# CHARLES UNIVERSITY

## FACULTY OF SOCIAL SCIENCES

Institute of Economic Studies

**Effect of Green New Deal on investment fund**

Bachelor's Thesis

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**Study programme: Economics and Finance**

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Year of the defence: 2022

## Declaration

1. I hereby declare that I have compiled this thesis using the listed literature and resources only.
2. I hereby declare that my thesis has not been used to gain any other academic title.
3. I fully agree to my work being used for study and scientific purposes.


In Prague on                                                                      Petr Prokš

**03.05.2022**

# References

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# Abstract

Socially responsible investing (SRI) had in recent decades gained in importance. Despite that there is no consensus amongst researchers regarding SRI effect on short-term or long-term fund´s performance in the United States. This paper seeks to utilize standard economic models (CAPM, 3-factor Fama-French) on latest (January 2018 to December 2021) data. In addition, author seeks to look for performance trend by splitting observed period to one before Covid crisis and during the crisis. Then he will look for any significant impact on funds' performance and its characteristics. Final part consists of observing effect of published articles by news outlet and whether there is any impact. News divided into positive and negative with regards to SRI thematic. Results implies that performance is negatively correlated with higher ranking of social consciousness of fund (ESG value was used) and that manager of funds with lower ESG standards are better at stock-picking. Study did not find any significant long-term effect of Covid crisis while short-term effect suggested greater need for funds to employ stock-picking skill. News effects were generally insignificant with effect of bad news being stronger than effect of positive news.

# Abstrakt

Společensky zodpovědné investování v posledních letech získávalo na důležitosti. Přesto však stále není mezi výzkumníky shoda, jak sociálně zodpovědného investování ovlivňuje výkon investičních fondů ve Spojených státech.  Tato studie se pokusí aplikovat standardní ekonomické modely (CAPM,3 faktorový model) na nejnovější data (od ledna 2018 do prosince 2021). Dále autor rozdělí data do období před a během Covidové krize. Následně bude autor hledat významné změny ve výnosů a charakteristice fondů. Poslední část se zaměřuje na pozorování vlivů mediálních článků na výsledky investičních fondů. Nejprve byly vybrány zprávy s tématikou společensky zodpovědného investování a ty byly následně rozděleny na pozitivní a negativní. Výsledky potvrdily, že výnosnost fondů a úroveň sociální zodpovědnosti fondů (ESG skoré bylo použito) mají negativní vztah a že manažeři fondů s nižším ESG hodnocením mají lepší schopnost vybrat dobré akcie. Studie nenašla žádné výrazné rozdíly mezi dobou před Covid-19 a během Covid-19.  V době největší Covidové epidemie byl vyvíjen značný tlak na schopnosti manažerů. Zprávy výkonnost fondu příliš neovlivnily, ale studie prokázala, že efekt negativních zpráv byl častěji silnější než efekt zpráv pozitivních.

## Keywords

Financial markets, Socially responsible investing, ESG, market news impact, investment fund

## Klíčová slova

Finanční trhy, Společensky zodpovědné investování, ESG, dopad zpráv na finančních trhy, investiční fondy

## Title

Effect of Green New Deal on investment funds

## Název práce

Dopady Green New Deal na investiční fondy

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# Introduction

In the last few decades, there has been an increase in public consciousness regarding climate, environment, and sustainability. As the effects of climate change become ever more visible and acute, the trend toward sustainability is expected to increase. In response, several organizations have begun to show their commitment to environmental principles (being conscious). In this study, the author focuses on the performance of these conscious funds based on their sustainable attributes. In addition, the author focuses on how environmental and sustainable news topics impact performance of these funds. The study exclusively focuses on mutual funds in the United States.

For the purpose of this thesis, the author uses words that are sometimes deemed ambivalent or have multiple meanings. Therefore, it is necessary to define them properly. In this thesis, the measure for the sustainability of funds is called the combined ESG score (ESG coming from Environment – Social – Governance). The combined ESG score comprises a wide range of environmental and governance measures. It is considered a quick and relevant measure of how well a fund performs in terms of ethical and environmental standards. For this reason, a fund's combined ESG score can be viewed as how "green" and "socially conscious" it is. Similarly, the author uses phrases such as low ESG fund and high ESG fund to mean funds with a high ESG value and low ESG value, respectively.

This text uses other ambiguous words such as green investing, socially responsible investing (SRI), and the Green New Deal. The author uses these three terms interchangeably. These words should be deemed as the practice when systematic pressure is imposed on companies (and funds) to address environmental challenges.

Finally, the term stock-picking skill requires explanation. This is the ability of fund managers to perform above (or below) expectations given their risk appetite level. In econometrics, it is usually defined as the intercept of models, with returns as the dependent variable.

This thesis includes three hypotheses. The first hypothesis states that high-ESG funds will underperform the low-ESG funds and that managers of low-ESG funds will have greater stock-picking skills. The second hypothesis states that high-ESG funds improved their performance during the observation period and during the COVID-19 crisis performed better than low-ESG funds. The third hypothesis states that positive ESG-themed news has a positive effect on high-ESG funds, and this effect is lower for low-ESG funds.

Data used in this thesis was retrieved from numerous sources. Weekly returns of fund and ESG scores are from the Refinitiv Eikon database, while the occurrence of ESG-themed news

was manually calculated using data from the Factiva database. Variables primarily responsible for explaining fund returns are from the Kenneth French webpage database and data about money supply (M1) are from the Federal Reserve Bank of St Louis. Weekly COVID-19 case data was sourced from the Our World in Data database. Weekly economic index (WEI) was retrieved from Federal Reserve Bank of New York.

An extension of the capital asset price model (CAPM) called the Fama-French 3-factor model was used for the empirical part of the study. These models are based on the efficient market hypothesis (EMH) and modern portfolio theory, both of which are further discussed in the theory and literature section.

This thesis seeks to contribute to two areas. Firstly, the author created and tested models based on ESG components to further debate performance and sustainability. Secondly, the author observed the effects of news announcements on funds' returns. While both of these studies have been undertaken previously, the author seeks to contribute to the existing literature by using the latest data to capture the effect of the COVID-19 crisis. In addition, the author uses ESG values when calculating the news impact, this will answer the question of how news impacts performance based on ESG.

# 1. Thesis overview

## 1.1 Structure of the thesis

In this chapter, the author introduces the thesis, explains its importance, and outlines their contribution to the topic. Chapter 2 focuses on theory and literature regarding the market, while Chapter 3 consists of data description, methodology, and results. Chapter 4 concludes the thesis. The bibliography and supplementary texts follow.

## 1.2 Topic importance

Modern financial markets represent and influence a significant part of major world economies and are especially prominent in most developed nations. A well-functioning financial market is able to facilitate the flow of funds to companies in need of capital. In exchange, borrowers are eligible for a claim on a future income stream. In addition to this primary function, financial markets can provide other benefits. For the average citizen, a financial market can provide a higher appreciation of savings and an improved ability to save for retirement. For researchers, a market provides key data and the ability to better understand economics. Politicians and central bankers view a stable financial sector as key to long-term economic growth. Indeed, the financial sector plays a significant role in the modern age and its negligence or destabilization can cause a major crisis (e.g., a subprime mortgage crisis caused the global financial crisis) or hamper growth in the real economy (Jokipii & Monnin, 2013). Therefore, financial markets continue to be one of the most researched and hotly debated areas in economics, studied by academics and commercial entities alike. The ability to properly understand current financial theory and literature can have long-standing benefits that are worth pursuing. Therefore, the importance of this topic is clear.

This study focuses on financial markets to test previously developed asset pricing models and to estimate relationships amongst characteristics within the financial market.

## 1.3 Thesis contribution to current research

In last 15 years, many studies about the performance of funds with socially responsible attitudes have been published. A significant number of papers about the reaction of market price to the influence of a news organization are also available. However, these two studies are rarely effectively combined into one.

Under the assumption of efficient markets, considering news impact same for all ESG funds would not have stirred up much trouble. Efficient markets suggest that investors expect to be compensated based on the systematic risk they are willing to take (CAPM). However, if SRI funds differ from other funds, it is reasonable to assume that the relationship between high ESG funds might differ. These differentiating characteristics might include a special irrational premium or a characteristic that mainstream models do not account for (e.g., better resilience against a crisis).

Therefore, the author's contribution is twofold. Firstly, the author utilizes already existing models (Fama-French 3-Factor model and CAPM) and their methods on the most recent data. These data contain COVID-19 crisis information and thus provide the opportunity to test whether the pandemic had any effect on the performance of these funds. Secondly, the author contributes to literature regarding the effect of public announcements on funds. The primary focus of the news effect is fund investors. For this purpose, the author uses financial and business news articles with large reader base in the United States and foreign news outlets with global reach (Economist and Financial Times).

# 1.4 Interpretation of results

The results indicate a significant difference based on ESG performance of funds as those with low ESG score appear to perform better. This result is expected as low-ESG funds utilize their freedom from non-financial restraints. During the observation period, this difference even increased in favour of funds with low ESG. By splitting the period into the period before COVID-19 and the period during COVID-19, the author did not find any significant change in variables. This would suggest that there are no persistent changes in funds' characteristics. However, the short-term effects of COVID-19 provide a good opportunity for fund managers. The short-term effect of COVID-19 was estimated on weeks when it reached its peak infection rate in the United States.

Evidence for the effect of news on return is low. However, resulting effects for bad news had been higher than effect for positive news.

The results clearly suggest that studies attempting to compare funds should focus on how funds are socially and environmentally valued as these characteristics could have a strong impact on a fund's performance.

# 2. Overview of literature and theory

A summary of the theory and literature regarding financial markets is presented in this chapter.

This thesis and, by extension, the hypotheses, are tied to numerous research fields. As such, it would be unpractical and overwhelming to conduct a brief explanation of all these fields. Instead, the author only focuses on the areas of research deemed most important. These academic areas create an overview of a subsection of the literature and theory. Defining which fields are deemed "most important „is, to some extent, subjective. However, the main aim of this thesis is the performance of ESG funds and performance as a reaction to public announcements (news). Therefore, the focus is on the cornerstones of financial markets, the nature of green (SRI) investing performance, and the reaction of the market to public announcements. In addition, provision about market imperfection is examined. Such a subsection complements green investing and provides additional (general) facts about funds' returns, which play a significant role in this thesis. Hence, this chapter is structured as follows.

Firstly, the author focuses on the general theory surrounding financial markets (mainly efficient market hypothesis (EMH) and modern portfolio theory). Then the focus is switched to presumed general market defects (imperfections), followed by SRI performance and other characteristics. Finally, the author discusses news announcements and their effects and possible explanations.

## 2.1 Financial theory

The cornerstones of modern understanding of the financial market are modern portfolio theory and EMH. While not universally regarded, they are the most used approaches amongst the academic community. In addition, author´s models (CAPM, Fama-French 3-factor model) are built upon this theory. Thus, they also present an essential part of contemporary financial theory. Another theory (behaviour finance) is briefly presented.

## 2.1.1 Efficient market hypothesis

The history of EMH is long and complex. Fama (1965) was the first to use the term information effective market as it is understood today. Fama concluded that the majority of stocks follow a random walk. Furthermore, Fama extended previously limited theory regarding the random walk of stock prices by creating the fair price model. This model works

with price adjustment for the next period that is dependent on set of publicly available information in the current period. This set must contain all important relationships between tested variables. While Fama's work is important, he was not the first to ask such a question. Other researchers, such as Roberts, Houthaker, and Cootner, also examined similar problems. However, relevant works in this field were developed based on the fair price model.

The EMH has three sub-hypotheses (created by Fama to be empirically testable and falsifiable). The strongest version states that current prices reflect all available information (including that which is not public). Thus, strong EMH supports the no-arbitrage rule and excludes the possibility of abnormal profits. However, this position is often challenged and currently remains one of the most controversial and disputed aspects of financial economics. Much of the criticism states that strong EMH is often too strict and unrealistic. Furthermore, three key criteria must be fulfilled to have efficient market information. There must be a large number of competitive, profit-maximizing actors who act independently of each other. New information follows a random pattern. A final criterion is that actors must have a fast and flexible adjustment mechanism. Fast adjustment should prevent any delay in translating new information into price changes.

Additional rules for efficient markets can be derived from these three criteria. These rules include a minimum number of investors in the financial market as the larger the group of active investors, the faster the adjustment mechanism works. Hence, as prices adjust to new information, the new information should be included in the price. This is the basis of the fair price model.

However, to make the fair price model feasible, it is essential to derive an information set. The strongest version of EMH has a set that includes all available (public and private) information. However, the implementation of more relaxed assumptions has cleared the way for the inception of semi-strong and weak EMH. Semi-strong EMH suggests that all public information is reflected in prices, while weak EMH claims that only past data are included in stock prices. From these definitions, it is possible to infer some major implications for funds, their managers, and stock-pickers in general. Weak form suggests that all technical analysis (attempting to predict future price movements based on previous price movements) cannot produce abnormal profit. Semi-strong EMH proposes that fundamental analysis (predicting price based on fundamental company information) is also ineffective. A strong form of EMH assumes that not even using private information will be able to generate above-market returns. Such theoretical claims are insufficient unless they can be empirically proven or disproven.

Therefore, a closer examination of the empirical validity of each version of EMH is necessary.

The weakest hypothesis implies that a trader cannot derive abnormal profit by applying technical trade rules. To test for the existence of autocorrelation, technical trading rules and run tests are used. Autocorrelation and technical trading rules are self-explanatory. A run test begins when price movements – up or down – are the same twice in the row and end when observation of price movements go in the opposite direction. Autocorrelation and the run test seem to support a weak EMH (Tokic et al., 2018), while the result of technical rules, although supportive, is quite limited (Coe & Laosethakul, 2021).

Evidence supporting semi-strong EMH must be able to disprove any form of strategy (in this case, it is irrelevant whether the trader is technical or fundamental). This can be tested in several ways, such as look for abnormal returns, predict performance based on quarterly earnings, or undertake a calendar or event study (price reaction to a specific event). The results for a semi-strong EMH are more mixed than in the case of a weak EMH. Event studies generally support a semi-strong EMH (Tao et al., 2021), while calendar studies oppose such a notion (Birru, 2018). In the case of predicting abnormal return based on characteristics, the first attempted studies (around 1970) suggest the existence of abnormal returns, while recent studies found no links. This could suggest that market actors noticed inefficiencies and were able to eliminate them.

The strongest form implies that no information can give an advantage to the investor. Studies to test a strong EMH tend to rely on the stock activities of members of an elite group. These groups are expected to have the most exclusive information and are sometimes referred to casually as "insiders" (e.g., CEO´s, politicians, managers of funds). In the majority of cases, the results are positive; thus, the strongest version of EMH seems to not hold (Biggerstaff et al., 2020; Cziraki et al., 2021; Neupane et al., 2021) . However, it is noteworthy that some of the early studies were more supportive of the ability to utilize private information, although this trend seems to slowly be dissipating. Some possible reasons for this change are greater access to information or stronger limitation on insider trading.

## 2.1.2 Modern portfolio theory

Modern portfolio theory was developed in the 1950s and multiple improvements have since been added, although the main ideas behind the theory have remained the same. By holding the portfolio's variance (risk) constant while maximizing the expected return or minimizing variance while holding the expected return, the efficient frontier (EF) will be created. An EF

represents the set of best possible outcomes. In this case, the best possible outcome should be interpreted as a result fulfilling both conditions (i.e., to have the highest expected return for a given variance and the lowest variance for a given return for investors). Furthermore, modern portfolio theory is more interested in how individual stocks (funds) affect the overall portfolio through correlation with the rest of the portfolio. This interest effectively supported groundwork for the theoretical benefits of diversification. As portfolio theory grew in importance, adjustments and improvements were made.

Fama et al. (1969) changed distribution of return to be more consistent with empirical findings. Distribution for stock returns copies normal distribution; however, it has fat tails, which was discovered by Larson (1960). Lee (1977) and Kraus and Litzenberger (1976) improved the model by adding skewness.  Another important milestone was a change in portfolio theory from a time-constant to a multiple-periods model and debates regarding whether returns are related over time. These topics are discussed in depth by Fama and French (1989) and Campbell and Shiller (1988). However, even risk itself has changed over time; instead of using the variance of the portfolio, sometimes downside risk is used (possibility of returns being below expected return if market condition worsens).

## 2.1.3 Models based on efficient market hypothesis and modern portfolio theory

CAPM *(Equation 1),* currently the best-known price identification model, is based on EMH and portfolio theory and is built on the relationship between expected asset return and its risk.

*Equation 1*

$$E(r_i) = r_f + \beta_i\big[E(r_M) - r_f\big]$$

*where E(r$_i$) is expected return, r$_f$ risk free interest rate, E(r$_M$) market return of investment.*

However, empirical findings suggest that returns have determinants in addition to market risk and thus challenge EMH. For this reason, other factors were added. For example, Fama's three(four)-factor model *(Equation 2)* was invented after finding the significance of size (small companies outperform large companies) and that value companies outperform growth companies. The momentum variable (buying winners and selling losers) was a later addition. In the last three decades the number of factors has grown significantly, reaching over 70 statistically significant factors.

*Equation 2*

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1(R_{Mt} - R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_{it}$$

*where $R_{it}$ is return of portfolio at time t, $R_{ft}$ free-risk return at time t, $R_{Mt}$ market return at time t, $R_{Mt}$- $R_{ft}$ excess return of market (MktRf), SMB small companies' premium, HML value premium*

# 2.2 Market imperfection

The previous section dealt with what is considered mainstream financial theory. However, EMH remains controversial and is disputed, with numerous well-documented cases that question its validity. The previous section hinted at the possibility of market imperfection as opposed to EMH. One of the most cited examples of market information efficiency is the better performance of passive funds over active funds. Passive funds are mainly governed by algorithms tracking certain indexes, while active funds have professional analysts who pick stocks. Therefore, if markets are efficient, no active funds should perform better than passive funds.

Most studies confirm cases where passive funds outperform active funds (although there are some studies of cases in which active funds outpace passive funds). This characteristic is well-documented and stable across time. For example, Malkiel (2003) and Jensen (1968) came to the same conclusion despite the 35-year difference. The same scenarios also hold for different geopolitical areas. For example, Corhay et al. (1987) examined the difference between European and US markets and concluded that despite the European financial market being smaller, both markets share similar characteristics. This raises the question of why investors do not allocate a significant sum (in the case of decreasing return to scale) or all their resources (in the case of increasing/constant return to scale) to passive funds to improve their yield. Furthermore, despite passive funds performing better than active funds, the active funds continue to engage in both fundamental and technical analysis. This may be due to a small (yet significant) number of funds that can produce above-market returns periodically (Fahling et al., 2019).

The persistence of active funds could be tied to (supposed) imperfection or anomalies across the entire financial market. For example, the Monday effect or January effect suggest that Friday returns affect those on Monday and higher returns in December affect those in January. Yet, despite these abnormal events, EMH (its strong, semi-strong, and weak variations) might still be valid if there are other events that previous literature has not accounted for.

Moskowitz (2000) suggests that lower returns of active funds are rational as investors are effectively compensated by higher-than-average returns in time of crisis. Therefore, according to Moskowitz, investors choose to have lower returns for the lower variance of returns (risk). Glode (2011) and Kosowski (2011) reached similar conclusions. Similarly the Monday effect might be explained as the inability of investors to trade on Saturday and Sunday, while the January effect might be affected by tax optimization.

These cases and other failures to account for market anomalies led to the creation of a theory that stands in direct opposition to the efficiency of financial markets – behavioural finance. This field is the synthesis between financial theory and (cognitive) psychology, which, through empirical experiments, provided instances when individuals act irrationally and subjectively.

## 2.3 Performance of socially responsible and green investing

Sustainable and renewable investing is a relatively new area of research that was first mentioned in the 1970s. Despite this, the body of literature and theory is growing rapidly, in no small part due to the wealthiest countries' focus on the transition from a fossil-fuelled economy to one of zero net emissions. In spite of this growth, essential questions remain open, such as the effect of sustainable investing on returns, whether there are premium investments (investors rewarded/compensated for perceived social benefits), or whether there are costs associated with green investing.

Even from a theoretical position, the answers are not clear. Opponents of socially responsible governance argue that an investor's decision to focus only on environmentally and socially responsible companies should impose a cost. This cost is due to non-financial restrictions on investors' options. Such restrictions can lead to a decrease returns as they should increase costs and limit potential gains. Theoretically, returns can be the same as without limitation. However, this would be rare as investors would need to choose the same companies (funds) for their portfolio, even when facing no restrictions. Lack of diversification caused by these standards should also lead to higher market-adjusted risk than in the normal case.

Conversely, supporters of SRI suggest that companies who actively exert efforts to be more environmentally friendly will reap the benefits. One benefit is greater public support (translating into greater demand for shares, causing the stock price to appreciate). In addition, companies should use disposable resources more effectively as the pressure of ESG standards

weighs in. Waddock and Graves (1997) found evidence suggesting that companies with good governance are able to produce better returns than other companies. Therefore, the theoretical debate about the benefits and cost of SRI is inconclusive.

The similar ambivalence can also be found in the results of empirical studies aimed at explaining sustainable investing. Bauer et al. (2005) found a negative effect for relationship between performance and sustainability while Edmans (2011) found relationship to be positive. However, some studies such as Hong & Kacperczyk (2009) found no-effect between. However, recent meta-studies suggest there is a positive link between environment consciousness and economic performance (Friede et al., 2015). This could point to funds with high ESG creating additional returns or that these funds have other desirable traits that command a premium. One such desirable trait or characteristic could be the ability to weather economic downturn more effectively than other funds. For example, Silva and Cortez (2016) found such evidence.

## 2.4 Effects of public announcement on prices

The final major topic is news – its announcement, and its effect. Similar to the case of market (im)perfection, there is a large body of literature dealing with individual stocks and impact of announcement from the 1950s onwards. The range and diversity of this academic area is significant. It includes the effect of a company's investor relationship (IR) on stock returns and the speed with which news is translated into appreciation/depreciation of stock value. The resilience of stocks within a particular industry to bad news and the after-effect of a public announcement is also often debated. However, this thesis does not consider individual stocks; rather, the focus is on funds consisting of a portfolio of stocks. Despite this obstacle, it is reasonable to assume that, on average, funds (as the grouping of stocks) will have similar characteristics and outcomes to individual stocks. This generalization can be considered fair at least for the case of this study because funds have shares just like companies and these shares have the same characteristics as stocks, such as returns and ESG ranking. The third hypothesis deals with a public announcement and its after-effect on price movements. Therefore, the third hypothesis is linked to theory regarding post-event price behaviour, which is usually explained by one of two hypotheses: hysteresis and uncertain information.

The hysteresis hypothesis supports the idea that investors overreact and the overreaction initially leads to greater price movement. However, as investors stop panicking, they will realize true intrinsic price, and this leads to opposite price movement. The uncertain

information hypothesis states that investors dislike uncertainty, which leads to any new information (even bad news) dispelling that uncertainty. Thus, the after-event return is expected to be followed by positive price movement. Most studies about post-announcement returns consider the short time period after a company discloses its (semi)annual earnings. However, this is not the case for this thesis, although the logic behind it should be same.

The inseparable part of a news announcement's impact is textual analysis, specifically the subcategory of qualitative analysis. Textual analysis is method used by researchers to identify topic of article. As the number of articles grew, the need to develop a method for large-scale identification of the meaning of these articles also grew. Various methods were created. The most commonly used are the bag-of-words model, vector distance, Naïve Bayes classifications, and likelihood ratios. However, it should be noted that the first attempt at textual analysis can be dated to the 13th century, but any large-scale study was not possible until the development of the first computer. As computing capacity grew exponentially, the cost (in terms of time and money) decreased. This allowed for an increasing number of studies about context recognition appearing in academic journals. A significant drawback is that textual analysis methods are far less precise than their quantitative counterparts and results can differ widely based on small changes in parameters.

Due to its nature, qualitative analysis is most commonly used for case studies where topic modelling, sentiment recognition, and word count are the primary focus. This naturally leads to an inclination for social sciences and computer linguistics where textual analysis has gained popularity. However, despite being a social science, this is not the case for economics. From the beginning, economic studies avoided large-scale use of textual analysis. The majority of significant developments have been achieved in last two decades.

In this thesis, the author uses the bag-of-words technique. Bag-of-words is not one specific method but the range of methods that rely on the existence of a list of words. These words are then used to evaluate articles based on the presence of specific words in the text. While these characteristics may vary, economic researchers commonly look at the theme of the article, such as positivity, negativity, or uncertainty. The number of words found in the article are then used to identify the sentiment of newspapers. This should also suggest how those articles affect the market. Therefore, the object of interest is to define investors' sentiment in relation to sustainable investing.

Finally, it is important to note that, based on EMH, prices should quickly adjust to the public (unexpected) announcement. Thus, to some degree, the ability of price to react to news is one

of the possible ways to test the efficiency of the market (however, this is not the aim of this thesis).

# 3. Methodology and data

## 3.1 Data description

Data used in this thesis came from two major sources. The first required source is a database with market news, as this can affect fund performance. The Dow Jones Factiva database was used to find and collect articles of interest as this is considered one of the most high-quality and comprehensive databases available. Factiva includes articles and papers from the majority of the business and academic spheres. The procedure for drawing data involved two steps. Firstly, articles were preselected if they had an SRI theme. A list of selected words was used for this step. Then, another list that focused on either positive words or negative words was used. Based on the second list, the author identified articles that were either positive or negative. However, the Factiva database was not used to its fullest extent. Instead, only the most credible, reliable, and influential sources were used. The search for articles was limited to major news sources to prevent newspapers with a small reader base from influencing the research. In addition, the chosen approach did not seek to limit the possibility that articles cited the same event as this measure is likely to suggest the event was of greater importance. Therefore, multiple citing of the same event correctly strengthened the weekly value (however duplicates were not allowed). Lastly, words synonymous with "Green New Deal" were included in the SRI list, but as it is difficult to effectively differentiate between what is general SRI news and the Green New Deal, the author considered them synonymous. Hence, to avoid confusion, all Green New Deal news was counted as general SRI news. It is unlikely that this decision caused a significant problem within the study because positive news about SRI or the Green New Deal is likely to have a similar effect.

The second source provided market data about funds. This information came from the Refinitiv Eikon database. All funds domiciled in the United States and listed as mutual funds were used (4,587 funds).

The third essential component of the data structure is the social responsibility (SR) or green investing measure. For this case, possible choices included Sustainalytics and MorningStar. However, a recent study (Dorfleitner et al., 2015) revealed a significant level of divergence between the individual measurements for each service provider. Hence, these data were derived from only one source without the possibility of combination. The most sensible (and also the most straightforward) approach was to derive data regarding SRI directly from the Refinitiv Eikon database. SRI data (called ESG in Eikon) were divided into three subgroups

based on company performance in the areas of environment, society, and governance. Each company received a score between 0 and 100 in each category. These numbers were then averaged to create their ESG score.

Refinitiv Eikon calculates and saves over 500 measures about socially responsible investing. However, only a subset of 186 of these measures is used to calculate an ESG score. The measures are grouped into 10 categories and three pillars (environment, governance, and social) to create the ESG score. The combined ESG score is arrived at after the ESG controversial score is discounted. The ESG controversial score controls for negative news and controversies. Therefore, the combined ESG score is one of the forms of news announcement. (For a detailed description of the Refinitiv Eikon approach, see the appendix.) The advantage of combined ESG is the ability to capture local (fund-specific) effects, allowing for a focus on the global effect. Therefore, combined ESG is the variable of choice for ethical and environmental standards of funds. As data from Refinitiv Eikon are private, they will be not provided in thesis however approach above should be sufficient to replicate database.

Not all mutual funds have an assigned ESG score, so the additional condition of a combined score above 0 was imposed. To avoid survivorship bias, collected data included funds that were either liquidated or merged. Other sources were used to add less important data or clarification.

Data about development of the COVID-19 pandemic was downloaded from the Ourwoldindata.com website and M1 money supply information came from FRED (Federal Reserve Bank of St. Louis).

Finally, the majority of the models required data input regarding factors influencing funds' performances. For this case, available online data from the official Kenneth French official was used. In addition, the weekly economic index (WEI) was used to measure investor confidence. The WEI can be found at the Federal Reserve Bank of New York's website.

All data are on weekly basis with a time period from the first week of 2018 (starting $5^{th}$ January) to the last week of December 2021 ($31^{st}$ December).

## 3.2 Hypotheses

The central part of this work is made up of three hypotheses. Firstly, funds with lower ESG score are able to outperform those with higher ESG and their managers will have greater skills (as they are not bound by ESG standards). Second, during the COVID-19 period, returns increased for high-ESG funds and this increase is greater than the increase for low-ESG

funds. The final hypothesis suggests that the occurrence of positive news has a corresponding positive effect on funds (on both high and low ESG score funds), and vice versa.

### 3.2.1 SRI performance

The SRI performance hypothesis states that funds with a greater commitment to the environment, governance, and social responsibility will produce below average returns and funds with lower-than-average ESG will produce higher returns for investors. In addition, the author predicts that low-ESG fund analysts will have a greater chance to develop "stock-picking skills" than managers from high-ESG funds as unsustainable funds are not limited by non-financial restrictions.

### 3.2.2 SRI trends and characteristics

The hypothesis about SRI trends and characteristics states that high-ESG funds improved their performance during the COVID-19 period more than low-ESG funds. Furthermore, high-ESG funds performed better during the COVID-19 crisis. Therefore, hypothesis also deals with the performance of SRI funds but in longer period. However, in this case, the author observed changes in performance during the given periods (pre-Covid and during-Covid).

### 3.2.3 Impact of news announcements

The hypothesis about SRI performance conditional on news states that funds with a higher SRI variable (higher ESG score) will have a greater positive (negative) reaction to positive (negative) news about ESG. The author also expects an opposite reaction for funds with low ESG value. Two possible ways in which imperfect price adjustment might occur, the uncertain information hypothesis and the hysteresis hypothesis, were briefly discussed in Section 2.2.3. The aim of this hypothesis is to produce evidence to support the existence of the hysteresis hypothesis. Therefore, the author expects that investors will overreact to events and the price response will not be adequate. However, in the following week, the price will move in the opposite direction and the price will reach its intrinsic value in the end.

## 3.3 Methodology and models

Before any estimation occurred, all funds (items of interest) were divided into groups based on their ESG score. This division, while subjective, was not completely arbitrary. The author

aimed to create division criteria to ensure a sufficient number of data points. For example, within the sample of 4,587 funds, only three funds achieved a combined ESG score above 70; therefore, choosing a range of 70–100 could not provide good results. Hence, funds were divided into the following groups: high ESG with values of 60 and more (508 funds), medium ESG (mid-ESG) with values between 40 and 60 (the largest group with 3,760 funds), and lastly, low ESG with values of less than 40 (319 funds).

As mentioned above, the sample includes 4,587 funds. However, the number of funds used during the modelling and estimation stages was lower because the most crucial variable, weekly return on the fund, is not available for all funds. Therefore, 42 funds were excluded from the high ESG group, 480 funds from the mid ESG group, and 72 funds from the low ESG group, leaving 466, 3,280 and 247 funds, respectively. As the number of funds in the groups differed, an alternative division was also used. The funds were sorted based on highest and lowest ESG and the top 20% and bottom 20%.

The ESG scores have a median of 52.39 and an average of 51.73, while the maximum and minimum are 71.39 and 25.61, respectively. The results for the weekly returns are interesting A trend emerged when calculating the weekly return for the high-ESG, mid-ESG and low-ESG groups. The low-ESG group had the best return in the observed period, followed closely by the mid-ESG group and the high-ESG funds performed worst. The low-ESG group's performance was quite high, with a 0.24% weekly return for the least sustainable group, 0.205% for the largest group, and 0.16 % for the most sustainable group. Therefore, the author concludes that ESG value is negatively correlated with performance.

# 3.3.1 Funds performance

A summary of models for calculating performance was presented in Section 2.1. The author primarily relied on the Fama-French 3-factor model for the following calculations (adjusted risk, small firm effect, and value effect will be referred to as "factors" from this point). However, the results for these cases might be supplemented by models that only use basic CAPM (i.e., only adjusted risk is considered). Therefore, most of the following empirical work involves extensions of *Equation 3* and *Equation 4*.

*Equation 3*

$$return_t = \beta_0 + \beta_1 MktRf_t + \varepsilon_t$$

*Equation 4*

$$return_t = \beta_0 + \beta_1 MktRf_t + \beta_2 HML_t + \beta_3 SMB_t + \varepsilon_t,$$

*where return$_t$ means return of fund at time t, MktR$_t$ exceed market risk at time t, HML$_t$ value premium at time t and SMB$_t$ premium of small capitalization at time t*

To estimate these models, OLS regression was used on all available funds, both individually and through time (therefore, data used is in time series format).

As the data contains multiple objects and multiple periods, it is possible to approach them as panel data. However, only one of the independent variables (ESG) changes among individual funds. Therefore, there is little benefit to employing either fixed or random effects. However, the author estimated fixed effect with fund performance as dependent variables, and ESG and factors as independent variables (see *Equation 5*).

By estimating the fixed effects for *Equation 5*, the author confirmed the insignificance of the variables for all factors (MktRf, HML, SMB), while ESG (the only cross-variant variable) was statistically significant with a negative sign and the model's adjusted-R almost equal to zero (see *Table 2*). This further supports the hypothesis that higher ESG funds are less able to produce higher returns than their low-ESG counterparts. Note that the insignificance of adjusted risk (MktRf) is also the case for CAPM with fixed and random effect.

*Equation 5*

$$return_{it} = \beta_0 + \beta_1 MktRf_{it} + \beta_2 HML_{it} + \beta_3 SMB_{it} + \beta_4 ESG_{it} + \varepsilon_{it}$$

However, using the same 3-factor model for individual funds via time series yielded significantly different results. While factors in the previous case were insignificant in individual estimates, the results confirm significance for the majority of funds. The strongest results are for adjusted risk (MktRf), with significance for 3,978 (3,971) funds. Results for the other factors are weaker yet still important as value effect (HML) is significant in 3,311 (3,103) cases and small firm effect (SMB) for 2,439 (2,108). The results indicate significance of the variable at 5% significance level. The numbers presented in parentheses have 1% significance. It is important to note that four additional funds had to be excluded from the results as the numbers for their observations were too low (having around five observed periods). Therefore, the final number of observations is 3,989.

For the time series analysis, the results for the intercept (Jensen alpha representing the possible stock-picking skill of fund managers) are not convincing. For individual funds, only 268 (91) funds have a significant alpha. This finding is in line with the majority of the literature that suggests that the persistent skill of a security analyst is a rarity.

The other part of the first hypothesis suggests that less constrained funds (in this case, those with a lower ESG score) will be in a better position to take advantage of more opportunities than funds that must adhere to ESG codes. The author observed results for funds with lower ESG and those with higher ESG. By focusing on the previously discussed structure (ESG above 60 and ESG below 40), the results suggest that there are marginally more funds in the lower part – 19 funds – and only 11 funds in the higher part. However due to the small number of funds, the difference could be coincidental. To add to the problem, the number of funds in groups is not the same, so the author extended observations to account for the top 20% of funds and lowest 20% of funds. This resulted in a large and more accurate picture, with 18 funds with talented managers residing amongst the highest ESG funds and 57 funds with the lowest ESG having skilled analysts. Therefore, the first hypothesis holds. It should also be noted that intercept is predominantly negative, however intercept is less negative for low-ESG funds than high-ESG funds hence ability of low-ESG fund managers can still be perceived as better.

## 3.3.2 Long-term trend and Covid crisis

In 2020, SARS-CoV-19 left no country unaffected and forced the world's largest economies to go into lockdown. This caused disruption in the supply chain and a halt to non-essential economic activity. However, in comparison to the prior section, results for trends in ESG during the COVID-19 crisis are less decisive. To estimate the possible effect of COVID-19, weekly US cases were used as a variable for COVID-19's threat to the economy. Despite the projected significant effect of COVID-19, results for estimates during crisis found no decisive change between prior to the crisis and after the crisis.

The time series using weekly cases as variables led to insignificant results. By estimating funds separately, only 106 (16) funds returned a significant result for the COVID-19 variable (called $Covid_t$ in the model).

A possible improvement is to add variables to account for money supply as the majority of the central banks (including the Federal Reserve Bank) engaged in unprecedented monetary stimulus during the crisis, which could lead to some distortion. Thus, a variable to adjust the model for the Federal Reserve Bank's policies was added (M1 money supply on weekly basis that is called $CBMoney_t$, see Equation 6). However, this did not result in a noticeable change in the model as both the effects of COVID-19 and money supply are inconclusive.

Another argument for the lack of significance of COVID-19 cases could be that connecting volatility and number of cases would be wrong because there is no meaningful connection.

The logical argument behind this is the fact that uncertainty was highest at the start of the pandemic and at when the new lockdown measures were debated. Therefore, the author introduced the WEI (weekly economic index) variable for business confidence. However, the results still seem to lack any meaningful significance following the introduction of WEI, which suggests that monetary policy and business confidence are not responsible for the insignificance of the COVID-19 variable. A possible explanation is that the observed data includes data from January 2018 while COVID-19 appeared in the United States in February 2020. Therefore, for the period between January 2018 and February 2020, data for COVID-19 cases are zero, so a shorter observed period is required.

*Equation 6*

$$return_t = \beta_0 + \beta_1 MktRf_t + \beta_2 HML_t + \beta_3 SMB_t + \beta_4 Covid_t + \beta_5 CBMoney_t + \varepsilon_t$$

The COVID-19 period can be analysed by estimating models for the specific time. In this case, the period must include the dates during which the effect of COVID-19 is expected to be most significant. The author decided to include all weeks when the number of new infections exceeded 1,500 cases per million people in the United States. This resulted in 28 observed dates grouped within three periods. Estimating individual funds for this COVID-19-related period produced varying results in comparison to all previous estimates. Firstly, the intercept is highly significant in the majority of cases (3,685, while for 1% significance it is 2,762). Second, the adjusted risk and small firm effect are not important, with 31 (6) and 174 (6) funds showing these factors as significant. Lastly, the value effect not only persisted but grew stronger for 3,524 (2,823) funds. This suggests that value firms are able to perform better during crises.

To look for more long-term trends, data was divided into prior to and during COVID-19 time (the during COVID-19 period began on 7 February 2020). This division split data into periods with 109 and 100 observations, respectively. In terms of significance for both intercept and factors, the results are almost identical.

The division of data into prior and during the COVID-19 period was also used to analyse average return of funds during these periods. The results indicate that ESG has a negative effect and groups with high ESG (top 20%, 60+ ESG) are outperformed by groups with low ESG (bottom 20%, 40- ESG). However, the COVID-19 crisis does not seem to have a converging effect. Instead, the difference between groups with high ESG and those with low ESG increased.

## 3.2.3 Effect of public announcements on performance

Testing the effect of announcements (news specifically) requires the compilation of a list of news outlets. In this case, the list contains major US-based economic and business magazines (for the complete list, see Appendix concerning News outlets) and the UK-based Economist and Financial Times. The UK-based magazines have global reach and, due to economic and linguistic ties between the US and the UK, their influence can be perceived as substantial. Data was divided into positive and negative groups ( *Equation 7*).

Time series analysis found little evidence to support the idea that general news articles generate returns. The number of funds with significant variable *Goodnews* is only 361 (48) and *Badnews* variable only has 97 (13).

*Equation 7*

$$return_t = \beta_0 + \beta_1 MktRf_t + \beta_2 HML_t + \beta_3 SMB_t + \beta_4 ESG_t + \beta_5 Goodnews_t + \beta_6 Badnews_t + \varepsilon_t$$

Furthermore, the effect of positive news is more often negative than positive. However, given the small number of funds showing the importance of either good news or bad news, this abnormality can be attributed to general insignificance of variable.

It should be noted that the chosen approach has some limitations. While the search words for positive effects can mainly capture positive news, this is not the case for negative words as many negative words were used in opposition to their original meaning (e.g., the word *unprofitable* in a sentence: green investing does not need to be unprofitable). Hence, a more accurate way to examine bad news as a variable would be to count the number of bad news stories regarding SRI manually. The author defined negative news as news that is either sceptical of green investing (the suggestion that ESG limits companies, that SRI is underperforming, holes in ESG standards) or positive to companies/industries known to have low ESG scoring (primarily fossil fuels). Following this approach (see *Equation 8*), the number of bad news occurrences decreased to 73 (suggesting that the automatic approach significantly misrepresented the topic of negative news). A similar method was chosen for handpicking positive news.

However, the results remain inconclusive. Despite an increase in bad news events (*Badnewshandpicked)* having significance in 360 (65) funds, good news significant (Goodnewshandpicked) only occurred in 70 (7). Despite that interesting fact can be observed as distribution of funds with significant news variables is not uniformed. Number of fund where negative news has significant effect is higher for high ESG and lower for low ESG. In top 20% there is 112 funds at 5% significance level, while in bottom 20% only 57 funds.

Interestingly this relationship is reverse for positive news (with 6 for high ESG and 15 for low ESG) but number of funds is very low. However, due to the nature of manual data calculation, the database might be more prone to mistakes.

*Equation 8*

$$return_t = \beta_0 + \beta_1 MktRf_t + \beta_2 HML_t + \beta_3 SMB_t + \beta_4 ESG_t + \beta_5 Goodnewshandpicked_t + \beta_6 Badnewshandpicked_t + \varepsilon_t$$

Finally, by adding lag variables (lagged variables defined as *Goodnews1$_t$* and *Badnews1$_t$*, see *Equation 9*) for both good and bad news, the results suggest a weak effect for positive news (524 [43] funds). The results for lagged value of negative news is even weaker, with 259 (43) cases.

*Equation 9*

$$return_t = \beta_0 + \beta_1 MktRf_t + \beta_2 HML_t + \beta_3 SMB_t + \beta_4 ESG_t + \beta_5 Goodnews_t + \beta_6 Badnews_t + \beta_7 Goodnews1_t + \beta_8 Badnews1_t + \varepsilon_t$$

Therefore, the effects of news article on a fund's return is generally low. The author concludes that the results do not support the existence of a clear connection between short-term economic impulses and ESG-valued funds caused by news impact. Hence there is no real support for hysteresis or uncertain information hypothesis.

# 3.4 Robustness check

Interpretation of results from the previous section can be complicated. The majority of results had been tested for 5% significance therefore this would imply that around 5% of funds should be significant if the dependent variable had no effect. However, the size of the confidence interval would be hard to precisely define. This problem poses the question of when results should be deemed significant and when not. For instance, cases, where the number of funds with the significant variable will be above 75%, could be considered quite significant. However less clear are cases where the number of funds with significant variables are around 500 funds (above 10%).

For this reason, the author will estimate previous models again however this time he will use only one time series where the return of funds at time *t* is given by the average return for all funds at time *t*. Therefore, the author's average results.

Results do support previous cases where all factors had been found strongly significant while news had not been found significant with a p-value of *badnews1* and *badnews* hovering slightly above 0.1.

Results had been also tested for Durbin-Watson (autocorrelation) and Breusch-Pagan test (heteroskedasticity). Results are in the Table 1 below. Durbin-Watson test had generally p-value around 0.5 suggesting no correlation. On the other hand, the Breusch-Pagan test had a p-value close to 0 suggesting that heteroskedasticity can influence results. As heteroskedasticity can influence standard error, results had been calculated with robust (White) standard error.

*Table 1*

| Models/Test | Breusch-Pagan test (p-value) | Durbin-Watson test(p-value) |
|---|---|---|
| CAMP | 0.01 | 0.45 |
| Fama-French-3-Factor | 0.002 | 0.832 |
| FF3F with news | 0.015 | 0.484 |
| FF3F with handpicked news | 0.008 | 0.598 |
| FF3F with lagged news | 0.009 | 0.39 |

By calculating average return of low ESG funds (average of bottom 20%) and high-ESG funds (average of top 20%) and replicating Equation 9, author is able to further supplement previous results about news impact. Results indicate that there is lagged negative effect on high ESG and low ESG funds (see Table 8,Table 9 for details). However, this effect is caused by positive news in case of low ESG funds and negative news in case of high ESG funds. This would suggest rather slow price adjustment to news.

# 4. Conclusion

To summarize, in efforts to identify trends of funds author use standard OLS estimates for individual funds. The majority of results seem to be in accordance with already existing literature.

For the most of funds, there is strong support for both CAPM and Fama-French factor models on individual bases while the high value of ESG (high ESG score) seems to indicate lower returns. The author had also found a larger number of funds able to exert stock-picking abilities with low ESG than with high ESG score.

Results regarding the Covid crisis and long-term trend are generally underwhelming. The exact weekly number of Covid cases seems to yield insignificant impact results even when accounting for the expansionary monetary politics of the central bank and general business confidence. However, by restricting model only to the period when it is expected for Covid to be most influential, different results are obtained. Firstly, stock-picking skill (intercept) and value effect are significant in the majority of cases. Secondly, the two remaining factors, adjusted return and small firms' effect, are being rendered unimportant.

The longer-term effect of Covid (by observing prior and during Covid) does not seem to influence the statistical significance of any variable. However, regarding an overall trend of performance, high-ESG funds seem to worsen their performance while low-ESG funds increased their own substantially.

Effect for news announcement had found stronger support for negative news but this support is still limited.

Thus, the results suggest that there is a relevant difference amongst performance of funds based on their ESG score.

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# Appendix
## Methodology

Precise methodology for ESG valuation:

https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/ refinitiv-esg-scores-methodology.pdf

Fama-French databank (Fama/French 3 factors US, weekly)

https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

# Fixed effect Model

*Table 2*

| plm(formula = pdata$return2 ~ pdata$MktRF + pdata$HML + pdata$SMB + pdata$ESG, data = pdata, model = "within") | |
|---|---|
| | *Dependent variable:* |
| | return2 |
| MktRF | 0.001 |
| | (0.001) |
| HML | -0.001 |
| | (0.001) |
| SMB | 0.001 |
| | (0.002) |
| ESG | -0.005$^{***}$ |
| | (0.0005) |
| Observations | 789,658 |
| R$^2$ | 0.0002 |
| Adjusted R$^2$ | 0.0002 |
| F Statistic | 32.018$^{***}$ (df = 4; 789653) |
| *Note:* | $^{*}$p$^{**}$p$^{***}$p<0.01 |

# Average time series

*Table 3*

| | Estimate | Std. Error | t value | Pr(>t) | |
|---|---|---|---|---|---|
| Intercept | -0.043280 | 0.035875 | -1.2064 | 0.229 | |
| MktRF | 0.896363 | 0.022404 | 40.0089 | 0 | *** |

*Table 4*

|  | Estimate | Std. Error | t value | Pr(>t) |  |
|---|---|---|---|---|---|
| Intercept | -0.020742 | 0026817 | -0.7735 | 0.4401 |  |
| MktRF | 0.866003 | 0.017728 | 48.8486 | 0 | *** |
| SMB | 0.138746 | 0.028139 | 4.9308 | 1.698e-06 | *** |
| HML | 0.097637 | 0.010866 | 8.9852 | 0 | *** |

*Table 5*

|  | Estimate | Std. Error | t value | Pr(>t) |  |
|---|---|---|---|---|---|
| Intercept | 0.028265 | 0.033907 | 0.8336 | 0.40548 |  |
| MktRF | 0.867970 | 0.017854 | 48.6156 | 0 | *** |
| SMB | 0.140189 | 0.0277784 | 5.0456 | 1.001e-06 | *** |
| HML | 0.100413 | 0.010842 | 9.2612 | 0 | *** |
| Goodnews | -0.044959 | 0.023367 | -1.9240 | 0.05575 | . |
| Badnews | 0.024094 | 0.027094 | 0.8893 | 0.37491 |  |

*Table 6*

|  | Estimate | Std. Error | t value | Pr(>t) |  |
|---|---|---|---|---|---|
| Intercept | 0.0039371 | 0.0322041 | 0.1223 | 0.9028 |  |
| MktRF | 0.8649299 | 0.017854 | 50.0250 | 0 | *** |
| SMB | 0.1340674 | 0.027784 | 5.2220 | 4.368e-07 | *** |
| HML | 0.0980269 | 0.010842 | 9.1302 | 0 | *** |
| Goodnewshandpicked | -0.003698 | 0.023367 | -0.2269 | 0.8207 |  |
| Badnewshandpicked | 0.024094 | 0.027094 | -1.2609 | 0.2088 |  |

*Table 7*

|  | Estimate | Std. Error | t value | Pr(>t) |  |
|---|---|---|---|---|---|
| Intercept | 0.0770729 | 0.0370305 | 2.0813 | 0.03867 | * |
| MktRF | 0.8646688 | 0.0164358 | 52.6090 | 0 | *** |
| SMB | 0.1412287 | 0.0238806 | 5.9140 | 1.416e-08 | *** |
| HML | 0.1022035 | 0.0105238 | 9.7116 | 0 | *** |
| Goodnewshandpicked | 0.0038382 | 0.0163556 | 2.2347 | 0.81470 |  |
| Badnewshandpicked | -0.054361 | 0.0428968 | -1.2672 | 0.20653 |  |
| Goodnews1 | -0.023205 | 0.0239264 | -0.9698 | 0.33329 |  |
| Badnews1 | -0.048357 | 0.0302471 | -1.2672 | 0.11145 |  |

*Table 8*

|  | Estimate | Std. Error | t value | Pr(>t) |  |
|---|---|---|---|---|---|
| Intercept | 0.1112552 | 0.0731692 | 1.5205 | 0.12995 |  |
| MktRF | 0.8345568 | 0.0294005 | 28.3858 | 0 | *** |
| SMB | 0.0581066 | 0.0455909 | 1.2745 | 0.20395 |  |
| HML | 0.1643574 | 0.0222350 | 7.3918 | 3.819e-12 | *** |

| | | | | | |
|---|---|---|---|---|---|
| Goodnewshandpicked | -0.008196 | 0.0325139 | -0.2521 | 0.804125 | |
| Badnewshandpicked | -0.129001 | 0.0867057 | -1.46879 | 0.13834 | |
| Goodnews1 | -0.016487 | 0.0466934 | 0.3531 | 0.72440 | |
| Badnews1 | -0.143027 | 0.0597488 | -2.3938 | 0.01759 | * |

*Table 9*

| | Estimate | Std. Error | t value | Pr(>t) | |
|---|---|---|---|---|---|
| Intercept | 0.1202539 | 0.0382516 | 3.1438 | 0.0019204 | ** |
| MktRF | 0.9389610 | 0.0170194 | 55.1700 | 0 | *** |
| SMB | 0.4865816 | 0.0208779 | 23.3061 | 0 | *** |
| HML | 0.0747269 | 0.0130940 | 5.7070 | 4.08e-08 | *** |
| Goodnewshandpicked | 0.0081521 | 0.0149668 | 0.5447 | 0.5865800 | |
| Badnewshandpicked | -0.022246 | 0.0335856 | -0.6624 | 0.5084905 | |
| Goodnews1 | -0.093238 | 0.0254120 | -3.6691 | 0.0003118 | |
| Badnews1 | 0.0242486 | 0.0295263 | 0.8213 | 0.4124742 | |

Note: Signif. Codes: 0 <***>, 0.001<**>,0.05<*>,0.1< . >

# News search

| Words for ESG | Socially Responsible investing, SRI, Green New Deal, sustainable, green investing, green investment, renewables, no emissions, low emission, no environmental impact, corporate governance, ESG |
|---|---|
| News outlet | Economist, Financial Times, Finance and Commerce, Crains Chicago Business, the Wall Street Journal, Investor´s business daily, Miami today, the Journal of Commerce |
| Negative words | Negative, bad news, unprofitable, lower, smaller, bad, hinder |
| Positive words | Positive, good news, profitable, higher, greater, good, support |

# Statistics for time series analysis

| | Intercept | MktRf | HML | SMB | Goodnews | Badnews | Goodnews1 | Badnews1 |
|---|---|---|---|---|---|---|---|---|
| 3Factor | 268 | 3978 | 3311 | 2439 | - | - | - | - |
| PreCov | 179 | 3981 | 3171 | 2193 | - | - | - | - |
| DuringCov | 180 | 3981 | 3171 | 2198 | - | - | - | - |
| MaxCov | 3685 | 31 | 3524 | 174 | - | - | - | - |
| News | 240 | 3977 | 3319 | 2418 | 361 | 98 | - | - |
| LaggedNews | 825 | 3977 | 3301 | 2484 | 142 | 101 | 524 | 259 |
| | | | | | | | | |

- Gives number of funds which had value significant at 5% (total number of funds is 3989 in this analysis)