038287
T0 - 15	-0.172245	-0.824902	319.644911	-0.046139
T0 - 14	0.874039	0.049137	348.703540	0.002631
T0 - 13	-0.127397	-0.078260	377.762168	-0.004027
T0 - 12	-1.239513	-1.317773	406.820796	-0.065334
T0 - 11	-0.683835	-2.001608	435.879425	-0.095873
T0 - 10	-0.211635	-2.213243	464.938053	-0.102644
T0 - 9	0.585936	-1.627307	493.996681	-0.073216
T0 - 8	0.041018	-1.586289	523.055309	-0.069360
T0 - 7	0.716968	-0.869321	552.113938	-0.036997
T0 - 6	0.749003	-0.120318	581.172566	-0.004991
T0 - 5	-0.475985	-0.596303	610.231194	-0.024139
T0 - 4	0.220222	-0.376081	639.289823	-0.014874
T0 - 3	-0.331924	-0.708005	668.348451	-0.027386
T0 - 2	0.005982	-0.702023	697.407079	-0.026583
T0 - 1	-0.360642	-1.062665	726.465708	-0.039427
T0	0.710921	-0.351744	755.524336	-0.012797
T0 + 1	-0.279989	-0.631733	784.582964	-0.022554
T0 + 2	0.010283	-0.621450	813.641593	-0.021787
T0 + 3	1.318719	0.697269	842.700221	0.024019
T0 + 4	1.577609	2.274878	871.758849	0.077048
T0 + 5	-0.303861	1.971017	900.817477	0.065671
T0 + 6	-0.792183	1.178834	929.876106	0.038658
T0 + 7	0.119971	1.298804	958.934734	0.041942
T0 + 8	0.285856	1.584661	987.993362	0.050415
T0 + 9	-0.786664	0.797997	1017.051991	0.025022
T0 + 10	-1.250385	-0.452388	1046.110619	-0.013987
T0 + 11	1.622873	1.170485	1075.169247	0.035697
T0 + 12	0.047908	1.218393	1104.227876	0.036666
T0 + 13	0.242321	1.460714	1133.286504	0.043391
T0 + 14	1.118316	2.579030	1162.345132	0.075646
T0 + 15	-0.666819	1.912211	1191.403760	0.055400
T0 + 16	-1.230466	0.681745	1220.462389	0.019515
T0 + 17	0.650200	1.331945	1249.521017	0.037680
T0 + 18	0.020722	1.352667	1278.579645	0.037829
T0 + 19	-0.607010	0.745656	1307.638274	0.020620
T0 + 20	0.558002	1.303659	1336.696902	0.035657
T0 + 21	0.515597	1.819256	1365.755530	0.049227
T0 + 22	-0.566604	1.252652	1394.814159	0.033541
T0 + 23	-1.211088	0.041564	1423.872787	0.001101
T0 + 24	-1.348555	-1.306991	1452.931415	-0.034289
T0 + 25	0.463616	-0.843375	1481.990044	-0.021908

Utilities

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	2.036323	2.036323	22.958818	0.424983
T0 - 24	-0.452909	1.583414	45.917637	0.233671

T0 - 23	-0.947324	0.636091	68.876455	0.076645
T0 - 22	-2.191056	-1.554965	91.835273	-0.162262
T0 - 21	-0.246879	-1.801845	114.794091	-0.168174
T0 - 20	0.115130	-1.686715	137.752910	-0.143711
T0 - 19	0.454602	-1.232113	160.711728	-0.097191
T0 - 18	-1.291693	-2.523806	183.670546	-0.186224
T0 - 17	0.176544	-2.347262	206.629365	-0.163292
T0 - 16	-0.766949	-3.114211	229.588183	-0.205529
T0 - 15	0.059322	-3.054889	252.547001	-0.192231
T0 - 14	0.819088	-2.235801	275.505820	-0.134700
T0 - 13	-0.058911	-2.294712	298.464638	-0.132826
T0 - 12	0.982549	-1.312163	321.423456	-0.073190
T0 - 11	0.213413	-1.098750	344.382274	-0.059208
T0 - 10	-1.964393	-3.063143	367.341093	-0.159821
T0 - 9	0.511288	-2.551855	390.299911	-0.129169
T0 - 8	0.648170	-1.903685	413.258729	-0.093645
T0 - 7	0.498511	-1.405174	436.217548	-0.067279
T0 - 6	-0.121456	-1.526631	459.176366	-0.071243
T0 - 5	0.906507	-0.620124	482.135184	-0.028242
T0 - 4	0.958519	0.338395	505.094003	0.015057
T0 - 3	0.405796	0.744191	528.052821	0.032385
T0 - 2	-0.830634	-0.086443	551.011639	-0.003683
T0 - 1	-0.312918	-0.399361	573.970457	-0.016669
T0	-1.238753	-1.638114	596.929276	-0.067048
T0 + 1	-0.774944	-2.413058	619.888094	-0.096920
T0 + 2	1.002472	-1.410587	642.846912	-0.055635
T0 + 3	-0.867340	-2.277927	665.805731	-0.088281
T0 + 4	-0.612512	-2.890439	688.764549	-0.110136
T0 + 5	2.114950	-0.775488	711.723367	-0.029068
T0 + 6	0.569215	-0.206273	734.682186	-0.007610
T0 + 7	1.725746	1.519473	757.641004	0.055203
T0 + 8	2.935671	4.455144	780.599822	0.159458
T0 + 9	0.005065	4.460209	803.558640	0.157343
T0 + 10	-1.114729	3.345480	826.517459	0.116368
T0 + 11	-0.317535	3.027945	849.476277	0.103890
T0 + 12	-0.006327	3.021618	872.435095	0.102299
T0 + 13	1.739566	4.761184	895.393914	0.159114
T0 + 14	1.371502	6.132686	918.352732	0.202370
T0 + 15	0.374295	6.506981	941.311550	0.212086
T0 + 16	0.908035	7.415016	964.270369	0.238788
T0 + 17	-1.753138	5.661878	987.229187	0.180199
T0 + 18	-1.502704	4.159174	1010.188005	0.130860
T0 + 19	0.809096	4.968269	1033.146823	0.154570
T0 + 20	0.525047	5.493316	1056.105642	0.169037
T0 + 21	-0.658566	4.834750	1079.064460	0.147181
T0 + 22	0.791991	5.626741	1102.023278	0.169497
T0 + 23	0.448252	6.074994	1124.982097	0.181123
T0 + 24	-1.076892	4.998102	1147.940915	0.147518
T0 + 25	-0.083345	4.914757	1170.899733	0.143629

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Communication Services

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.480878	-0.480878	5.815210	-0.199413
T0 - 24	0.003157	-0.477721	11.630419	-0.140080
T0 - 23	0.289460	-0.188261	17.445629	-0.045073
T0 - 22	-0.292296	-0.480557	23.260839	-0.099640
T0 - 21	-0.186727	-0.667284	29.076049	-0.123749
T0 - 20	0.879738	0.212454	34.891258	0.035967
T0 - 19	-0.056980	0.155474	40.706468	0.024368
T0 - 18	-0.787551	-0.632077	46.521678	-0.092671
T0 - 17	-0.349520	-0.981597	52.336887	-0.135684
T0 - 16	-0.251659	-1.233256	58.152097	-0.161723
T0 - 15	0.108028	-1.125228	63.967307	-0.140689
T0 - 14	3.532086	2.406858	69.782517	0.288122
T0 - 13	-0.988503	1.418355	75.597726	0.163129
T0 - 12	-1.330570	0.087785	81.412936	0.009729
T0 - 11	0.128135	0.215920	87.228146	0.023119
T0 - 10	1.295877	1.511797	93.043355	0.156730
T0 - 9	-0.022675	1.489121	98.858565	0.149769
T0 - 8	0.380351	1.869473	104.673775	0.182726
T0 - 7	0.532634	2.402107	110.488985	0.228525
T0 - 6	0.971477	3.373584	116.304194	0.312820
T0 - 5	0.370897	3.744481	122.119404	0.338844
T0 - 4	0.447059	4.191540	127.934614	0.370578
T0 - 3	-0.493257	3.698284	133.749823	0.319782
T0 - 2	-0.576546	3.121738	139.565033	0.264246
T0 - 1	1.698617	4.820355	145.380243	0.399785
T0	1.102009	5.922364	151.195453	0.481644
T0 + 1	-0.369340	5.553025	157.010662	0.443165
T0 + 2	0.654585	6.207610	162.825872	0.486477
T0 + 3	1.391505	7.599115	168.641082	0.585169
T0 + 4	0.078974	7.678089	174.456291	0.581313
T0 + 5	-0.063342	7.614747	180.271501	0.567142
T0 + 6	0.369800	7.984547	186.086711	0.585319
T0 + 7	0.990641	8.975187	191.901921	0.647894
T0 + 8	-0.026871	8.948317	197.717130	0.636384
T0 + 9	-0.665430	8.282887	203.532340	0.580584
T0 + 10	0.225720	8.508607	209.347550	0.588064
T0 + 11	-0.399565	8.109042	215.162759	0.552823
T0 + 12	-0.953650	7.155393	220.977969	0.481348
T0 + 13	0.421813	7.577206	226.793179	0.503146
T0 + 14	-0.037645	7.539561	232.608389	0.494349
T0 + 15	-0.643713	6.895847	238.423598	0.446594
T0 + 16	-2.147943	4.747905	244.238808	0.303805
T0 + 17	-0.261874	4.486031	250.054018	0.283691
T0 + 18	-0.070593	4.415439	255.869227	0.276035
T0 + 19	1.100070	5.515508	261.684437	0.340955
T0 + 20	1.736535	7.252043	267.499647	0.443403
T0 + 21	-1.158352	6.093691	273.314857	0.368594
T0 + 22	-2.021736	4.071955	279.130066	0.243725
T0 + 23	0.516254	4.588209	284.945276	0.271808

T0 + 24	-0.916807	3.671403	290.760486	0.215310
T0 + 25	-1.940251	1.731152	296.575695	0.100523

Consumer Staples

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-1.865356	-1.865356	20.734418	-0.409653
T0 - 24	-0.004046	-1.869402	41.468836	-0.290297
T0 - 23	-0.468195	-2.337597	62.203255	-0.296390
T0 - 22	0.048834	-2.288763	82.937673	-0.251319
T0 - 21	0.854172	-1.434591	103.672091	-0.140896
T0 - 20	1.729842	0.295251	124.406509	0.026471
T0 - 19	-0.268648	0.026604	145.140927	0.002208
T0 - 18	0.640180	0.666783	165.875346	0.051772
T0 - 17	-0.142425	0.524359	186.609764	0.038385
T0 - 16	-0.444692	0.079667	207.344182	0.005533
T0 - 15	-0.480252	-0.400585	228.078600	-0.026525
T0 - 14	0.461228	0.060643	248.813019	0.003845
T0 - 13	-0.154347	-0.093704	269.547437	-0.005707
T0 - 12	-1.844067	-1.937771	290.281855	-0.113735
T0 - 11	0.043014	-1.894757	311.016273	-0.107439
T0 - 10	0.879766	-1.014991	331.750691	-0.055726
T0 - 9	1.200782	0.185791	352.485110	0.009896
T0 - 8	-0.003678	0.182113	373.219528	0.009427
T0 - 7	2.022420	2.204533	393.953946	0.111069
T0 - 6	-0.625812	1.578721	414.688364	0.077525
T0 - 5	1.099682	2.678403	435.422782	0.128357
T0 - 4	0.392811	3.071214	456.157201	0.143798
T0 - 3	0.303068	3.374282	476.891619	0.154515
T0 - 2	-0.656021	2.718261	497.626037	0.121854
T0 - 1	0.161174	2.879434	518.360455	0.126471
T0	-0.036453	2.842981	539.094874	0.122445
T0 + 1	-0.660682	2.182299	559.829292	0.092233
T0 + 2	-0.838203	1.344096	580.563710	0.055783
T0 + 3	-0.396479	0.947617	601.298128	0.038645
T0 + 4	0.491260	1.438877	622.032546	0.057692
T0 + 5	-0.153178	1.285699	642.766965	0.050712
T0 + 6	-0.927713	0.357986	663.501383	0.013898
T0 + 7	-0.419403	-0.061417	684.235801	-0.002348
T0 + 8	-0.051951	-0.113368	704.970219	-0.004270
T0 + 9	0.774194	0.660827	725.704637	0.024531
T0 + 10	-0.572227	0.088600	746.439056	0.003243
T0 + 11	-0.527538	-0.438937	767.173474	-0.015847
T0 + 12	-0.744907	-1.183845	787.907892	-0.042175
T0 + 13	0.247847	-0.935997	808.642310	-0.032915
T0 + 14	-0.046463	-0.982460	829.376729	-0.034114
T0 + 15	-0.155518	-1.137978	850.111147	-0.039030
T0 + 16	-2.425608	-3.563586	870.845565	-0.120758
T0 + 17	-0.820166	-4.383752	891.579983	-0.146813
T0 + 18	-0.726623	-5.110376	912.314401	-0.169192
T0 + 19	-0.431214	-5.541590	933.048820	-0.181419
T0 + 20	1.302784	-4.238805	953.783238	-0.137252

T0 + 21	0.243073	-3.995732	974.517656	-0.127998
T0 + 22	0.307033	-3.688699	995.252074	-0.116925
T0 + 23	1.073475	-2.615224	1015.986492	-0.082047
T0 + 24	-2.641931	-5.257155	1036.720911	-0.163275
T0 + 25	-6.223556	-11.480711	1057.455329	-0.353051

Energy

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.140057	-0.140057	5.975100	-0.057297
T0 - 24	0.602604	0.462547	11.950200	0.133804
T0 - 23	-0.155538	0.307009	17.925300	0.072513
T0 - 22	-0.809553	-0.502544	23.900400	-0.102795
T0 - 21	-0.102761	-0.605305	29.875499	-0.110743
T0 - 20	0.332379	-0.272926	35.850599	-0.045582
T0 - 19	0.015550	-0.257376	41.825699	-0.039797
T0 - 18	-0.316251	-0.573628	47.800799	-0.082968
T0 - 17	0.407118	-0.166510	53.775899	-0.022706
T0 - 16	0.053669	-0.112840	59.750999	-0.014598
T0 - 15	0.218200	0.105360	65.726099	0.012996
T0 - 14	0.426978	0.532338	71.701199	0.062867
T0 - 13	-0.189101	0.343236	77.676298	0.038945
T0 - 12	-0.427824	-0.084588	83.651398	-0.009249
T0 - 11	-0.119934	-0.204522	89.626498	-0.021603
T0 - 10	0.053862	-0.150659	95.601598	-0.015409
T0 - 9	-0.047399	-0.198058	101.576698	-0.019652
T0 - 8	-0.819722	-1.017780	107.551798	-0.098140
T0 - 7	-0.302604	-1.320384	113.526898	-0.123923
T0 - 6	-0.545188	-1.865572	119.501998	-0.170657
T0 - 5	-0.065242	-1.930814	125.477098	-0.172369
T0 - 4	-0.314031	-2.244845	131.452197	-0.195795
T0 - 3	0.338369	-1.906476	137.427297	-0.162628
T0 - 2	-0.042253	-1.948729	143.402397	-0.162732
T0 - 1	-0.130781	-2.079509	149.377497	-0.170145
T0	-0.036454	-2.115963	155.352597	-0.169765
T0 + 1	0.016187	-2.099776	161.327697	-0.165317
T0 + 2	-0.072402	-2.172178	167.302797	-0.167936
T0 + 3	-0.661528	-2.833705	173.277897	-0.215270
T0 + 4	-0.176557	-3.010262	179.252996	-0.224839
T0 + 5	-0.668829	-3.679091	185.228096	-0.270326
T0 + 6	-1.341605	-5.020696	191.203196	-0.363092
T0 + 7	-0.807724	-5.828419	197.178296	-0.415070
T0 + 8	0.211066	-5.617353	203.153396	-0.394112
T0 + 9	0.410572	-5.206782	209.128496	-0.360050
T0 + 10	-0.044861	-5.251643	215.103596	-0.358073
T0 + 11	0.112440	-5.139203	221.078696	-0.345639
T0 + 12	0.596100	-4.543103	227.053795	-0.301501
T0 + 13	0.484733	-4.058371	233.028895	-0.265856
T0 + 14	-0.051362	-4.109733	239.003995	-0.265834
T0 + 15	-0.754856	-4.864589	244.979095	-0.310800
T0 + 16	-0.438259	-5.302847	250.954195	-0.334743
T0 + 17	-0.198778	-5.501625	256.929295	-0.343229

T0 + 18	-0.325817	-5.827442	262.904395	-0.359401
T0 + 19	0.375541	-5.451900	268.879495	-0.332483
T0 + 20	-0.014082	-5.465983	274.854595	-0.329698
T0 + 21	0.141047	-5.324935	280.829694	-0.317755
T0 + 22	0.841384	-4.483552	286.804794	-0.264746
T0 + 23	-0.337659	-4.821210	292.779894	-0.281764
T0 + 24	-0.742182	-5.563392	298.754994	-0.321871
T0 + 25	-4.251231	-9.814623	304.730094	-0.562233

Financials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	0.978549	0.978549	2.758771	0.589148
T0 - 24	-0.523640	0.454909	5.517541	0.193665
T0 - 23	-0.426888	0.028021	8.276312	0.009740
T0 - 22	0.499932	0.527953	11.035083	0.158930
T0 - 21	-0.095653	0.432300	13.793853	0.116397
T0 - 20	-0.547865	-0.115565	16.552624	-0.028405
T0 - 19	0.080374	-0.035191	19.311395	-0.008008
T0 - 18	0.485715	0.450524	22.070165	0.095899
T0 - 17	-0.435472	0.015052	24.828936	0.003021
T0 - 16	-0.475069	-0.460017	27.587707	-0.087582
T0 - 15	0.588900	0.128883	30.346478	0.023396
T0 - 14	0.213767	0.342650	33.105248	0.059553
T0 - 13	0.450212	0.792862	35.864019	0.132394
T0 - 12	0.505461	1.298323	38.622790	0.208911
T0 - 11	-0.923542	0.374781	41.381560	0.058260
T0 - 10	-1.037167	-0.662386	44.140331	-0.099700
T0 - 9	0.660583	-0.001803	46.899102	-0.000263
T0 - 8	0.138884	0.137081	49.657872	0.019453
T0 - 7	2.488044	2.625124	52.416643	0.362590
T0 - 6	-0.292778	2.332346	55.175414	0.313993
T0 - 5	-0.236009	2.096337	57.934184	0.275419
T0 - 4	-0.414745	1.681592	60.692955	0.215850
T0 - 3	-1.741095	-0.059504	63.451726	-0.007470
T0 - 2	0.018287	-0.041216	66.210496	-0.005065
T0 - 1	0.436644	0.395427	68.969267	0.047614
T0	-0.427288	-0.031860	71.728038	-0.003762
T0 + 1	-1.048506	-1.080366	74.486809	-0.125179
T0 + 2	0.180548	-0.899818	77.245579	-0.102381
T0 + 3	0.510572	-0.389246	80.004350	-0.043518
T0 + 4	0.068079	-0.321168	82.763121	-0.035303
T0 + 5	0.301172	-0.019996	85.521891	-0.002162
T0 + 6	0.756561	0.736565	88.280662	0.078393
T0 + 7	-0.256901	0.479664	91.039433	0.050272
T0 + 8	-0.527344	-0.047680	93.798203	-0.004923
T0 + 9	-0.307910	-0.355589	96.556974	-0.036187
T0 + 10	0.375488	0.019898	99.315745	0.001997
T0 + 11	-0.112643	-0.092745	102.074515	-0.009180
T0 + 12	-0.616457	-0.709202	104.833286	-0.069266
T0 + 13	-0.882268	-1.591470	107.592057	-0.153429
T0 + 14	-0.247843	-1.839313	110.350827	-0.175093

T0 + 15	0.983349	-0.855965	113.109598	-0.080483
T0 + 16	0.827372	-0.028592	115.868369	-0.002656
T0 + 17	0.776255	0.747663	118.627139	0.068646
T0 + 18	-0.839424	-0.091761	121.385910	-0.008329
T0 + 19	-0.748244	-0.840005	124.144681	-0.075391
T0 + 20	-0.990422	-1.830427	126.903452	-0.162486
T0 + 21	0.522478	-1.307950	129.662222	-0.114864
T0 + 22	-0.467979	-1.775929	132.420993	-0.154329
T0 + 23	-0.497699	-2.273628	135.179764	-0.195553
T0 + 24	-2.000633	-4.274261	137.938534	-0.363930
T0 + 25	-2.365065	-6.639326	140.697305	-0.559733

Industrials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.542970	-0.542970	2.586494	-0.337614
T0 - 24	-0.224121	-0.767091	5.172989	-0.337269
T0 - 23	-0.589608	-1.356699	7.759483	-0.487043
T0 - 22	0.172424	-1.184274	10.345978	-0.368185
T0 - 21	-0.739804	-1.924078	12.932472	-0.535035
T0 - 20	1.745079	-0.178999	15.518967	-0.045438
T0 - 19	1.206486	1.027487	18.105461	0.241475
T0 - 18	0.677871	1.705358	20.691956	0.374899
T0 - 17	1.571636	3.276994	23.278450	0.679201
T0 - 16	0.848659	4.125653	25.864945	0.811217
T0 - 15	-0.770075	3.355578	28.451439	0.629093
T0 - 14	0.199759	3.555337	31.037934	0.638167
T0 - 13	0.023954	3.579292	33.624428	0.617262
T0 - 12	1.188645	4.767936	36.210923	0.792338
T0 - 11	1.491932	6.259869	38.797417	1.004995
T0 - 10	0.393977	6.653845	41.383912	1.034325
T0 - 9	0.319196	6.973042	43.970406	1.051579
T0 - 8	-0.311475	6.661567	46.556901	0.976302
T0 - 7	2.626327	9.287894	49.143395	1.324905
T0 - 6	-1.026373	8.261521	51.729890	1.148654
T0 - 5	0.157020	8.418541	54.316384	1.142277
T0 - 4	-0.345524	8.073017	56.902879	1.070209
T0 - 3	-3.488948	4.584068	59.489373	0.594335
T0 - 2	-0.678142	3.905927	62.075868	0.495750
T0 - 1	0.586274	4.492201	64.662362	0.558642
T0	-0.501602	3.990599	67.248857	0.486626
T0 + 1	-1.167674	2.822925	69.835351	0.337802
T0 + 2	0.457607	3.280532	72.421846	0.385487
T0 + 3	2.038455	5.318986	75.008340	0.614149
T0 + 4	2.700389	8.019375	77.594835	0.910383
T0 + 5	1.784943	9.804318	80.181329	1.094916
T0 + 6	0.621721	10.426039	82.767824	1.146010
T0 + 7	-0.752325	9.673714	85.354318	1.047081
T0 + 8	-0.467747	9.205967	87.940813	0.981690
T0 + 9	1.186511	10.392478	90.527307	1.092268
T0 + 10	0.608691	11.001169	93.113802	1.140071
T0 + 11	-0.105451	10.895718	95.700296	1.113779

T0 + 12	-1.542072	9.353646	98.286791	0.943481
T0 + 13	-0.269471	9.084175	100.873285	0.904477
T0 + 14	-0.557166	8.527009	103.459780	0.838322
T0 + 15	-0.271559	8.255450	106.046274	0.801665
T0 + 16	-2.845351	5.410099	108.632769	0.519069
T0 + 17	-0.649440	4.760659	111.219263	0.451416
T0 + 18	-4.961980	-0.201321	113.805758	-0.018872
T0 + 19	-5.345417	-5.546738	116.392252	-0.514133
T0 + 20	3.175639	-2.371099	118.978747	-0.217378
T0 + 21	0.530846	-1.840253	121.565241	-0.166906
T0 + 22	-1.042348	-2.882601	124.151735	-0.258707
T0 + 23	-1.983794	-4.866395	126.738230	-0.432268
T0 + 24	-2.234308	-7.100703	129.324724	-0.624397
T0 + 25	-2.731265	-9.831969	131.911219	-0.856051

Materials

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	-0.149149	-0.149149	19.591230	-0.033697
T0 - 24	0.315583	0.166433	39.182459	0.026589
T0 - 23	-0.426082	-0.259649	58.773689	-0.033868
T0 - 22	-0.123675	-0.383324	78.364918	-0.043302
T0 - 21	-0.300398	-0.683721	97.956148	-0.069082
T0 - 20	0.646662	-0.037060	117.547378	-0.003418
T0 - 19	0.288808	0.251748	137.138607	0.021497
T0 - 18	-0.066162	0.185586	156.729837	0.014824
T0 - 17	1.123473	1.309060	176.321066	0.098584
T0 - 16	0.682323	1.991382	195.912296	0.142273
T0 - 15	1.038841	3.030223	215.503525	0.206418
T0 - 14	-0.464403	2.565820	235.094755	0.167342
T0 - 13	-0.065881	2.499939	254.685985	0.156649
T0 - 12	1.811091	4.311030	274.277214	0.260307
T0 - 11	-0.345539	3.965491	293.868444	0.231324
T0 - 10	-0.101624	3.863867	313.459673	0.218238
T0 - 9	-0.158117	3.705750	333.050903	0.203058
T0 - 8	0.637398	4.343148	352.642133	0.231280
T0 - 7	-0.575103	3.768046	372.233362	0.195303
T0 - 6	-0.471678	3.296368	391.824592	0.166529
T0 - 5	-0.102338	3.194030	411.415821	0.157470
T0 - 4	0.103806	3.297836	431.007051	0.158850
T0 - 3	-0.126723	3.171113	450.598281	0.149388
T0 - 2	-0.431383	2.739729	470.189510	0.126349
T0 - 1	0.412160	3.151889	489.780740	0.142420
T0	-0.038761	3.113129	509.371969	0.137937
T0 + 1	-0.362100	2.751028	528.963199	0.119614
T0 + 2	-0.962163	1.788866	548.554429	0.076378
T0 + 3	-0.108810	1.680056	568.145658	0.070485
T0 + 4	0.132582	1.812638	587.736888	0.074769
T0 + 5	0.620552	2.433189	607.328117	0.098733
T0 + 6	0.818593	3.251782	626.919347	0.129872
T0 + 7	-0.169108	3.082674	646.510576	0.121238
T0 + 8	-0.243217	2.839457	666.101806	0.110018

T0 + 9	0.003920	2.843377	685.693036	0.108585
T0 + 10	-0.319421	2.523956	705.284265	0.095039
T0 + 11	0.276352	2.800309	724.875495	0.104010
T0 + 12	0.083722	2.884030	744.466724	0.105701
T0 + 13	0.363142	3.247172	764.057954	0.117474
T0 + 14	0.271089	3.518261	783.649184	0.125680
T0 + 15	0.810538	4.328799	803.240413	0.152737
T0 + 16	-0.152727	4.176072	822.831643	0.145584
T0 + 17	-0.746319	3.429752	842.422872	0.118167
T0 + 18	-0.488356	2.941396	862.014102	0.100184
T0 + 19	-2.965480	-0.024084	881.605332	-0.000811
T0 + 20	0.478368	0.454284	901.196561	0.015133
T0 + 21	0.136898	0.591182	920.787791	0.019482
T0 + 22	0.410131	1.001313	940.379020	0.032653
T0 + 23	1.075322	2.076635	959.970250	0.067024
T0 + 24	0.937482	3.014117	979.561479	0.096304
T0 + 25	4.356023	7.370140	999.152709	0.233163

Utilities

	Average AR, %	Average CAR, %	Average CAR variance	Theta
T0 - 25	1.519930	1.519930	9.397385	0.495816
T0 - 24	-0.115156	1.404775	18.794771	0.324032
T0 - 23	0.217764	1.622538	28.192156	0.305584
T0 - 22	0.069344	1.691882	37.589541	0.275954
T0 - 21	0.729478	2.421360	46.986927	0.353241
T0 - 20	-0.378120	2.043240	56.384312	0.272107
T0 - 19	0.467644	2.510884	65.781697	0.309581
T0 - 18	-0.662207	1.848677	75.179083	0.213212
T0 - 17	1.212144	3.060821	84.576468	0.332823
T0 - 16	0.392431	3.453252	93.973853	0.356225
T0 - 15	1.563718	5.016970	103.371238	0.493448
T0 - 14	1.774071	6.791041	112.768624	0.639502
T0 - 13	1.145077	7.936118	122.166009	0.718014
T0 - 12	1.509585	9.445703	131.563394	0.823506
T0 - 11	2.564823	12.010526	140.960780	1.011609
T0 - 10	-1.618216	10.392310	150.358165	0.847517
T0 - 9	0.609433	11.001744	159.755550	0.870429
T0 - 8	1.923409	12.925152	169.152936	0.993793
T0 - 7	-1.001644	11.923508	178.550321	0.892326
T0 - 6	0.085673	12.009181	187.947706	0.875981
T0 - 5	0.373787	12.382968	197.345092	0.881478
T0 - 4	1.785120	14.168089	206.742477	0.985363
T0 - 3	-1.683980	12.484108	216.139862	0.849161
T0 - 2	1.746389	14.230497	225.537248	0.947569
T0 - 1	1.296932	15.527430	234.934633	1.013039
T0	0.670290	16.197720	244.332018	1.036248
T0 + 1	-1.964917	14.232803	253.729403	0.893522
T0 + 2	0.952651	15.185454	263.126789	0.936150
T0 + 3	0.541700	15.727155	272.524174	0.952681
T0 + 4	0.875724	16.602879	281.921559	0.988825
T0 + 5	-0.868253	15.734626	291.318945	0.921875

T0 + 6	0.104763	15.839389	300.716330	0.913398
T0 + 7	0.009994	15.849383	310.113715	0.900019
T0 + 8	0.305835	16.155217	319.511101	0.903795
T0 + 9	1.415224	17.570441	328.908486	0.968825
T0 + 10	1.812806	19.383247	338.305871	1.053833
T0 + 11	0.101937	19.485184	347.703257	1.044961
T0 + 12	-1.059408	18.425776	357.100642	0.975058
T0 + 13	0.963624	19.389400	366.498027	1.012811
T0 + 14	-0.047770	19.341629	375.895413	0.997607
T0 + 15	0.767763	20.109392	385.292798	1.024480
T0 + 16	-3.325935	16.783457	394.690183	0.844799
T0 + 17	0.052401	16.835858	404.087569	0.837524
T0 + 18	-3.493112	13.342745	413.484954	0.656168
T0 + 19	-2.431336	10.911409	422.882339	0.530605
T0 + 20	1.195268	12.106677	432.279724	0.582294
T0 + 21	2.204750	14.311427	441.677110	0.680974
T0 + 22	-1.104070	13.207357	451.074495	0.621859
T0 + 23	-1.128813	12.078544	460.471880	0.562876
T0 + 24	-2.171032	9.907512	469.869266	0.457063
T0 + 25	-5.937030	3.970482	479.266651	0.181365