



# STOCK MARKET REACTIONS TO REIT GREEN BOND ISSUANCE ANNOUNCEMENTS

**Title:** “Stock Market Reactions to REIT Green Bond Issuance Announcements”

**Author:** Freriks, J. [Julian]

**Student number:** S3444686

**Contact:** j.freriks.2@student.rug.nl

**Degree:** MSc. Real Estate Studies

**University:** University of Groningen – Faculty of Spatial Sciences

**Version:** 1.1.0 (Final Version)

**Date:** 30 June 2023

**Supervisor:** Dr. X. Liu

**Assessor:** Em. Prof. Dr. E.F. Nozeman

**Word count:** 12.610

# PREFACE

This master's thesis represents the culmination of my academic endeavours in the field of real estate, as well as the conclusion to the master Real Estate Studies at the University of Groningen.

I would like to express my gratitude to my thesis supervisor, Dr. Xiaolong Liu, for his support throughout the research process. Furthermore, I would like to acknowledge the contributions of my family, friends, colleagues and acquaintances for their support, understanding, criticism and encouragement throughout my academic journey.

Furthermore, I would like to express my hope that this master thesis will serve as a valuable resource for fellow scholars, researchers, practitioners, and anyone with an interest in the field of real estate studies. It is my sincere desire that the findings presented within these pages will contribute to the ongoing discourse and understanding of real estate dynamics, thereby facilitating informed decision-making and fostering sustainable development within the real estate sector.

I hereby present this master thesis titled "Stock Market Reactions to REIT Green Bond Issuance Announcements". As Master theses are preliminary materials to stimulate discussion and critical comment, this research aims to be transparent in the disclosure of data and research design, which will enhance the replicability of the research. Therefore, the syntax of the statistical analysis is provided in Appendix IV. For any questions, inquiries, suggestions or comments, interested readers are encouraged to contact the author of this thesis via the contact details provided on the front page of the thesis.

Julian Freriks

University of Groningen – Faculty of Spatial Sciences

30 June 2023

Disclaimer: The analysis and conclusions set forth are those of the author and do not indicate concurrence by the supervisor or research staff.

# ABSTRACT

Real estate companies need to make substantial investments aimed at reducing the carbon footprint of their assets to align with the climate net-zero goals the Paris Agreement. This commitment is crucial because the real estate sector plays a substantial role in contributing to greenhouse gas emissions. The financing sector developed green bonds as one of the solutions to secure the necessary funding for environmentally sustainable investments. This master's thesis examines the stock market reactions to REIT green bond issuances by employing an event study methodology over 34 green bonds issued by sixteen U.S. REITs over the period 2013-2023. The findings indicate no stock market reactions to green bonds issuances on an aggregate level. However, for first-time green bond issuers, the stock market consistently generates negative reactions, with cumulative abnormal returns ranging from -1.28% to -1.57%, depending on the asset pricing model employed. The results are robust to various asset pricing models and event windows. The findings suggest that first-time green bond issuance announcements are a credible signal of the REIT's commitment towards climate friendly investments, which leads equity investors to re-evaluate their investment portfolios. The negative stock market reaction becomes less pronounced as REITs become seasoned green bond issuers.

*Keywords: Green bonds, REITs, signalling theory, shareholder value, event study*

# TABLE OF CONTENTS

Preface.....	I
Abstract .....	II
List of Figures .....	IV
List of Tables.....	IV
List of Abbreviations.....	IV
[1] Introduction.....	1
1.1 Background .....	1
1.2 Research problem and objectives .....	2
1.3 Structure .....	4
[2] Theoretical Framework.....	5
2.1 Green bonds.....	5
2.2 Climate finance.....	6
2.3 Signalling theory .....	9
2.4 REITs and conventional bond issuances .....	10
[3] Methodology.....	11
3.1 Event study .....	11
3.2 Endogeneity.....	15
3.3 Robustness.....	16
[4] Data.....	18
4.1 Descriptive statistics.....	19
[5] Results .....	22
5.1 Stock market reaction to green bond issuance announcements.....	24
5.2 Stock market reaction by issuer seasonality.....	25
5.3 Stock market reaction to conventional bond issuance announcements.....	26
5.4 Power of the test .....	28
[6] Conclusion .....	30
6.1 Limitations.....	31
6.2 Future research .....	32
References .....	33
Appendices .....	42
I. REITs .....	42
II. Eyeball Analysis of CAAR distributions.....	44
III. Time-series plot.....	52
IV. Stata syntax .....	53
V. Additional references.....	142

## List of Figures

Figure 1: Green Bond Issuance Volume (Climate Bond Initiative, 2023) .....	6
Figure 2: Event Study Timeline (MacKinlay, 1997).....	13

## List of Tables

Table 1: Bond issuances over time.....	19
Table 2: Bond characteristics .....	20
Table 3: Green Bond Issuer Characteristics .....	<b>Error! Bookmark not defined.</b>
Table 4: Stock market reaction to green bond issuance announcements.....	23
Table 5: Stock market reaction by issuer seasonality.....	26
Table 6: Stock market reaction to conventional bond issuance announcements.....	27
Table 7: Wilcoxon signed-rank test.....	27

## List of Abbreviations

ARCH	Autoregressive conditional heteroscedasticity
CAAR	Cumulative average abnormal return
CAPM	Capital asset pricing model
CAR	Cumulative abnormal return
CH4	Carhart four-factor model
CO <sub>2</sub>	Carbon Dioxide
EGARCH	Exponential generalized autoregressive conditional heteroskedasticity
ESG	Environmental, social and governance
FFO	Funds from operations
FF3	Fama-French three-factor model
GARCH	Generalized autoregressive conditional heteroskedasticity
GBP	Green bond principles
GDP	Gross domestic product
HML	High-minus-low factor
JB	Jarque-Bera test
MM	Market model
MOM	Momentum factor
MV	Market value
OLS	Ordinary least squares
PDF	Portable document format
REIT	Real estate investment trust
RF	Risk-free rate
RM	Return on the market
ROA	Return on assets
ROE	Return on equity
SD	Standard deviation
SMB	Small-Minus-Big factor
SW	Shapiro-Wilk test
U.S.	United States
USD	United States Dollar

# [1] INTRODUCTION

## 1.1 Background

The real estate sector accounted for close to 40% of global carbon dioxide (CO<sub>2</sub>) emissions in the year 2021, with nearly three quarters of the CO<sub>2</sub> emissions of the real estate sector stemming from real estate operations (IEA, 2022; Carlin, 2022). Without intervention, an approximate two-thirds of the global greenhouse gas emissions from real estate sector in 2040 will stem from already existing buildings (IEA, 2020). Therefore, the real estate sector is seen as a vital sector in the effort towards reaching the goals of the Paris Agreement of limiting the global temperature increase to +1.5 degrees Celsius and achieve Net-Zero emissions by 2050 (Janda et al., 2021; UNFCCC, 2015). However, currently only about 15% of global real estate assets align with the targets set by the Paris Agreement (Schoenmaker & Planque, 2022). Hence, decarbonisation of assets is one of the largest challenges the real estate sector currently faces.

Real estate companies must commit to substantial investments in order to reduce the carbon footprint of their assets. According to McKinsey (2022), the total expenditures required for the global net-zero transition are estimated to be approximately \$275 trillion. Real estate investment is generally considered as a capital-intensive endeavour (Riddiough & Steiner, 2017). The capital expenditures required to decrease the carbon footprint may prove particularly challenging for real estate investment trusts (REITs). The comparable lending costs of REITs are higher than that of other real estate companies, since REITs are already tax-exempt and therefore do not benefit from an interest cost tax shield (Morri & Jostov, 2018). Indeed, Niskanen & Falkenbach (2012) find that REITs are consistently less levered than real estate operating companies that are subject to corporate tax. Furthermore, due to their dividend pay-out requirements and limitations on cash retention, REITs are constrained in their abilities to retain significant amounts of capital and have to rely on external sources in order to fund their future investments and growth (Ott et al., 2005). Substantial investments towards improving sustainability within buildings may therefore impact the ability of REITs to produce adequate returns to satisfy its shareholders (Beracha, Feng & Hardin, 2019; Carlin, 2022). More information on the specific characteristics of REITs is provided in Annex I.

Zhang & Du (2020) note that shortage of capital is one of the key limiting factors in reaching the goals of the Paris agreement. To accommodate the capital shortages and need for investments to move to net-zero, the financing sector has developed an increasingly wide range, depth and volume of sustainable financing instruments in order to finance green transition initiatives and sustainable investments arose as of recent years (Cerami & Fanizza, 2023). One of the more well-known and widely adopted sustainable finance products of recent years is the green bond, which can be attributed to their availability to the wider public through primary and secondary markets, as well as being of

relatively low-risk (Kouwenberg & Zheng, 2023; Zhang et al., 2021). In 2021, the global green bond issuance volume grew 75% year-over-year to a total of \$522.7bn (Climate bonds initiative, 2021). Financing via green bond proceeds is a well-established practice for the real estate sector, as over the period 2007-2019, the real estate sector issued 11.9% of the total green bond proceeds (Löffler et al., 2021).

In their survey on the green bond issuer motives, Sangiorgi & Schopohl (2021) find that most green bond issuers perceive the issuing costs of green bonds to be higher than that of comparable conventional bonds. Issuing green bonds comes with additional costs in the disclosure of information, certification and monitoring of the usage of green bond proceeds. As such, issuing green bonds should come with consideration and weighing of interests for firm managers (Tang & Zhang, 2020). Niskanen & Falkenbach (2012) note that decisions regarding capital structure are among the most important challenges for REIT managers, with implications for both equity and debt holders, especially in periods of tightening credit availability. In order to make an informed decision whether or not to issue green bonds, it is of interest for REIT managers to fully understand the possible implications of green bond issuances on their shareholders.

Climate financing via green bonds did not gain much traction until the adoption of the Paris Agreement late December 2015. Since then, the issuance volume of green bonds has seen remarkable growth, particularly as of recent years (Kouwenberg & Zheng, 2023). Subsequently, scientific endeavours on the impact of green bonds and climate financing are still in the early stages. Most scholars have focussed on the pricing of green bonds in debt capital markets. In the literature, the yield spread found on green bonds compared to their conventional counterpart is defined as the green bonds premium or greenium. Zerbib (2019) studied green bonds from 2013-2017 and found that, on average, green bonds were issued at a 2 basis points premium compared to their conventional counterparts. Similar findings are produced by Gianfrate & Peri (2019) Löffler et al. (2021) and Nanayakkara & Colombage (2019). Weng (2022) studied whether green bonds allow real estate companies to acquire funding at a lower cost than via conventional bonds and found that on average, the yield on green bonds issued by real estate companies is approximately 10 basis points lower than the yield on conventional bonds over the period 2013-2022. For REITs, Weng (2022) found that the yield discount approximated 11 basis points on average. While the position of green bonds within debt capital markets has received substantial attention by scholars, the impact of financing via green bond proceeds on firm performance and the firm's shareholders is still relatively unexplored (Bhutta et al., 2021; Lebellet et al., 2020).

## **1.2 Research problem and objectives**

To summarize, The real estate sector is a significant contributor to global carbon dioxide emissions, and achieving sustainability goals, requires substantial investments in decarbonization. Real Estate

Investment Trusts (REITs) face unique challenges due to their capital-intensive nature and constraints on capital retention. To address the capital shortages and facilitate the transition to net-zero, green bonds have emerged as a sustainable financing instrument. However, the implications of green bond financing on shareholder value and stock market reactions for REITs remain relatively unexplored in the literature. Understanding the impact of green bond financing on REITs is crucial for informing decision-making by REIT managers, investors, and the financial sector.

This research will therefore aim to examine the stock market reactions to the announcement of green bond financing by real estate investment trusts. Numerous scholars have argued that REITs present a unique research area in regards to the limitations and requirements under which REITs operate compared to other equities (e.g. Connors & Jackmann, 2000; Giacomini et al., 2015; Morri & Parri, 2017 ; Van der Ee, 2019). The capital requirements to move towards net-zero may therefore pose unique challenges for Real Estate Investment Trusts, making them an interesting area of study in the context of climate finance. An elaboration on the structure of REITs can be found within Appendix I. This master's thesis accordingly adopts the following main research question:

**Main research question:** *How does green bond financing affect the stock returns of real estate investment trusts (REITs)?*

This thesis will contribute to the literature on climate finance, particularly in the area of green bonds, by providing empirical evidence on the relationship between green bond financing and shareholder value of REITs. Second, this thesis aims to contribute to broader scientific efforts made to mitigate climate change and achieve sustainability goals and uncover how these challenges can be addressed through innovative financing mechanisms such as green bonds. Overall, the research objective has the potential to make a valuable contribution to the scientific literature and inform policy and practice in the real estate and finance sectors. In conclusion, investigating the share price impact of green bond financing within the real estate sector will provide further insight into the effectiveness, position and dynamics of green bonds as a sustainable financing instrument. In order to address the main research question effectively, the following sub research questions will be investigated:

**Sub research question 1:** *What is the overall effect of green bond issuance announcements on the stock market reactions of REITs?*

The purpose of this sub research question is establish whether there is a relationship between the issuance of green bonds and the REITs' stock price behaviour. Understanding the overall effect will provide insights into the market perception of green bond financing in the real estate sector and its influence on REITs' shareholder value.

**Sub research question 2:** *Do stock market reactions to green bond issuance announcements differ between first-time issuers and seasoned issuers of green bonds in the REIT industry?*



This sub-question focuses on understanding whether the market perceives first-time green bond issuers differently from established green bond issuers in the REIT industry. This sub-question helps shed light on the importance of reputation and experience in green bond financing and provides insights into the market's perception of REITs' sustainability efforts.

**Sub research question 3:** *Do stock market reactions to green bond issuances differ from stock market reactions to conventional bond issuances in the REIT industry?*

The purpose of this sub-question is to examine potential differences in market reactions and to establish whether the market attributes different values to green bonds compared to conventional bonds in the context of REITs. This sub-question helps assess the relative importance of the 'green' label of green bonds in investors' decisions in the REIT industry.

### **1.3 Structure**

This remainder of this Master's thesis is structured as follows. Chapter two will provide the theoretical framework and research hypotheses. The third chapter will elaborate on the dataset and applied research methodology. The results of the thesis will be presented and discussed in chapter four. Chapter five forms the discussion, as well as limitations of the study and recommendations for future research. The conclusions drawn from this thesis will be given in chapter six.

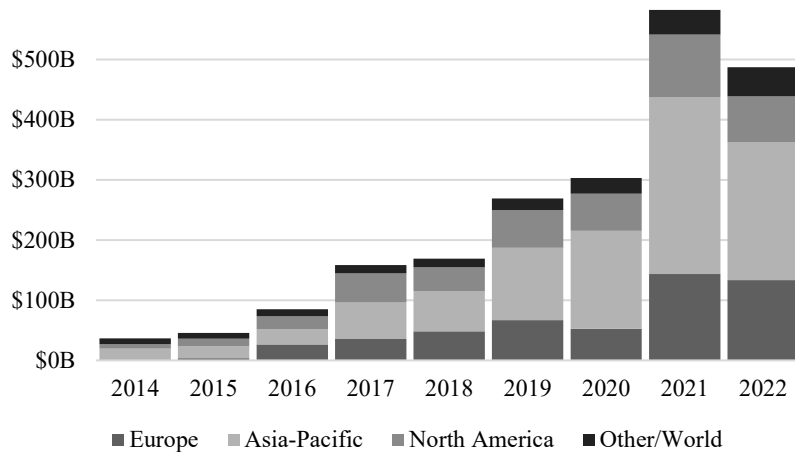
## [2] THEORETICAL FRAMEWORK

This chapter presents the theoretical framework that underpins the research conducted in this thesis, drawing upon a comprehensive literature review conducted using the academic search engines of Google Scholar and Scopus. The literature review was performed using a diverse range of keywords to identify relevant studies and establish a solid foundation for the research. The keywords include, but are not limited to, both standalone and in conjunction with each other, the following terms: “*Green bonds*”, “*REITs*”, “*signalling theory*”, “*event study*”, “*stock returns*” and “*shareholder value*”. The list of key search terms is non-exhaustive as academic endeavours often involve a non-linear and iterative approach that evolves over time, as opposed to a linear process. As such, this thesis is the product of a process where numerous research alleyways, keywords, questions and alternative approaches have been explored. While these explorations have been essential for shaping the research direction, the final version of this thesis functions as a reflection of the most relevant and impactful findings that provide a comprehensive understanding of the research subject. Additional sources that were consulted during the research process, but which are not a part of the final version of this master’s thesis, are included in Appendix V.

### 2.1 Green bonds

According to the Green Bond Principles (GBP) framework developed by the International Capital Market Association, green bonds are defined as “*any type of bond instrument where the proceeds or an equivalent amount will be exclusively applied to finance or re-finance, in part or in full, new and/or existing eligible Green Projects*” (ICMA, 2021, pp.3). Amongst others, eligible green projects consist of investments in energy efficiency, renewable energy, climate change adaptation and green buildings. Furthermore, the GBP provide guidelines for a transparent process regarding reporting, the project selection and evaluation process and the management of bond proceeds. Green bonds are identical to conventional bonds in all other aspects and bond characteristics such as convertibility or put/callability.

The first officially labelled green bond was issued by the World Bank in collaboration with the Skandinaviska Enskilda Banken AB (SEB) in 2008 (the World Bank, 2019). The green bond issued by the World Bank established the foundation for the contemporary green bond market. Several years later, in 2013, the Swedish real estate company Vasakronan issued the world’s first corporate green bond (Wirdenius & Nerlich, 2013). Since 2013, the global volume of green bond issuances volume consistently shown an upward exponential growth trend (Figure 1). The annual issuance volume surpassed \$500 billion USD for the first time in 2021. The growth of the green bond market underlines the growing popularity of green bonds as a climate finance instrument as of recent years.



**Figure 1:** Green Bond Issuance Volume (Climate Bond Initiative, 2023)

By issuing green bonds, firms are subject to elevated levels of environmental performance monitoring, increasing the costs of deviating from previously made environmental pledges (Lu, 2021). Issuing green bonds requires comprehensive and specific disclosure on the use of proceeds as well as ongoing reporting on the progress of the environmental projects undertaken with the bond proceeds. Furthermore, to qualify for a green bond status, the bond must be verified and monitored by an independent and approved third party (CBI, 2019). The notable difference between green bonds and conventional bonds therefore is that the proceeds of conventional bonds can be used for the financing of non-green projects, whereas green bonds can only be used towards projects described in the GBP and hence green bonds are a less flexible financing instrument than conventional bonds. Therefore, some scholars argue that the additional steps that need to be taken into account in order to issue green bonds verify the credibility of the bond issuer to the investor and hence limit the risk on greenwashing (Baker et al., 2018). Greenwashing describes a phenomenon where a firm deliberately finances via green instruments to boost the firm’s public image, while in reality the use of the bond proceeds has little or no positive impact on the environment (De Freitas Netto et al., 2010). The disclosure requirement and the increased monitoring compared to conventional bonds decrease the information asymmetry between the shareholders and the management of the firm and narrows the latitude for firms to stray from their previously communicated sustainability goals. Flammer (2021) analysed corporate green bonds and found that green bond issuers reduced their CO<sub>2</sub> emissions significantly after the bond issuance. This finding is replicated by Fatica & Panzica (2021), who find that green bond issuers decrease their scope-1 emissions after financing via green instruments.

## 2.2 Climate finance

From the previous section can be derived that green bond issuances convey information on the commitment of the firm towards investments in sustainable assets. Indirectly, green bond issuances also indicate upcoming operational and capital expenses related to sustainable investing, which could

in turn impact the firm's cash flow and returns. Heinkel et al. (2001) present a conceptual model based on a cost-benefit analysis that stipulates that firms would switch from polluting assets to green assets if increased cost of obtaining capital in capital markets due to a lack of interest from ethical investors in financing polluting assets outweigh the investments needed to operate more sustainable. The conceptual model predicts an equilibrium price point between the size of investments in sustainable improvements on the one hand and added financing costs on the other. The findings of El Ghouli et al. (2011), Chava (2014) as well as Wang et al. (2023) are consistent with the conceptual model developed by Heinkel et al. (2001). Based on this conceptual model, issuing green finance instruments may indicate that managers have found green investment projects that turn a net profit (Daubanes et al., 2021). As Daubanes et al. (2021) mention, the issuance of green bonds is a deliberate managerial decision. The authors argue that managers will only adopt green financing strategies if investing in sustainable projects turns a profit.

Consistent with the aims of this research, a handful of scholars have focused on exploring the market reactions to green bond issuances. Based on the information provided in the theoretical framework of this thesis up to this point, one may hypothesize that financial markets react positively to green bond issuances, since green financing under the conceptual framework of Heinkel et al. (2001) would only occur if it constitutes profitability to the firm. Some scholars found results consistent with this hypothesis, Flammer (2021) analysed corporate green bonds over the period 2013-2018 and reported increasing stock prices of firms after green bond issuance, especially for first time green bonds issuers. These findings are consistent with the work of Tang & Zhang (2020), who studied bond issuances over the period 2007-2018 and found that a green bond issuance can induce positive stock price reactions and higher stock liquidity, with a stronger effect for first-time issuers. Additionally, Tang & Zang (2020) find an increased share of institutional ownership of stocks after green bonds issuance. Baulkaran (2019) examined stock market reactions to green bond issuance announcements and found positive cumulative abnormal stock returns for firms that issued green bonds. Baulkaran (2019) also documents positive relationship between the cumulative abnormal returns of the stock and the firm's size, value (expressed as Tobin's  $Q$ ) and growth. As such, Baulkaran (2019) interprets the positive stock market reactions to green bond issuance announcements as a reaction to long-term value enhancement and investor preference for sustainable assets. This narrative fits the findings of recent market reports, that state that demand for sustainable real estate assets by institutional investors, global asset owners and lenders increased as of recent years, while sustainable assets are in limited supply, ultimately leading to price increases (FTSE Russel, 2021; PwC, 2020).

However, the aforementioned findings are not universally reproduced. Jørgensen & Reisigl (2022) do not find significant stock market reactions to green bond issuances in their study on European green bond issuers. Furthermore, the work of Lebellet et al. (2020), who studied corporate green bond issuances from 2009 to 2018 shows significantly negative cumulative abnormal returns after a green

bond issuance, the results of which are robust to various tests. Lebellet et al. (2020) argue that the stock market reacts negatively to green bond issuances in similar fashion to convertible bond issuances. Convertible bonds, which can be converted from debt to equity, have the potential to dilute the value of existing shares and impact the firm's capital structure (Dann & Mikkelson, 1984). As such, issuing convertible bonds is undesirable for equity holders. Green bonds do not impact the firm's capital structure as such, but may convey information on upcoming operational and capital expenses, which could impact the firm's cash flow and returns. This argument would be consistent with the findings of Niccolò et al. (2020), who analysed the impact of ESG strategies on the dividend payout policy of Chinese companies and found that an increased focus on environmental policy negatively impacts the free cash flow of the firm and the ability to pay dividends to its shareholders. Investing in sustainable projects may therefore also have negative implications on the firm value. Similar findings are produced in real estate literature. Cachon et al. (2022) analysed global equity REITs and found that REITs with higher ESG (Environmental, Social and Governance) performance scores have lower firm value and lower operating cash flow.

The real estate industry must make substantial investments in order to achieve the sustainability goals (McKinsey, 2022). In addition to the high capital expenditures needed for decreasing the carbon footprint of assets, real estate firms also have to incur the loss of rental income during building renovations, as well as expenses for green building certification. Stakeholder management regarding retrofitting of existing buildings can prove another complex, time-consuming and costly endeavour (Janda et al., 2021). The capital costs of the investments will have to be compensated by an increase of the property's rental income and market value. Indeed, investments in energy efficiency in buildings can decrease operating costs and increase the estimated rental value and subsequently increase the market value of commercial real estate assets (Carlson & Pressnail, 2018; Plebankiewicz, 2019). Furthermore, non-green real estate assets may be penalized with reductions in market value if their carbon emissions are above median (Gröbel et al., 2022; Ferentinos et al., 2021). Yet, the net profitability and rate of return of sustainable investments are uncertain, as recently demonstrated by Azcarate-Aguerre et al. (2022). The authors find that, investments in energy-efficient retrofitting of commercial real estate potentially underperform scenario's in which no retrofitting investments are made in terms of Net Present Value when accounting for costs of capital and opportunity cost. Firms may be constrained in increasing their rental levels to cover the initial investment due to a variety of factors, such as legislation (Ahlrichs & Rockstuhl, 2022), rental contracts (Melvin, 2018) and market dynamics (Azcarate-Aguerre et al., 2022).

In climate finance literature as well as real estate literature, there seems to be no clear consensus on the implications of green bond announcements for the investor. Based on the information provided by a green bond issuance announcement, investors may re-evaluate their investment portfolio. The first hypothesis of this thesis is therefore formulated as:

**Hypothesis 1:** *Green bond issuance announcements impact stock returns for REITs<sup>1</sup>.*

## 2.3 Signalling theory

The hypothesis formulated in the previous section finds its theoretical roots in signalling theory. Signalling theory in finance stipulates that firm managers have access to more information on the firm's quality than investors do, and that access to this information would alter the perception of the firm by market participants (Stiglitz, 2002). Signalling theory has been extensively applied by scholars to explain stock price reactions following corporate events (e.g. Armstrong et al., 2010; He et al., 2013; Kazemi & Rhamani, 2013). Discrepancy between the information of the firm's management and the information of the firm's shareholders is also known as information asymmetry. Information asymmetry denotes the condition that not all information of the firm is available to all market participants at the same time (Riley, 2001).

If capital markets are perfectly efficient, all information on the firm is available to the investor and therefore fully reflected in the share price (Fama, 1970). Following, a financing decision such as a green bond issuance would not impact the firm valuation (Fama & French, 1998). In perfect capital markets, information asymmetry does not affect the share price of the firm (Armstrong et al., 2011). However, capital markets are generally considered to be not perfectly efficient (Gilson & Kraakman, 1984). Rather, capital markets may more likely reflect a semi-strong or weak form of efficiency, to which information asymmetry is inherent (Berk et al., 2017). The stock price is thus a reflection of all publicly available information and may be impacted by signals from the firm's management.

Via corporate actions, firm managers can "signal" information on the quality of the firm or future prospects to the financial markets (Berk et al., 2017). A common manifestation of signalling theory is found in the firm's dividend policy. By increasing dividend payments, the firm's management signal the affordability of future dividends regarding strong underlying financial fundamentals and good future prospects (Berk et al., 2017). Particularly for firms that apply dividend smoothing, dividend increases can be seen as a credible information signal of the firm's future earnings prospects (Berk et al., 2017). Other corporate actions that can be seen as signals of information are, for example, seasoned equity offerings, changes in insider stockownership or leverage decisions (Berk et al., 2017).

The main hypothesis of this thesis tests for the market reaction of green bond issuance announcements. As mentioned in section 2.1, green bond issuance announcements may signal to the market that the issuing firm is committing to a more climate friendly corporate policy. However, on seasoned green

---

<sup>1</sup> Stock returns in this thesis are defined as the daily relative change in the closing price of the corresponding stock, adjusted for the impact of corporate events. See also the footnote on section 3.1, page 12.

bond issuances, the financial markets may already be aware of the firm's climate commitment. This entails that signalling effect would fade on an increasing number of green bond issuances. Flammer (2021) and Tang & Zhang (2020) find an increased market reaction to first-time green bond issuances compared to seasoned green bond issuances, implying that the firm's environmental commitment was previously either unknown or uncertain for investors. Therefore, the second hypothesis tested in this research is formulated as:

**Hypothesis 2:** *Green bond issuance announcements generate abnormal stock returns for REITs, especially for first time issuers.*

## **2.4 REITs and conventional bond issuances**

A plausible comment that critical readers of this thesis may make is concerning the empirical power of the event study. Indeed, a green bond issuance is an event with multiple potential informational components (Ahopelto, 2021). Next to the potential signalling effect of climate commitment studied within this thesis, a green bond is first and foremost an announcement that the firm increases their leverage via unsecured lending, equal to conventional bond issuances. A conventional corporate debt issuance is often regarded as a signalling event itself (Berninger et al., 2022). Debt offerings may signal the confidence of the firm's managers to increase leverage for taking on investment opportunities (Berk et al., 2017). On the other hand, debt issuance may signal the firm's (future) inability to finance projects with internal funds (Myers & Majluf, 1984).

Due to their dividend pay-out requirements and limitations on cash retention, REITs are constrained in their abilities to retain significant amounts of capital and have to rely on external sources rather than internal financing in order to fund their future investments and growth (Ott et al., 2005). This explains why REITs, despite lacking a tax-shield benefit, exhibit relatively high levels of leverage (Morri & Jostov, 2018). As REITs have to rely on external funding for their investments regardless, conventional REIT bond issuances reveal less information to the market than conventional debt issuances by generic firms. Indeed, Berninger et al. (2022) studied the signalling effect of conventional REIT bond issuances and found no evidence for a signalling effect. Similarly, Mansley et al. (2023) found no overall effect of conventional debt offerings on REIT's stock prices. The unique setting in this thesis focused on the green bonds issued by REITs therefore may allow the study to more accurately isolate the possible signalling effect of the "green" label on a green bond issuance without the confounding effect of conventional debt signalling, unlike prior studies that focus on green bonds across multiple industries. Therefore, the third and final hypothesis tested in this thesis is formulated as:

**Hypothesis 3:** *Conventional bond issuance announcements generate no abnormal stock returns for REITs.*

## [3] METHODOLOGY

### 3.1 Event study

In order to study the share price effects of green bonds issuances by REITs, this thesis employs the event study method. The event study method is commonly applied by scholars in the financial and economic fields to estimate the effect of non-random events that are unanticipated by the market on stock prices (McWilliams & Siegel, 1997). Event studies work particularly well in studies of the financial field, as the financial markets function efficiently and effects on asset pricing following a certain event can generally be measured instantly (MacKinlay, 1997). The event study and the signalling theory therefore share ontological congruence, as similar to event studies, signalling theory assumes a semi-strong form of market efficiency. With a semi-strong form of efficiency, the financial market fully reflects all publicly available information as implied within the share price (Fama, 1970). However, information that is not (readily) available to the public, *private information*, is therefore not reflected in the share price. With a semi-strong form of efficiency, market prices adjust quickly when the private information is made public (Berk et al., 2017). The event study method is applied to measure whether stock prices follow abnormal returns after an event that is unanticipated by the market, and therefore not priced in (McWilliams & Siegel, 1997). Next to that, event studies do not require data from firm's financial statements and hence remove possible bias from accounting procedures (Benston, 1982). Rather, the method relies on stock prices, which in efficient capital markets price in all available information disclosed by the firm. As such, an event study aims to measure the effect of an event that feeds the market with new information. In order to test the signalling effect of green bond issuances on the stock returns of REITs, the event study is a suitable research methodology, as the methodology and theoretical framework share ontological congruence.

This thesis closely follows the standard event study research approach as described in MacKinlay (1997). As for the base model, this thesis adopts the market model approach, which is consistent with Flammer (2021), Lebellet et al. (2020) and Baulkaran (2019). As MacKinlay (1997) describes, the market model approach functions as an improvement over the constant mean return model as the market model removes the influence that the market returns on day  $t$  have on the returns of firm  $i$ . Therefore, the market model reduces the variance of returns. First, the estimated return of REIT  $i$  on day  $t$  should be computed given the market model. The parameters are commonly estimated using the following Ordinary Least Squares (OLS) regression in equation (1) (MacKinlay, 1997). OLS is the most common linear regression where the deviation between the actual observations in the dataset and the fitted line based on the values expected by the estimation is minimized (Brooks & Tsolacos, 2010a). The OLS regression formula to estimate the parameters via the standard market model is the following:

$$R_{it}^a = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (1)$$



Where  $R_{it}^a$  is the adjusted<sup>2</sup> return of REIT  $i$  at day  $t$ .  $R_{mt}$  is the return of the market portfolio on day  $t$ . The return on the market portfolio is reflected as the daily return of the relevant market index. The market index applicable for this research will be elaborated on in chapter four of this thesis.  $\beta_i$  is the beta and slope of the regression model. The beta can therefore be interpreted as the sensitivity of stock  $i$  relative to the market index, also known as the systematic risk of the security (Phuoc, 2018).  $\alpha_i$  is the intercept of the regression function. The intercept of the market models is more commonly known in the financial field as the *Jensen's alpha*, the excess return of stock  $i$  on the market return (Phuoc, 2018). Under the assumption of market efficiency, Jensen's alpha should therefore not statistically differ from zero.  $\varepsilon_{it}$  denotes the error term of the OLS regression.

The estimated return of firm  $i$  on day  $t$  is given by the market model estimation as:

$$\hat{R}_{it}^a = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \quad (2)$$

Then, the abnormal returns of firm  $i$  on day  $t$  can then be computed by subtracting the estimated return from the actual return:

$$AR_{it}^a = R_{it}^a - \hat{R}_{it}^a \quad (3)$$

The next step of the event study is to specify the time line for the event study (MacKinlay, 1997). Figure 1 illustrates the timeline of event studies. The time element in the timeline of the event studies is denoted  $\tau$ . The timeline includes the *event date* itself, which is the announcement day of the green bond, denoted  $\tau = 0$ . The announcement day is taken as the event date as the announcement day reflects the moment in time in which the market is supplied with information on the green bond issuance, and hence the announcement day serves as a better proxy for measuring the signalling effect of green bond issuances compared to the issuance day. This approach is consistent with Flammer (2021). Following, the *event window* should be specified, which is the amount of days prior and following the event date, denoted as  $\tau = T_2 - T_1$ . The *estimation window* is the period in which the expected returns of the event window are estimated, denoted  $\tau = T_1 - T_0$ . The estimation window and

---

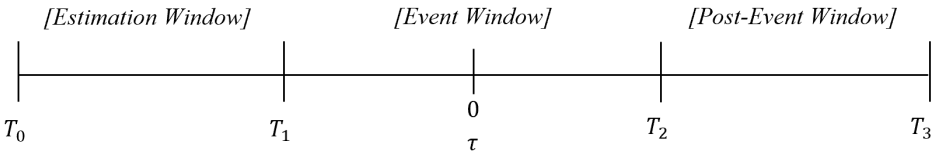
<sup>2</sup> In order to calculate returns, the daily closing prices of the stock have to be adjusted. The process is elaborated in the Compustat Global guide by WRDS (2020). The first step is to adjust the closing price for the possible effect of (reverse) stock splits:

$$1. \quad P_{it}^a = \frac{P_{it}}{AF_{it}}$$

Where  $P_{it}$  is the closing price of firm  $i$  on day  $t$ ,  $AF_{it}$  is adjustment factor attributable to the ex-rights day of stock split events.  $P_{it}^a$  is therefore the adjusted closing price of firm  $i$  on day  $t$ . The second step is calculate the adjusted return with by subtracting the adjusted closing price of day  $t$  by the adjusted close price of the day before ( $t-1$ ), controlling for the impact of the distribution of cash and cash equivalents, as well as the reinvestment of dividends and the compounding effect of dividends paid on reinvested dividends, denoted as the Total Daily Return Factor (TDRF). The closing prices from our sample have been adjusted on an ex-ante basis by data provider Thompson Reuters and therefore have not been manually performed in the research process.

$$2. \quad R_{it}^a = \frac{P_{it}^a \cdot DTRF_{it}}{P_{it-1}^a \cdot DTRF_{it+1}} - 1$$

event window should not overlap, as this would overestimate the potential effect of the event on the returns (MacKinlay, 1997). Some research designs may also include the *post-event window*, denoted as  $\tau = T_3 - T_2$ . (MacKinlay, 1997)



**Figure 2:** Event Study Timeline (MacKinlay, 1997)

Specifying the correct event window for the event study can prove a challenging task, as there are no definite rules on the length of and dimension of the parameters (Krivin et al., 2003). The event window should be chosen in such a way that the true effects of the event are measured while limiting the inclusion of confounding effects (McWilliams & Siegel, 1997). Financial markets operate in a semi-strong form of efficiency, and are therefore expected to rapidly adjust to new information (Berk & DeMarzo, 2017). As the event study is conducted under the assumption of market efficiency, the event window should cover a relatively short time-span (McWilliams & Siegel, 1997). The possibility of a stock price effect of information leaked to the public cannot be excluded, therefore the window should include days prior to the announcement date (McWilliams & Siegel, 1997). MacKinlay (1997) suggest to include a period after the event to measure lagged stock price effects. McWilliams & Siegel (1997) argue that event windows longer than two trading days may be heavily impacted by confounding effects. Similarly, Lebellet et al. (2020), applied an event window of  $[0,1]$  while studying the impact of corporate green bond issuances. Yet, other researchers apply longer event windows and find robust results. For example, Flammer (2021) applied the event window  $[-5,10]$ , whilst Baulkaran (2019) applied an event window of  $[-10,10]$ .

Consistent with the comments made by Eckbo et al. (2007, pp. 314), we apply a three-day event window of  $[-1,1]$ . This is the shortest event window that allows for the incorporation of possible prior knowledge and lagged stock price effects. However, we repeat the process with several event windows in order to check for robustness, the results of which are presented in chapter four. Consistent with Benninga & Vroetman (2008, pp. 333) and Baulkaran (2019), an estimation window of 252 trading days, or one full calendar year is applied. To limit possible overlap in the estimation window and event window, that estimation window ends 10 days prior to the event window, or 2 full calendar weeks.

The abnormal returns computed in equation (3) reflect the daily abnormal returns. However, to capture the impact of the green bond issuance, the abnormal returns over the event window should be accumulated, leading to the Cumulative Abnormal Returns (CAR) of green bond  $i$  over the event window  $(\tau_1, \tau_2)$ .

$$CAR_i^a(\tau_1, \tau_2) = \sum_{\tau=1}^{\tau=2} AR_{i\tau}^a \quad (4)$$

The  $CAR$  computes the abnormal returns of stock  $i$  over the event window when stock  $i$  issued the green bond. To measure the abnormal returns of green bond announcements for REITs, the cumulative abnormal returns of all REITs in the event window should be aggregated<sup>3</sup>, leading to the following:

$$\overline{CAR}^a(\tau_1, \tau_2) = \frac{1}{N} \sum_{i=1}^N CAR_i^a(\tau_1, \tau_2) \quad (5)$$

Where  $\overline{CAR}$  is the aggregated cumulative abnormal adjusted return over the event window  $(\tau_1, \tau_2)$ .  $N$  is the number of green bond issuance events and  $CAR_{i\tau}^a$  is the cumulative abnormal adjusted return for REIT  $i$  over the event window. The variance of  $\overline{CAR}$  is given as the following (MacKinlay, 1997):

$$\overline{CAR}^a(\tau_1, \tau_2) = \frac{1}{N} \sum_{i=1}^N \sigma_i^{2a}(\tau_1, \tau_2) \quad (6)$$

The event study relies on the assumption of that the green bond issuance event windows of the REITs in the sample do not overlap and that the aggregated cumulative abnormal adjusted returns are normally distributed over the event window (MacKinlay, 1997)<sup>4</sup>. Under these assumptions, the null hypothesis is that the  $\overline{CAR}$  does not statistically differ from zero. The alternative hypothesis being that the  $\overline{CAR}$  does statistically differ from zero.

$$H_0: \overline{CAR}^a(\tau_1, \tau_2) = 0$$

$$H_a: \overline{CAR}^a(\tau_1, \tau_2) \neq 0$$

Finally, the standard approach to test the null hypothesis is computed using the test statistic  $J$  (MacKinlay, 1997). The test statistic  $J$  is computed by:

$$J = \frac{\overline{CAR}^a(\tau_1, \tau_2)}{\sqrt{\text{var} \overline{CAR}^a(\tau_1, \tau_2)}} \sim N(0,1) \quad (7)$$

The test statistic of equation (7) asymptotically follows the standard normal distribution across the number of REITs  $N$  and the event window.

---

<sup>3</sup> MacKinlay (1997) elaborates on two separate methods to arrive at the aggregated  $CAR$ . Although computationally different, the approaches lead to similar outcomes. For more information on the computation of abnormal returns, interested readers are referred to the work of MacKinlay (1997).

<sup>4</sup>  $\overline{CAR}^a(\tau_1, \tau_2) \sim N[0, \text{var}(\overline{CAR}^a(\tau_1, \tau_2))]$

## 3.2 Endogeneity

Many event studies aim to uncover the market's response to certain corporate announcements. It is important to note that the timing and nature of these announcements are often within the control and discretion of the firm's management. This implies that managers have the ability to make choices regarding when and how to disclose information or make decisions that have an impact on the firm and its market value. Therefore, by design, the binary choice to make the announcement studied within these event studies is endogenous. In similar fashion, issuing a green bond is in itself endogenous to managerial decisions and possibly to firm characteristics.

Endogeneity is also tied to signalling theory. Since managers may freely opt to provide signals to the market, signalling theory literature emphasises the intentional communication of positive information rather than negative information (Connelly et al., 2011). High-quality firms therefore are more inclined to signal information to financial markets than low quality firms (Kirmani & Rao, 2000). However, some corporate actions may be perceived as negative signals, such as seasoned equity offerings. As Myers & Majluf (1984) mention, firm managers will likely issue new equity when they believe their company's stock price is overvalued.

This thesis does not attempt to determine the effects of green bond issuances for individual REITs and their characteristics. Rather, the focus of this thesis is concerned with whether the decision to finance via green bonds overall can be associated with stock return behaviour. The traditional event study methodology that is applied in this thesis is well-suited for estimating average announcement effects (Scruggs, 2006). The endogeneity of the event would only lead to misspecifications in the announcement effects when attempting to explain cross-sectional variation in the announcement effects (Eckbo et al., 1990). The event study methodology assumes that markets are efficient and that stock prices rapidly incorporate all available information. Although the endogeneity of the event introduces the potential influence of managerial decisions, the methodology's underlying assumption is that market prices adjust to reflect the revised expectations based on the private information known to the managers. Therefore, the abnormal returns observed during the event window are believed to reflect the market's response to the new information, even if the event itself is endogenous.

Furthermore, the market model approach combined with a tight event window aids to minimize the impact of the event from other factors that affect stock prices. While endogeneity may affect the estimation of expected returns, the methodology allows for identification of abnormal returns that deviate from what would be expected under normal circumstances. Running several tests over a variety of Event windows allows for testing the robustness of the study results to possible confounding factors such as prior knowledge or market expectations leading up to the event. Section 3.3 will provide more detail on the robustness tests employed in this thesis.

### 3.3 Robustness

Within this section of the thesis, various methods are proposed in order to test for the robustness of the base model developed in section 3.1. First, the market model as presented in equations (1) through (7) mostly imposes basic statistical assumptions on the estimation of abnormal returns. Economic models such as the Capital Asset Pricing Model (CAPM) developed by Sharpe (1964) and Lintner (1965) can constitute a more accurate approach by imposing economic assumptions on the model (MacKinlay, 1997). Similar to the market model, the CAPM stipulates that over the holding period, the risk of the stock is the deviation of the firm's realized returns from the expected returns. The riskiness of the stock can be categorized as either *idiosyncratic risk*<sup>5</sup> or *systematic risk*<sup>6</sup> (Berk et al., 2017).

Idiosyncratic risk is inherent to the firm, while systematic risk is inherent to the entirety of the financial markets and hence affects all stocks. Inflation rates, interest rates and GDP are all commonly linked to systematic risks. Modern portfolio theory, as pioneered by Markowitz (1952) dictates that any idiosyncratic risk can be diversified by holding a portfolio of stocks. Hence, investors gain no excess return for holding idiosyncratic risk. Rather, the risk of a stock is fully determined by its systematic risk, which is modelled via the CAPM (Berk et al., 2017). The CAPM bears resemblance to our base market model, the difference being that the CAPM accounts for the risk-free rate of the market, as according to CAPM assumptions, an investor holding zero risk should expect an excess return of zero.

The market model of equation (1) is therefore adjusted consistent with the CAPM, with  $R_{ft}$  corresponds to the return on the risk-free asset:

$$R_{it}^a - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \varepsilon_{it} \quad (8)$$

Within asset pricing theory, the Capital Asset Pricing Model is still considered to be simple in nature and particularly sensitive to imperfect investor behaviour patterns (Berk et al., 2017). Numerous scholars have focused on producing multi-factor asset pricing models that capture an increased portion of the variance of stock returns than the CAPM. For the stock returns of REITs, the three-factor model developed by Fama & French (1993) or the subsequent four-factor model by Carhart (1997) can be superior predictors of abnormal returns compared to the traditional CAPM (Connors & Jackmann, 2000; Ooi et al., 2009; Van der Ee, 2019). Conversely, the less adopted investment factor posed in the recently developed five-factor model by Fama & French (2015) does not show a relationship with REIT returns (Van der Ee, 2019). In order to test the robustness of our model, we therefore control for the CAPM, Fama-French three-factor model and the Carhart four-factor model, consistent with Flammer (2021).

---

<sup>5</sup> Other common definitions are: firm-specific risk, unsystematic risk, unique risk or diversifiable risk

<sup>6</sup> Other common definitions are: market risk and undiversifiable risk

The Fama-French three-factor model extends the CAPM by two additional factors, the size factor and the value factor (Fama & French, 1993). The size factor is the return difference between a portfolio of small stocks and a portfolio of big stocks, in terms of market capitalization. The value factor is the return difference between a portfolio of value stocks, based on a high ratio of book value of equity to market value of equity and a portfolio of growth stocks based on a low ratio of book value of equity to market value of equity. The size factor and value factor incorporate the pricing of additional risk with small-cap stocks and stocks with low growth potential. To arrive at the Fama-French three factor model, we add the size factor SMB at time  $t$  with coefficient  $\beta_{Si}$  and the value factor HML with coefficient  $\beta_{Hi}$  to equation (8) to extend the CAPM to the Fama-French three-factor model:

$$R_{it}^a - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \beta_{Si}SMB_t + \beta_{Hi}HML_t + \varepsilon_{it} \quad (9)$$

The Carhart four-factor model as introduced by Carhart (1997) extends the Fama-French three-factor model by one additional factor, the momentum factor. The momentum factor captures the difference in returns between stocks that have performed well in the recent past, i.e. experienced an upward trend in their stock price, and stocks that have performed poorly in the recent past, i.e. experienced a downward trend in their stock price. The momentum factor suggests that stock returns are influenced by their previous momentum. We add the momentum factor MOM at time  $t$  with coefficient  $\beta_{Mi}$  to the Fama-French three-factor model to arrive at the Carhart four-factor model:

$$R_{it}^a - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \beta_{Si}SMB_t + \beta_{Hi}HML_t + \beta_{Mi}MOM_t + \varepsilon_{it} \quad (10)$$

The three models provided will be tested next to the base model in order to test for robustness of the research results. Another robustness check will be to run the test statistics across multiple event windows. As mentioned previously, specifying the correct event window for the event study comes with no definite rules on the length of and dimension of the parameters. Running the event study of a single, predetermined event window may thus be interpreted as data snooping by the critical reader, or can possibly introduce selection bias. The analysis will therefore be conducted over multiple event windows as to ensure robustness of the results. The next chapter will present that data that has been applied to conduct event study.

## [4] DATA

The data used for this thesis has been largely retrieved from the Thompson Reuters Refinitiv Datastream. Thompson Reuters is a high quality provider of financial data that is often used in scientific research (Stanford Graduate School of Business Library, 2023). Useful tools of the Thompson Reuters Datastream platform include a filter on whether issued bonds are labelled as green as well as access to the announcement date of bond issuances. This research focuses specifically on REITs from the United States, as the United States have the most well-established REIT regime (Fritsch et al., 2010; Niskanen & Falkenbach 2012). This approach limits the possible confounding effects of country specific effects, legislation differences in the REIT regime as well as currency effects.

The data for this thesis have been collected over the period 2013-2023. This period is selected since the first corporate green bond has been issued in 2013, which has been touched upon within section 2.1. The period from 2013 to 2023 therefore captures the most complete timeline of REIT green bond issuances at the time that this thesis was constructed, and extending the timeframe beyond 2013 would therefore have no meaningful impact on the results of this thesis. As Thompson Reuters is a high quality data provider and the most common cited source within green bond literature (e.g. Flammer, 2021; Fatica & Panzica, 2021; Löffler et al., 2021), the dataset of this thesis likely consists of a large portion of the green bonds that have been issued by U.S. REITs. The data of 2023 have been retrieved until March 31<sup>st</sup>, or the end of the most recent fiscal quarter, as to not interfere with the timeline of this thesis.

The daily returns and trade volume of all REITs over the period 2013-2023 have been retrieved, as well as a set of control variables over the same period. The daily S&P 500 and returns over the 2013-2023 period have been retrieved from the Kenneth French library via the Wharton Research Data Services. Daily S&P 500 returns are commonly employed by scholars to reflect the overall performance of the U.S. stock market (Wobst et al., 2020). Given that this research focuses on REITs from the United States, the returns on the S&P 500 index developed by Standard & Poor's functions as a credible proxy for the returns of the market portfolio. Lastly, for the purpose of robustness tests, the returns on the Fama-French factors model and Carhart's fourth factor as well as the returns on 1-Month Treasury Bills have also been retrieved from the Kenneth French library. The return on treasury bonds (T-Bills) is the most common proxy for a truly risk-free asset from the United States (Berk et al., 2017). The analysis will be conducted in Stata 17, a statistical software package from Statcorp. The analysis syntax will be provided in Appendix IV. The next section will provide the descriptive statistics of the dataset.

## 4.1 Descriptive statistics

Table 1 provides the timeline over which the bonds within the dataset have been issued. The bond dataset consists of 528 conventional bonds and 34 green bonds issued by 130 REITs<sup>7</sup>. The first U.S. REIT green bond of the dataset has been issued in 2014, whereas the majority of green bond issuances date from 2019 or more recent. Compared to the issuance volume of conventional bonds, the market share of green bonds is relatively small. However, especially since 2019, there has been a notable increase in the share of green bond issuances compared to conventional bond issuances in the sample. The popularity of green bonds, particularly in sub-markets, is only emerging as of recent years (Flammer, 2021; Jørgensen & Reisigl, 2022). The adoption of legally binding climate goals within the Paris Agreement is considered to be an important catalyst in the rise of green bonds (Kouwenberg & Zheng, 2023). The timeline of the green bonds in the sample express similarities to the development of the green bond market depicted in figure 1.

**Table 1: Bond issuances over time**

Year	Green Bonds			Conventional Bonds	
	N	Amount Issued (in Bn \$)	Green Bond Market Share	N	Amount Issued (in Bn \$)
2013	0	0	0.00%	14	4.95
2014	1	0.45	3.87%	28	11.18
2015	1	0.50	3.16%	26	15.33
2016	0	0	0.00%	43	19.78
2017	0	0	0.00%	95	35.92
2018	2	1.05	7.34%	37	13.26
2019	4	1.80	3.91%	70	44.29
2020	9	4.74	7.39%	68	59.40
2021	12	6.80	11.49%	94	52.40
2022	4	3.20	17.01%	30	15.61
2023	1	0.50	6.20%	22	7.57
<b>Total</b>	<b>34</b>	<b>19.04</b>		<b>528</b>	<b>279.69</b>

*Note: The green bond market share is calculated by dividing the green bond issuance volume of the corresponding year by the total bond issuance volume.*

Table 2 provides the descriptive statistics of the bonds in the sample dataset. The lowest credit rating that a green bond has received in the sample is BBB- , with all green bond issuances being of investment grade. The credit ratings of the conventional bond issuers are not specifically investment grade and may contain lower, withdrawn or missing credit ratings. The lower credit ratings may

<sup>7</sup> To accommodate the panel dataset suitable for the event study and avoid cross-sectional correlation, overlapping bond announcement dates were pooled into portfolio 's. These observations are pooled using weighted averages and totals for the corresponding variables. This procedure furthermore addresses the 'repeated time values within panel' error in the statistical software package of Stata whilst minimizing any detrimental effects on the quality of the data, and is consistent with the methodology of MacKinlay (1997).



explain why the conventional bond show a considerably higher mean coupon rating and yield-to-maturity. The mean issuance amount of both green bonds and conventional bonds is very similar.

**Table 2: Bond characteristics**

<b>Panel A: Green Bonds</b>						
<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Median</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
<i>Green Bonds</i>	34					
Coupon (%)	34	2.71	2.7	1.12	0	4.75
Issuance Amount (\$Mln)	34	560.11	500	217.36	143.75	1200
Maturity (years)	34	9.29	10.01	4.76	2.98	30.94
			<b>Mode</b>		<b>Min</b>	<b>Max</b>
Credit Rating	31		BBB+		BBB-	A
Environmental Score	19		B		C-	A+
<b>Panel B: Conventional Bonds</b>						
<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Median</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
<i>Conventional Bonds</i>	528					
Coupon (%)	525	4.61	4.38	1.91	0	10.875
Issuance Amount (\$Mln)	515	543.72	400	597.35	0.36	4800
Maturity (years)	386	10.31	10.02	5.98	0.02	30.56
			<b>Mode</b>		<b>Min</b>	<b>Max</b>
Credit Rating	364		BBB+		DDD+*	A
Environmental Score	364		D-		D-	A+

\* The lowest actual rating. Excludes non-rated bonds or bonds that had their rating withdrawn

Table 3 provides the issuer characteristics of the REITs that have issued green bonds, summarized as per the year of the first green bond issuance announcement per REIT. Of the 130 REITs in the dataset, only 16 have issued green bonds over the period 2013-2023, which is comparable to the market share of green bonds in table 1.

**Table 3: Green Bond Issuer Characteristics**

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Median</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
Size	16	16.569	16.696	0.843	14.372	18.235
Cash flow ratio	16	0.059	0.065	0.228	0.005	0.098
Leverage ratio	16	0.448	0.448	0.115	0.133	0.621
ROA	16	0.031	0.031	0.021	-0.001	0.063
ROE	16	0.070	0.072	0.033	0.015	0.121
Tobin's Q	16	1.020	1.039	0.381	0.067	1.661

Size is defined as the natural log of total assets. Cash flow ratio is the REITs FFO (funds from operations) divided by its total assets. The FFO is a REIT-specific measure to accurately find the cash flow from real estate operations (Chen, 2023). The leverage ratio is the REIT's total debt divided by total assets. ROA and ROE are the REIT's return on assets and return on equity, respectively. Tobin's

Q is a common forward-looking measure of the firm value, as developed by Tobin (1969). Tobin's Q can be derived via numerous computations, in this thesis Tobin's Q is computed by dividing the REIT's market capitalization by its total assets. The descriptive statistics from the dataset of this thesis are comparable to previous literature (e.g. Baulkaran, 2019; Lebellet et al., 2020). The next section will provide the results of the event study.

## [5] RESULTS

This chapter will present the results of the event study applied in this Master's thesis. As mentioned in section 3.1, the main focus of this event study is the cumulative average abnormal returns (denoted as CAAR or  $\overline{CAR}$ ) over the three-day event window of  $[-1,1]$  around the announcement day: day 0.

Consistent with existing literature, the analysis is run over multiple event windows to eliminate the possible confounding effect that the selection of the event window itself may contain. Next to the main event window of  $[-1,1]$ , the following time intervals surrounding the announcement day are considered:

- $[0,1]$ : Only including the announcement day and the subsequent trading day. This event window is selected based on the work of Lebelle et al. (2020),
- $[0,0]$ : Only including the announcement day. This event window is included to minimize all other confounding factors in the event study.
- $[-1,2]$ : Including the announcement day, one trading day prior to the announcement day and two trading days following the announcement day.
- $[-2,2]$ : Including the announcement day, two trading days prior to the announcement day and two trading days following the announcement day.
- $[-5,10]$ : Including the announcement day, a full trading week prior to the announcement day and two full trading weeks thereafter. This event window is selected based on the work of Flammer (2021)
- $[-10,10]$ : Including the announcement day, a full trading week prior to the announcement day and two full trading weeks thereafter. This event window is selected based on the work of Baulkaran (2019)

Next to the standard market model, the analysis is repeated using the capital asset pricing model, the Fama-French three-factor model and the Carhart four-factor model. The returns as well as the estimated returns are calculated as simple returns, consistent with the computations applied by Fama and French (1993) for the asset pricing models. The simple returns allow for a more straightforward evaluation of the results than log-returns. As Duarte-Silva & Kimel (2014) have shown, specifying the hypothesis in simple returns or log-returns will lead to similar results, if the test is built correctly. The results of the analysis are presented in table 4. Furthermore, the assumption that the CAAR are normally distributed across the number of REITs and the event window (MacKinlay, 1997) is tested by means of the Shapiro-Wilk test for normality, as developed by Shapiro & Wilk (1965) and the Jarque-Bera test for excess skewness and kurtosis, as developed by Jarque & Bera (1987), the results of which are also presented in table 4. An eyeball analysis of the CAAR distribution across the event windows including histograms and Q-Q plots can be found in Appendix II.

**Table 4:** Stock market reaction to green bond issuance announcements

<b>Panel A: Market Model</b>									
<b>Event Window</b>	<b><math>\overline{\text{CAR}}</math></b>	<b>Std. Error</b>	<b>T-Statistic</b>	<b>P-Value</b>	<b>SW</b>	<b>JB</b>	<b>Min</b>	<b>Max</b>	<b>N</b>
[-1,1]	-0.0042456	0.0041177	1.03	0.310	0.394	5.19*	-0.0747036	0.0373616	34
[0,1]	-0.0031088	0.0034193	-0.91	0.370	1.250	6.95**	-0.0641365	0.0313266	34
[0,0]	0.0002066	0.0023214	0.09	0.930	0.741	1.75	-0.0303563	0.0323711	34
[-1,2]	-0.0028325	0.0043828	-0.65	0.523	1.225	6.38**	-0.0840593	0.0557494	34
[-2,2]	-0.0014432	0.0060572	-0.24	0.813	1.259	4.44	-0.0840593	0.0923360	33
[-5,10]	-0.0018441	0.0119367	-0.15	0.878	0.128	3.24	-0.1793179	0.1431957	32
[-10,10]	-0.0052014	0.0124110	-0.42	0.678	0.440	1.09	-0.1451910	0.1373977	29
<b>Panel B: CAPM</b>									
<b>Event Window</b>	<b><math>\overline{\text{CAR}}</math></b>	<b>Std. Error</b>	<b>T-Statistic</b>	<b>P-Value</b>	<b>SW</b>	<b>JB</b>	<b>Min</b>	<b>Max</b>	<b>N</b>
[-1,1]	-0.0042030	0.0240110	-1.02	0.315	0.400	5.22*	-0.0746934	0.0375227	34
[0,1]	-0.0030805	0.0034195	-0.90	0.374	1.253	6.96**	-0.0641301	0.0313266	34
[0,0]	0.0002206	0.0023215	0.10	0.925	0.728	1.72	-0.0303534	0.0323326	34
[-1,2]	-0.0027756	0.0043848	-0.63	0.531	1.230	6.39**	-0.084046	0.0556987	34
[-2,2]	-0.0013647	0.0060567	-0.23	0.823	1.244	4.38	-0.084046	0.0921445	33
[-5,10]	-0.0015789	0.011931	-0.13	0.896	0.102	3.23	-0.1792786	0.1440230	32
[-10,10]	-0.0047762	0.012416	-0.38	0.703	0.414	1.06	-0.1451944	0.1384934	29
<b>Panel C: Fama-French Three-Factor Model</b>									
<b>Event Window</b>	<b><math>\overline{\text{CAR}}</math></b>	<b>Std. Error</b>	<b>T-Statistic</b>	<b>P-Value</b>	<b>SW</b>	<b>JB</b>	<b>Min</b>	<b>Max</b>	<b>N</b>
[-1,1]	-0.0048983	0.0030544	-1.60	0.118	-0.550	1.39	-0.0509497	0.0391202	34
[0,1]	-0.0020960	0.0028207	-0.74	0.463	0.798	1.41	-0.046244	0.0269947	34
[0,0]	-0.0001006	0.0019929	-0.05	0.960	-1.127	2.09	-0.0261544	0.0313943	34
[-1,2]	-0.0037707	0.0034777	-1.08	0.286	-0.049	1.69	-0.0395991	0.0521863	34
[-2,2]	-0.0039869	0.0041356	-0.96	0.342	-1.116	1.30	-0.0626003	0.0586033	33
[-5,10]	-0.005673	0.0113487	-0.50	0.621	-1.120	1.54	-0.165147	0.1387919	32
[-10,10]	-0.0138567	0.0121378	-1.14	0.263	-0.706	0.06	-0.1439637	0.1317015	29
<b>Panel D: Carhart Four-Factor Model</b>									
<b>Event Window</b>	<b><math>\overline{\text{CAR}}</math></b>	<b>Std. Error</b>	<b>T-Statistic</b>	<b>P-Value</b>	<b>SW</b>	<b>JB</b>	<b>Min</b>	<b>Max</b>	<b>N</b>
[-1,1]	-0.0029426	0.0033197	-0.89	0.382	-0.683	2.34	-0.0563885	0.0362413	34
[0,1]	-0.0004106	0.0031272	-0.13	0.896	0.363	3.12	-0.0513770	0.0463583	34
[0,0]	0.0014256	0.0020404	0.70	0.490	1.426*	4.96*	-0.0201053	0.0323945	34
[-1,2]	-0.0017345	0.0034927	-0.50	0.623	-0.689	0.19	-0.0422160	0.0461856	34
[-2,2]	-0.0027827	0.0042785	-0.65	0.520	-1.815	0.51	-0.0625041	0.0494437	33
[-5,10]	-0.0030314	0.0112013	-0.27	0.788	0.283	4.99*	-0.1814097	0.1195847	32
[-10,10]	-0.0069549	0.0114103	-0.61	0.547	1.273	4.39	-0.1653817	0.1035520	29

Notes: CARs are denoted in decimal points. SW and JB provide the test statistics of the Shapiro-Wilk test and Jarque-Bera test, respectively. \* and \*\* denote significance at the 10% and 5% levels, respectively.

## 5.1 Stock market reaction to green bond issuance announcements

From table 4 can be derived that the sample size, denoted  $N$ , decreases as the event window increases, for the longer window of analysis increases the potential overlap of events, in cases where a REIT has issued multiple green bonds, which would violate the assumption of zero covariance between abnormal returns. The overlapping events are thus omitted from the analysis in larger event windows to eliminate cross-sectional correlation.

The results presented in table 4 indicate that the cumulative abnormal returns across the multitude of event windows are, on average, consistently negative. Only on the event window that solemnly includes the green bond issuance announcement day, the event window  $[0,0]$ , the CAAR sign turns positive. However, the results found in this analysis are not statistically significant at either the 10% or 5% levels. We therefore cannot reject the null hypothesis that the abnormal returns over the event window are statistically different from 0. Next to that, the low values of CAAR displayed in table 4 are also not economically significant, with the maximum CAAR deviation corresponding to -0.5%. Overall, the results suggest that the different models applied in the event study do not provide sufficiently strong evidence of significant abnormal returns during the specified event windows. The green bond issuance announcements by themselves may therefore not explain the apparent consistent negative cumulative abnormal returns across the event windows. On aggregate, green bond issuance announcement by U.S. REITs do not generate meaningful stock market reactions.

The results of the analysis in table 4 are consistent with Jørgensen & Reissigl (2022), who also do not find significant stock market reactions to green bond issuances in their study on green bonds in the European market. The results also express minor similarity to the findings of Lebellet et al. (2020), who find consistently negative CARs across various event windows. However, unlike Lebellet et al. (2020), the results from this study do not express statistical or economic significance. A possible explanation for the overall negative market sentiment towards green bond issuance announcements mentioned by these studies is perceived increased uncertainty and risk surrounding the future profitability and value creation of the sustainable investment strategy adopted by the firm.

Conversely, the findings of Flammer (2021), Baulkaran (2019) and Tang & Zhang (2020) are not reproduced in this study, as no evidence is found of positive CARs. Hence, this raises the question as to why the results of this thesis and previous studies show such dissimilarity. Since the chosen event windows as well as the asset pricing models applied in the analyses are based on the aforementioned studies, the model and event window configurations are not likely causing the observed dissimilarities. A more logical explanation can be found in the REIT industry-specific and region-specific characteristics of the samples. The specific structure of REITs pertaining to capital retention limitations and the absence of a tax-shield may prompt the different stock market reaction to green bond issuances of the REIT industry than in other industries. Furthermore, the aforementioned studies

focus on global samples, contrasting the specific focus of this thesis on the United States, suggesting a difference in market reaction to green bonds globally and within the United States.

The first hypothesis of the theoretical framework of this thesis, that green bond issuance announcements overall induce stock market reactions, therefore cannot be confirmed by the results of the event study.

Even though no significant market reactions can be detected across the event windows surrounding green bond issuance announcement in this study on aggregate, the possible effects may be more strongly pronounced depending on the issuer seasonality, which a finding produced by the works of Flammer (2021) and Tang & Zhang (2020). The analysis is repeated over the selected event window [-1,1] while distinguishing first-time green bond issuances from repeated green bond issuances. The results of this analysis are presented in table 5 and discussed in section 5.2.

## **5.2 Stock market reaction by issuer seasonality**

Consistent with the findings of Flammer (2021) and Tang & Zhang (2020), the results of the heterogeneous cross-sectional analysis conducted in table 5 show substantially greater values of CAAR over the event window for first-time issuers. Moreover, the stock market reactions to first-time green bond issuances are statistically significant at the 5% level, for all estimation models. For first-time green bond issuers, we find statistically significant negative CARs ranging between -1.57% and -1.28%. The results are therefore not only statistically significant, but also economically significant. On average, the stock markets reacts negatively to first-time green bond issuances from REITs, with a market reaction between ranging from -1.57% to -1.28%. For seasoned issuances, the results revert to statistically insignificant test-statistics, confirming the second hypothesis tested in this thesis, that the stock market reactions are more pronounced for first-time green bond issuances.

While the finding of more pronounced stock market reactions to first-time green bond issuances is consistent with Flammer (2021) and Tang & Zhang (2020), this study finds consistently negative CARs where the previously mentioned studies find consistently positive CARs. The findings of this study therefore bear more resemblance to the findings of Lebellet et al. (2020), who find consistently stronger negative market reactions to first-time green bond issuances. The more negative stock market reaction on first time green bond issuances may be induced by investor uncertainty on the financing structure and impacts of green bonds, as green bonds are still a relatively unknown financing instrument. Furthermore, consistent with the arguments made by all of the aforementioned studies, the first green bond issuance by the firm may lead to increased media-, analyst and investor attention than any subsequent issuances, causing the stock market reactions to be more pronounced on first-time issuances.

**Table 5:** Stock market reaction by issuer seasonality

<b>Panel A: First-time issuers</b>									
<b>Model</b>	<b>CAR</b>	<b>Std. Error</b>	<b>T-Statistic</b>	<b>P-Value</b>	<b>SW</b>	<b>JB</b>	<b>Min</b>	<b>Max</b>	<b>N</b>
MM	-0.0157365**	0.0066263	-2.37**	0.031**	-1.359	1.25	-0.0747036	0.0338203	16
CAPM	-0.0156775**	0.0066316	-2.36**	0.032**	-1.351	1.24	-0.0746934	0.0337821	16
FF3	-0.0145781**	0.0039950	-3.65**	0.002**	-0.039	0.91	-0.0509497	0.0110612	16
CH4	-0.0128157**	0.0045957	-2.79**	0.014**	-0.877	2.17	-0.0563885	0.0213830	16
<b>Panel B: Seasoned Issuers</b>									
<b>Model</b>	<b>CAR</b>	<b>Std. Error</b>	<b>T-Statistic</b>	<b>P-Value</b>	<b>SW</b>	<b>JB</b>	<b>Min</b>	<b>Max</b>	<b>N</b>
MM	0.0059685	0.0038329	1.56	0.138	-0.843	2.40	-0.0340955	0.0373616	18
CAPM	0.0059965	0.0038312	1.57	0.136	-0.791	2.44	-0.0340946	0.0375227	18
FF3	0.0037061	0.0035263	1.05	0.308	0.563	3.99	-0.0333359	0.0391202	18
CH4	0.0058334	0.0037705	1.55	0.140	0.174	3.38	-0.0335727	0.0362413	18

Notes: CARs are denoted in decimal points. SW and JB provide the test statistics of the Shapiro-Wilk test and Jarque-Bera test, respectively. \* and \*\* denote significance at the 10% and 5% levels, respectively.

Furthermore, the results show a both statistically and economically insignificant stock market reaction to seasoned green bond issuances, the sign of which is slightly positive. The non-reaction or slightly positive market reaction of subsequent green bond issuances could be interpreted as a ‘more positive’ market reaction as compared to negative stock market reaction to first-time green bond issuances. Two speculative interpretation may be derived from this finding.

On the one hand, the stock market possibly has become more familiar with the implications of green bond issuances as the green bond market progresses and matures, indicating that investors were perhaps relatively unaware of the possible implications of green bonds at the time of the first green bond issuances, which may indicate lower uncertainty and risk associated to the firm’s investment strategy as the green bond market matures.

On the other hand, the more positive stock market reaction on subsequent issuances may indicate an emerging ‘green reputation effect’ of the REIT, which is an argument derived from the findings of Petreski et al. (2022). Subsequent green bond issuances may earn the REIT a ‘green reputation’, reducing the firm’s climate risk, attracting institutional as well as climate impact investors. This argument follows the same rationale of Flammer (2021) and Tang & Zhang (2020) where green bonds function as a credible signal of the firm’s commitment towards climate friendly investments, and investors become increasingly aware of the REIT’s climate commitments and intentions upon subsequent green bond issuances.

### 5.3 Stock market reaction to conventional bond issuance announcements

This section will present an analysis of stock market to conventional bond issuances by REITs. This analysis is conducted to measure possible counterfactual effects as tested under hypothesis 3 of the theoretical framework. The results of the event study on conventional bond issuance announcements

over the event window  $[-1,1]$  are presented in table 6. The number of observations, denoted  $N$ , is substantially lower than the amount of conventional bonds in the dataset, which amounts to 528, as depicted in table 2. First of all, any conventional bonds with missing data related to either the coupon rate, issuance amount or the maturity are omitted from the analysis, as these data are important to determine the quality of the announcement, leaving 386 conventional bonds as suitable for analysis. When accounting for overlapping event windows as well as possible missing values for the return and market returns over the event windows in the dataset, 124 conventional bonds remain suitable for the statistical analysis.

**Table 6:** Stock market reaction to conventional bond issuance announcements

Model	CAR	Std. Error	T-Statistic	P-Value	SW	JB	Min	Max	N
MM	-0.0036764	0.0039673	-0.93	0.356	6.639**	58.56**	-0.2610806	0.1018260	124
CAPM	-0.0028919	0.0040378	-0.72	0.475	6.388**	55.66**	-0.2610797	0.1018260	124
FF3	-0.0027488	0.0040474	-0.68	0.498	6.360**	58.45**	-0.2761394	0.1057039	124
CH4	-0.0021270	0.0042177	-0.50	0.615	6.702**	69.44**	-0.3110307	0.1052771	124

*Notes: CARs are denoted in decimal points. SW and JB provide the test statistics of the Shapiro-Wilk test and Jarque-Bera test, respectively. The event window is  $[-1,1]$ . \* and \*\* denote significance at the 10% and 5% levels, respectively*

The CARs over the event window as presented in table 6 do not express statistical significance. Furthermore, the low values of CAAR also indicate low economic significance. The Shapiro-Wilk test for normality as well as the Jarque-Bera test for excess kurtosis and skewness consistently exhibit significant test statistics across all models applied in this analysis, highlighting the presence of skewness and kurtosis in the distribution of the CARs. Hence, the CARs of conventional bond issuances cannot be assumed to be normally distributed over the event window. As the assumption that the CARs are normally distributed over the event study is violated in this particular case, a more prudent approach would be to resort to non-parametric test alternatives (Brooks & Tsolacos, 2010b). A common non-parametric alternative for event studies is the Wilcoxon signed-rank test (MacKinlay, 1997), which was developed by Wilcoxon (1945). The Wilcoxon signed-rank test in the event study operates under the null hypothesis that CARs are equally likely to deviate positively as well as negatively from 0 (MacKinlay, 1997). We repeat the analysis presented in table 6 via the Wilcoxon signed-rank test, the results of which are displayed in table 7.

**Table 7:** Wilcoxon signed-rank test

Model	Z	P-Value	Positive	Negative	Zero	N
MM	0.322	0.7477	67	57	0	124
CAPM	0.441	0.6589	67	57	0	124
FF3	0.247	0.8050	66	58	0	124
CH4	0.324	0.7458	68	56	0	124

*Notes: Z correspond to the z-statistic of the Wilcoxon signed-rank test. The event window is  $[-1,1]$ .*

*The Wilcoxon signed-rank test operates under  $H_0: CAR = 0$*



Across all models, the Wilcoxon signed-rank test displays negative z-statistics, with a greater amount of positive CARs relative to negative CARs, whereas the standard t-distribution of CAAR in table 6 suggests a negative relationship. The divergence in results here, even though both tests do not exhibit any statistical significance, may be explained by the influence of large negative outliers under the test statistic of the analysis of table 6.

As both statistical tests do not exhibit any statistical significance, the results of the Wilcoxon signed-rank test are equivalent to the results from the test statistic in table 6. The null hypotheses of the Wilcoxon signed-rank test and the event study test-statistics cannot be rejected. This thesis has therefore found no evidence that conventional bonds issuance announcements by REITs lead to abnormal stock returns. The findings are consistent with hypothesis 3, and confirm the findings of Berninger et al. (2022) as well as the findings of Mansley et al. (2023), in that REIT conventional bond issuances do not lead to significant stock market reactions.

#### 5.4 Power of the test

When conducting statistical analysis, the prudent researcher is encouraged to reflect on the power of the statistical test applied, which is the probability of correctly rejecting a false null hypothesis (Brooks & Tsalacos, 2010a). Hence, the power of the tests determines the probability, denoted  $\beta$ , of committing a Type II error, which occurs when the researcher fails to reject a null hypothesis when the alternative hypothesis is true. The probability of committing a type I error, which occurs when the null hypothesis is rejected when it is actually true, denoted  $\alpha$ , is determined by the size of the test. The size of the test is determined by the significance level or confidence interval set by the researcher. The probabilities of committing a Type I or Type II error are interconnected. The probability to commit a Type I error decreases when the probability of a type II error increases, and vice versa. The only way to simultaneously reduce the probability of committing a type error is by increasing the sample size (Brooks & Tsalacos, 2010a). Critical readers will therefore question the relatively small sample size of the analyses conducted in section 5.1 and particularly section 5.2. Indeed, with respectively 34 and 16 observations, the sample size is rather small.

For the event study, the critical region of rejection is given by (MacKinlay, 1997):

$$\theta_1 < c\left(\frac{\alpha}{2}\right) \text{ or } \theta_1 > c\left(1 - \frac{\alpha}{2}\right) \quad (12)$$

While the power function is given by (MacKinlay, 1997):

$$P(\alpha, H_a) = pr\left(\theta_1 < c\left(\frac{\alpha}{2}\right) | H_a\right) + pr\left(\theta_1 > c\left(1 - \frac{\alpha}{2}\right) | H_a\right) \quad (13)$$

---

<sup>8</sup> where  $c(x) = \varphi - 1(x)$ .  $\varphi(\cdot)$  is the standard normal cumulative distribution function (MacKinlay, 1997)

According to the power function given by MacKinlay (1997) at the 5% level, with a standard deviation of the CAR of 2% and a test statistic of CAR above 1%, the power is consistently high for both large samples as well as small samples, i.e. sample sizes with less than 40 observations. For CARs below 1% and larger standard deviations, the power of the test diminishes dramatically, even for sample sizes with over 200 observations (MacKinlay, 1997). For the analysis with the smallest sample size, conducted in section 5.2, the power of the test still exceeds 80% according to the tabulation of MacKinlay (1997, p.29). Furthermore, the CARs under this analysis follow the desired normal distribution. In summary, despite the small sample size, the power of the test is still reasonably high.

Still, it is advisable to increase the sample size in order to improve the power of the test (Brooks & Tsolacos, 2010a). With the selected period of the study, the entire timeline of corporate green bonds is covered. Depending on the coverage of the database of Thomson Reuters Refinitiv on the topic of green bonds, the probability that the sample is a representative representation of the population of green bonds issued by REITs in the United States is relatively high. Thomson Reuters is a very respectable and high-quality financial database as well as the most used financial database in green bond literature (e.g. Flammer, 2021; Fatica & Panzica, 2021; Löffler et al., 2021). Increasing the sample size, in a U.S. context, is therefore not possible at this point in time, which is a limitation of this master's thesis.

The overall results of this chapter indicate that stock markets react negatively to REIT first time green bond issuances and do not react significantly to seasoned green bond issuances or conventional bond issuances. The findings may indicate that REITs can inform the market of their commitment towards climate friendly investments by issuing green bonds. The first green bond issuance announcement of a REIT apparently prompts investors to reconsider their investment position in the respective REIT, consistent with the hypothesis of signalling theory and the arguments of Fatica & Panzica (2021) and Flammer (2021).

## [6] CONCLUSION

The aim of this thesis is to examine the stock market reactions to the announcement of green bond financing by real estate investment trusts. By means of an event study methodology, comprising a variety of asset pricing models across different event windows, the results do not show evidence of an overall stock market reaction to green bond issuance announcements by REITs. However, the analysis does find consistent evidence of negative stock market reactions to green bond issuance announcements for first-time issuers, ranging between -1.57% and -1.28% depending on the asset pricing model. The result that the stock market reactions are more pronounced for first-time green bond issuances are in line with the literature on green bonds. However, the result that the stock market consistently shows negative returns following a green bond issuance contradicts the majority of the comparable research. This divergence may be explained by regional difference in comparison to previous studies, or differences pertaining specifically to the REIT industry. Additionally, the study found that the stock market does not react to conventional green bond issuances by real estate investment trusts, which is consistent with recent theory on capital structure of REITs.

The results suggest that green bond issuance announcements are a credible signal of the REIT's commitment towards climate friendly investments, which leads equity investors to re-evaluate their investment portfolios, inducing negative stock market reactions. Furthermore, the results suggest that the green bond market is gradually maturing, as the stock market shows a less negative reaction towards subsequent green bond issuances by REITs. Lastly, The less negative reaction on seasoned green bond issuances may also indicate the possibility of a 'green reputation effect' emerging among REITs.

Although the empirical tests of this thesis provides no decisive explanations of the results, the thesis adds to the emerging body of literature on climate financing by providing insights specific to the real estate sector by dissecting the stock market reactions to REIT green bond issuance announcements. Furthermore, the results are of interest to REIT managers, as they increase awareness of the consequences of REIT capital structure decisions, and on the considerations that REIT managers should make regarding the REIT's capital structure. Lastly, the results are relevant for investors in both debt- and equity capital markets, allowing for a better anticipation of market movements. Overall, substantial developments are still necessary to overcome the financial hurdles of the global net-zero transition, particularly in the real estate sector, both regarding the green bond market and climate financing as a whole.

## 6.1 Limitations

The main limitation of this study, as explained in section 5.4, is the relatively small sample size, which may have an impact on the validity and credibility of the research. In conjunction with the small sample size, the time-line over which the green bonds have been issued in the sample prevent analysis on the long-term effects of green bond issuances on the performance of the REIT in the stock market. From a share- and stakeholder perspective, long-term performance effects are at least as important as short term market movements. Similarly, no indication of the possible effect of the current debt issuance environment, which is characterised by a very low interest rates (Fred economic data, 2023; Nowacki, 2023) can be provided by this research. Both the long-term effects of green bond issuances as well as period-specific effects are important considerations for future research.

The classical event study economic market model approach has some disadvantages. First of all, the asset pricing models for financial time series may potentially violate assumptions of ordinary least squares. Asset pricing models are known to exhibit heteroskedasticity (Corhay & Rad, 1996). Furthermore, the asset pricing models may contain autoregressive conditional heteroscedastic (ARCH) effects in the residuals (Będowska-Sójka, 2009). Other researchers may therefore find more robust results by applying GARCH or EGARCH models, particularly regarding clusters of volatility. The dataset of this study also appears to contain a volatility cluster, as can be derived by plotting the time-series line of the stock returns, which can be found in Appendix III. The majority of researchers in the financial field continue to apply the classic asset pricing models, which, on aggregate, still provide plausible results (MacKinlay, 1997). Nevertheless, scholars interested in event studies in general, and climate financing in particular, may consider GARCH/EGARCH modelling in their future endeavours. Since event studies deal with a rather strong set of research assumptions, it is important to extend the body of research on climate financing approaches in order to gain a better understanding of the underlying mechanisms of debt and equity capital market reactions and the effectiveness of climate financing instruments.

Furthermore, it is highly relevant to note that non-financial benefits and other considerations are not captured by the event study. While the findings suggest that green bond issuances are not beneficial for REITs, especially for first time issuers, any non-financial incentives or behavioural incentives for issuing green bonds are not considered in this study. Lastly, the findings presented in this research pertain to U.S. REITs specifically. REIT legislation is passed on a country by country basis. Hence, the stock market may react different to other REIT regimes. The stock market reaction green bond issuance announcements to other REIT-type regimes remains an avenue for future research.

## 6.2 Future research

Several limitations of this study provide opportunities for future research, which is also touched upon in the previous sections. For example, scholars interested in climate finance may focus on examining long-term effects of green bond issuances or the effect of the issuance period on the lifetime and issuance volume of green bonds. Furthermore, researchers could perform a similar analysis to this research on other sub-industries and regions. Lastly, researchers may adopt different methodologies to validate the findings within this theses and previous research on the impact of green bond issuances to add depth to the emerging body of literature on climate financing.

Another highly relevant research paradigm that has not received any attention in this thesis up to this point concerns the pricing of financial securities relative to their climate risk. Krueger et al. (2020) argue that climate risk is an important investment factor for institutional investors. The return on financial instruments varies according to that investment's sensitivity to a variety of risk factors, one of which may be an asset pricing model market risk, such as climate transition risk (Semieniuk et al., 2021). An interesting overview of the literature on climate risk and stock returns has been provided by Venturini (2022). Future research may focus on finding out the climate risk that has been priced in by capital markets on "green" stocks and "brown" stocks. In the light of this study, an interesting focus for future research may be to examine whether green bond issuers are attributed lower climate risks than firms that do not issue green bonds. A possible conceptual frameworks may be derived from Pástor et al. (2022), who studied equities from the U.S. stock market between 2012-2020 and found that the ex-ante expected returns of brown assets are higher than the expected returns of brown assets, which can be attributed to the higher climate risk on brown assets, prompting investors to demand a higher return for bearing the climate risk. Another conceptual framework on the pricing of climate risks is produced by Bolton & Kacperczyk (2021), who find that investors demand higher returns on their investment in U.S. stocks for bearing higher climate risks. However, the current literature on climate risk pricing is currently underdeveloped and fragmented, whilst the presented theoretical models have been insufficiently empirically tested (Venturini, 2022). Furthermore, the data available for comparable research is are scarce. Therefore, this thesis did not include the pricing of climate risk within the theoretical framework or empirical testing, but notes that scholars may be interested in pursuing research on the topic in the future.

## REFERENCES

- Alcock, J. & Steiner, E. (2017). The interrelationships between REIT capital structure and investment. *Abacus*, 53(3), pp. 371-394.
- Ahopelto, K. (2021). *Green bonds and shareholder value: the announcement effect of corporate green bonds*. MSc. Thesis. Jyväskylä University, Jyväskylä.
- Ahlrichs, J. & Rockstuhl, S. (2022). Estimating fair rent increases after building retrofits: A max-min fairness approach. *Energy Policy*, 164(1), pp. 1-12.
- Armstrong, C.S., Core, J.E., Taylor, D.J. & Verrecchia, R. E. (2011). When does information asymmetry affect the cost of capital?. *Journal of accounting research*, 49(1), pp. 1-40.
- Azcarate-Aguerre, J.F., Conci, M., Zils, M., Hopkinson, P. & Klein, T. (2022). Building energy retrofit-as-a-service: a Total Value of Ownership assessment methodology to support whole life-cycle building circularity and decarbonisation. *Construction Management and Economics*, 40(9), pp. 676-689.
- Baker, M., Bergstresser, D., Serafeim, G. & Wurgler, J. (2018). *Financing the response to climate change: The pricing and ownership of US green bonds*. Working paper no. w25194. Available at: National Bureau of Economic Research: <https://www.nber.org/papers/w25194>
- Baulkaran, V. (2019). Stock market reaction to green bond issuance. *Journal of Asset Management*, 20(5), pp. 331-340.
- Będowska-Sójka, B. (2009). Event Study Analysis with Market Model and Garch Modelling: Announcement of Share Repurchase on the Warsaw Stock Exchange. *Zeszyty Naukowe / Uniwersytet Ekonomiczny w Poznaniu*, 112(1), pp. 17-33.
- Berninger, M., Bossong, P., Schiereck, D. & Steinhardt, M. (2022). Too transparent for signalling? A global analysis of bond issues by property companies. *Accounting & Finance*, 00, pp. 1-21.
- Benninga, S. & Voetmann, T. (2008). Event Studies. In: S. Benninga. *Financial modelling*. third ed., Boston, MA: MIT Press, pp. 331-357.
- Benston, G. J. (1982). Accounting numbers and economic values. *The Antitrust Bulletin*, 27(1), pp. 161-215.
- Berk, J., Demarzo, P. & Harfor, J. (2017). *Fundamentals of Corporate Finance*, fourth edition, Harlow: Pearson Education Limited.
- Bolton, P. & Kacperczyk, M. (2021). Do investors care about carbon risk?. *Journal of financial economics*, 142(2), pp. 517-549.

- Beracha, E., Feng, Z. & Hardin III, W. G. (2019). REIT operational efficiency and shareholder value. *Journal of Real Estate Research*, 41(4), pp. 513-554.
- Bhutta, U.S., Tariq, A., Farrukh, M., Raza, A. & Iqbal, M.K. (2022). Green bonds for sustainable development: Review of literature on development and impact of green bonds. *Technological Forecasting and Social Change*, 175(1), pp. 1-16.
- Brooks, C. & Tsolacos, S. (2010a). An overview of regression analysis. In: C. Brooks, S. Tsolacos, ed, *Real Estate Modelling and Forecasting*, first ed., Cambridge: Cambridge University Press, pp. 72-107.
- Brooks, C. & Tsolacos, S. (2010b). An overview of regression analysis. In: C. Brooks, S. Tsolacos, ed, *Real Estate Modelling and Forecasting*, first ed., Cambridge: Cambridge University Press, pp. 135-193.
- Carhart, M.M. (1997). On persistence in mutual fund performance. *The Journal of finance*, 52(1), pp. 57-82.
- Carlin, D. (2022). *40% Of Emissions Come From Real Estate; Here's How The Sector Can Decarbonize*. Forbes. [Online] Available at: <https://www.forbes.com/sites/davidcarlin/2022/04/05/40-of-emissions-come-from-real-estate-heres-how-the-sector-can-decarbonize/?sh=6d3d9ec063b7> [Accessed 19 February 2023].
- Carlson, K. & Pressnail, K. D. (2018). Value impacts of energy efficiency retrofits on commercial office buildings in Toronto, Canada. *Energy and Buildings*, 162(1), pp. 154-162.
- Cerami, L. & Fanizza, D. (2023). *A Market for Brown Assets To Make Finance Green*. IMF Working Paper No. 2023/011, Available at: SSRN: <https://ssrn.com/abstract=4344622>
- Chava, S. (2014). Environmental externalities and cost of capital. *Management Science*, 60(9), pp. 2223–2247.
- Chen, J. (2023). *Funds From Operations (FFO): A Way to Measure REIT Performance*. Investopedia. [Online] Available at: <https://www.investopedia.com/terms/f/fundsfromoperation.asp#:~:text=Why%20FFO%20Is%20a%20Good,of%20the%20standard%20depreciation%20methods> [Accessed 30 May 2023].
- Climate Bond Initiative (CBI) (2019). *Climate Bonds Standard*. Version 3.0 [Online] Available at: <https://www.climatebonds.net/files/files/climate-bonds-standard-v3-20191210.pdf> [Accessed 13 March 2023].

- Climate Bond Initiative (CBI) (2023). *Interactive Data Platform*. [Online] Available at: <https://www.climatebonds.net/market/data/> [Accessed 25 May 2023].
- Connelly, B.L., Certo, S.T., Ireland, R.D. & Reutzel, C.R. (2011). Signaling theory: A review and assessment. *Journal of management*, 37(1), pp. 39-67.
- Connors, D. N., & Jackman, M. L. (2000). *The cost of equity capital for REITs: an examination of three asset-pricing models*. PhD dissertation. Massachusetts Institute of Technology, Cambridge: MA.
- Corhay, A. & Rad, A.T. (1996). Conditional heteroskedasticity adjusted market model and an event study. *The Quarterly Review of Economics and Finance*, 36(4), pp. 529-538.
- Dann, L.Y. & Mikkelson, W.H. (1984). Convertible debt issuance, capital structure change and financing-related information: Some new evidence. *Journal of Financial Economics*, 13(2), pp. 157-186.
- Daubanes, J.X., Mitali, S.F. & Rochet, J. C. (2021). Why Do Firms Issue Green Bonds? *Swiss Finance Institute Research Paper*, No 21-97. Available at: SSRN: <https://ssrn.com/abstract=3996238>
- De Freitas Netto, S.V., Sobral, M.F.F., Ribeiro, A.R.B., & Soares, G.R.D.L. (2020). Concepts and forms of greenwashing: A systematic review. *Environmental Sciences Europe*, 32(19), pp. 1-12.
- Duarte-Silva, T. & Kimel, M.T. (2014). Testing excess returns on event days: Log returns vs. dollar returns. *Finance Research Letters*, 11(2), pp. 173-182.
- Eckbo, B.E., Maksimovic, V. & Williams, J. (1990). Consistent estimation of cross-sectional models in event studies. *The Review of Financial Studies*, 3(3), pp. 343-365.
- Eckbo, B.E., Masulis, R.W. & Norli, Ø. (2007). Security offerings. In: B.E. Eckbo, ed, *Handbook of empirical corporate finance*, first ed., Amsterdam: Elsevier, pp. 233-373.
- El Ghoul, S., Guedhami, O., Kwok, C.C. & Mishra, D.R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance*, 35(9), pp. 2388–2406.
- Fama, E.F. (1970). Efficient capital markets: A review of theory and empirical work. *The journal of Finance*, 25(2), pp. 383-417.
- Fama, E.F. & French, K.R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of financial economics*, 33(1), pp. 3-56.
- Fama, E.F. & French, K.R (1998). Market efficiency, long-term returns, and behavioral finance. *Journal of Financial Economics*, 49(3), pp. 283-306.



- Fama, E.F. & French, K.R. (2015). A five-factor asset pricing model. *Journal of financial economics*, 116(1), pp. 1-22.
- Fatica, S. & Panzica, R. (2021). Green bonds as a tool against climate change? *Business Strategy and the Environment*, 30(5), pp. 2688-2701.
- Ferentinos, K., Gibberd, A. & Guin, B. (2021). *Climate policy and transition risk in the housing market*. Bank of England Working Paper No. 918. Available at: SSRN: <https://ssrn.com/abstract=3838700> [Accessed 20 February 2023]
- Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics*, 142(2), pp. 499–516.
- Fred economic data (2023). *Federal Funds Effective Rate*. [Online] Available at: <https://fred.stlouisfed.org/series/FEDFUNDS> [Accessed 29 June 2023].
- Fritsch, N. Prebble Q.C.J. & Prebble, R. (2010). A comparison of selected features of real estate investment trust regimes in the United States, the United Kingdom and Germany. *Bulletin for International Taxation*, pp. 320-329.
- FTSE Russel (2021). Sustainable Investment: 2021 global survey findings from asset owners. [Online] Available at: <https://www.ftserussell.com/index/spotlight/sustainable-investment-2021-global-survey-findings-asset-owners> [Accessed 27 February 2023]
- Giacomini, E., Ling, D.C. & Naranjo, A. (2015). Leverage and returns: A cross-country analysis of public real estate markets. *The Journal of Real Estate Finance and Economics*, 51(1), pp. 125-159.
- Gianfrate, G. & Peri, M. (2019). The green advantage: Exploring the convenience of issuing green bonds. *Journal of cleaner production*, 219(1), pp. 127-135.
- Gilson, R.J. & Kraakman, R.H. (1984). The mechanisms of market efficiency. *Va. L. Rev.*, 70, 549.
- Gröbel, S., Bender, M., Grimm, S. & Heidrich, R. (2022). *WoMa Monitor Q3 2022*. JLL. [Online] Available at: <https://www.jll.de/content/dam/jll-com/documents/pdf/research/emea/germany/de/Wohnungsmarktmonitor-JLL-Deutschland-322.pdf> [Accessed 20-02-2023]
- He, W.P., Lepone, A. & Leung, H. (2013). Information asymmetry and the cost of equity capital. *International Review of Economics & Finance*, 27(1), pp. 611-620.
- Heinkel, R., Kraus, A. & Zechner, J. (2001). The Effect of Green Investment on Corporate Behavior. *The Journal of Financial and Quantitative Analysis*, 36(4), pp. 431–449.

- ICMA (2021). *Green Bond Principles*, June 2021 with June 2022 Appendix. [Online] Available at: [https://www.icmagroup.org/assets/documents/Sustainable-finance/2022-updates/Green-Bond-Principles\\_June-2022-280622.pdf](https://www.icmagroup.org/assets/documents/Sustainable-finance/2022-updates/Green-Bond-Principles_June-2022-280622.pdf) [Accessed 3 March 2023].
- IEA (2020). *Energy Technology Perspectives 2020*. IEA. Paris [Online] Available at: [https://iea.blob.core.windows.net/assets/7f8aed40-89af-4348-be19-c8a67df0b9ea/Energy\\_Technology\\_Perspectives\\_2020\\_PDF.pdf](https://iea.blob.core.windows.net/assets/7f8aed40-89af-4348-be19-c8a67df0b9ea/Energy_Technology_Perspectives_2020_PDF.pdf) [Accessed 18 February 2023]
- IEA (2022). *Buildings*. IEA. Paris [Online] Available at: <https://www.iea.org/reports/buildings> [Accessed 18-02-2023]
- Janda, K.B., Kenington, D., Ruyssevelt, P. & Willan, C. (2021). Pursuing a net-zero carbon future for all: Challenges for commercial real estate. *One Earth*, 4(11), pp. 1530-1533.
- Jarque, C.M. & Bera, A.K. (1987) A Test for Normality of Observations and Regression Residuals. *International Statistical Review*, 55, pp. 163-172.
- Jørgensen, J. M. & Reisinger, P. (2022). *Green Bonds—Stock Price Effects & Issuer Motives: A European Case Study*. Msc. Thesis. Copenhagen Business School, Copenhagen.
- Kazemi, H. & Rahmani, F. (2013). Relationship between information asymmetry and cost of capital. *Management Science Letters*, 3(1), pp. 321-328.
- Kirmani, A. & Rao, A.R. (2000.) No pain, no gain: A critical review of the literature on signaling unobservable product quality. *Journal of Marketing*, 64(2), pp. 66-79
- Kouwenberg, R. & Zheng, C. (2023). A Review of the Global Climate Finance Literature. *Sustainability*, 15(2), pp. 1-32.
- Krivin, D., Patton, R., Rose, E. & Tabak, D. (2003). Determination of the appropriate event window length in individual stock event studies. Available at: SSRN: <https://ssrn.com/abstract=466161>
- Krueger, P., Sautner, Z. & Starks, L.T. (2020). The importance of climate risks for institutional investors. *The Review of Financial Studies*, 33(3), pp. 1067-1111.
- Lebelle, M., Lajili Jarjir, S. & Sassi, S. (2020). Corporate green bond issuances: An international evidence. *Journal of Risk and Financial Management*, 13(2), pp. 25.
- Lintner, J. (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. *The Review of Economics and Statistics*, 47(1), pp. 13-37.
- Lu, S.S. (2021). The green bonding hypothesis: How do green bonds enhance the credibility of environmental commitments? PhD Dissertation. The University of Chicago: Chicago.

- Löffler, K.U., Petreski, A. & Stephan, A. (2021). Drivers of green bond issuance and new evidence on the “greenium”. *Eurasian Economic Review*, 11(1), pp. 1–24.
- MacKinlay, A.C. (1997). Event studies in economics and finance. *Journal of economic literature*, 35(1), pp. 13-39.
- Mansley, N., Wang, Z., Weng, X. & Zhang, W. (2023). Good growth, bad growth: Market reaction to capital raising for REIT expansion. *International Review of Financial Analysis*, 86(1), pp. 1-13.
- McKinsey (2022). *The net-zero transition: What it would cost, what it could bring*. [Online] Available at: <https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/the%20net%20zero%20transition%20what%20it%20would%20cost%20what%20it%20could%20bring/the-net-zero-transition-what-it-would-cost-and-what-it-could-bring-final.pdf> [Accessed 19 February 2023]
- McWilliams, A. & Siegel, D. (1997). Event studies in management research: Theoretical and empirical issues. *Academy of management journal*, 40(3), pp. 626-657.
- Melvin, J. (2018). The split incentives energy efficiency problem: Evidence of underinvestment by landlords, *Energy Policy*, 115(1), pp. 342-352.
- Morri, G. & Jostov, K. (2018). The effect of leverage on the performance of real estate companies: A pan-European post-crisis perspective of EPRA/NAREIT index. *Journal of European Real Estate Research*, 11(3), pp. 284-318.
- Morri, G. & Parri, E. (2017). US REITs capital structure determinants and financial economic crisis effects. *Journal of Property Investment & Finance*, 35(6), pp. 556-574.
- Myers, S. & Majluf, N. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13(2) pp. 187-221.
- Nanayakkara, M. & Colombage, S. (2019). Do investors in green bond market pay a premium? Global evidence. *Applied Economics*, 51(40), pp. 4425-4437.
- Nareit (2021). *Global Real Estate Investment*. [Online] Available at: <https://www.reit.com/investing/global-real-estate-investment> [Accessed 28 February 2023].
- Nareit (2023). *What's a REIT (Real Estate Investment Trust)?*. [Online] Available at: <https://www.reit.com/what-reit> [Accessed 28 February 2023].
- Nowacki, L. (2023). *2022 Fed Rate Hike Impact On Mortgages, Home Buying And More*. Rocket Mortgage. [Online] Available at: <https://www.rocketmortgage.com/learn/fed-rate->

[hike#:~:text=Talk%20to%20our%20Home%20Loan,the%20Fed%20has%20increased%20rates. \[Accessed 29 June 2023\].](#)

- Niccolò, N., Battisti, E., Papa, A. & Miglietta, N. (2020). Shareholder value and dividend policy: The role of ESG strategies, *IEEE International Conference on Technology Management, Operations and Decisions*, 20511407, pp. 1-5
- Niskanen, J., & Falkenbach, H. (2012). European listed real estate: the capital structure perspective. *Nordic Journal of Surveying and Real Estate Research*, 9(1), pp. 76-97.
- Ooi, J.T., Wang, J. & Webb, J.R. (2009). Idiosyncratic risk and REIT returns. *The Journal of Real Estate Finance and Economics*, 38(1), 420-442.
- Ott, S.H., Riddiough, T.J. & Yi, H.C. (2005). Finance, Investment and Investment Performance: Evidence from the REIT Sector. *Real Estate Economics*, 33(1), pp. 203–235.
- Pástor, L., Stambaugh, R.F. & Taylor, L.A. (2022). Dissecting green returns. *Journal of Financial Economics*, 146(2), pp. 403-424.
- Petreski, A., Schäfer, D. & Stephan, A. (2022). *Green Bonds' Reputation Effect and Its Impact on the Financing Costs of the Real Estate Sector*. DIW Berlin Discussion Paper No. 2019. Available at: SSRN: <https://ssrn.com/abstract=4248052> [Accessed 25 January 2023].
- Phuoc, L. T. (2018). Jensen's alpha estimation models in capital asset pricing model. *The Journal of Asian Finance, Economics and Business*, 5(3), pp. 19-29.
- Plebankiewicz, E., Juszczak, M. & Kozik, R. (2019). Trends, costs, and benefits of green certification of office buildings: a Polish perspective. *Sustainability*, 11(8), pp. 1-17.
- PwC (2020). 2022: *The Growth Opportunity of the Century, Are you ready for the ESG change?* [Online] Available at: <https://www.pwc.lu/en/sustainable-finance/esg-report-the-growth-opportunity-of-the-century.html> [Accessed 14 January 2022]
- Riddiough, T. J. & Steiner, E. (2017). *Financial Flexibility and Manager-Shareholder Conflict*. Available at SSRN: <https://ssrn.com/abstract=2975543>
- Riley, J.C. (2001). Silver signals: Twenty-five years of screening and signaling. *Journal of Economic Literature*, 39(2), pp. 432-478.
- Sangiorgi, I. & Schopohl, L. (2021). Explaining green bond issuance using survey evidence: Beyond the greenium. *The British Accounting Review*, 55(1), pp. 1-27.
- Shapiro, S.S. & Wilk, M. B. (1965). An analysis of variance test for normality (complete samples). *Biometrika*, 52(3&4), pp. 591-611.

- Sharpe, W.F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The journal of finance*, 19(3), pp. 425-442.
- Schoenmaker, D. & Planque, V. (2022). *Building Performance Standards aim to reduce carbon emissions across the U.S.* CBRE. [Online] Available at: [http://image.cbcrecommunications.com/lib/fe8213727c6d0d7475/m/2/75941850-5e77-4507-87b2-367eec7bb893.pdf?utm\\_medium=email&utm\\_source=ExactTarget&utm\\_campaign=EA+VP+Building+Performance+Standards+aim+to+reduce+carbon+emissions+across+the+US&utm\\_content=Explore+the+report](http://image.cbcrecommunications.com/lib/fe8213727c6d0d7475/m/2/75941850-5e77-4507-87b2-367eec7bb893.pdf?utm_medium=email&utm_source=ExactTarget&utm_campaign=EA+VP+Building+Performance+Standards+aim+to+reduce+carbon+emissions+across+the+US&utm_content=Explore+the+report) [Accessed 18 February 2023]
- Scruggs, J.T. (2007). Estimating the cross-sectional market response to an endogenous event: Naked vs. underwritten calls of convertible bonds. *Journal of Empirical Finance*, 14(2), pp. 220-247.
- Semieniuk, G., Campiglio, E., Mercure, J.F., Volz, U. & Edwards, N.R. (2021). Low-carbon transition risks for finance. *Wiley Interdisciplinary Reviews: Climate Change*, 12(1), pp. 1-24.
- Stanford Graduate School of Business Library (2023). *Major Financial Databases: A Comparison.* [Online] Available at: <https://web.stanford.edu/group/gsblibrary/guides/financial-db-comparison.pdf> [Accessed 29 April 2023].
- Stiglitz, J.E. (2002). Information and the change in the paradigm in economics. *American Economic Review*, 92(3), pp. 460-501.
- Tang, D. Y. & Zhang, Y. (2020). Do shareholders benefit from green bonds?. *Journal of Corporate Finance*, 61(1), pp. 1-18.
- The World Bank (2019). *10 Years of Green Bonds: Creating the Blueprint for Sustainability Across Capital Markets.* [Online] Available at: <https://www.worldbank.org/en/news/immersive-story/2019/03/18/10-years-of-green-bonds-creating-the-blueprint-for-sustainability-across-capital-markets> [Accessed 25 May 2023].
- Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of money, credit and banking*, 1(1), pp. 15-29.
- UNFCCC (2015). *Paris Agreement: Decision 1/CP.17 - UNFCCC Document FCCC/CP/2015/L.9/Rev.1*, [Online] Available at: <http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf> [Accessed 20 February 2023].
- Van der Ee, S. (2019). *What drives REIT returns?* Msc. Thesis. University of Groningen, Groningen.
- Venturini, A. (2022). Climate change, risk factors and stock returns: A review of the literature. *International Review of Financial Analysis*, 79(1), pp. 1-18.

- Wang, Y., Delgado, M. S. & Xu, J. (2023). When and where does it pay to be green? A look into socially responsible investing and the cost of equity capital. *International Journal of Corporate Social Responsibility*, 8(1), pp. 1-23.
- Weng, H. C. (2022). *Green Bonds Issuance Benefits: Evidence from the Real Estate Sector*. Msc. Thesis. KTH Royal Institute of Technology, Stockholm.
- Wilcoxon, F. (1945) Individual comparisons by ranking methods. *Biometrics*, 1(1) pp. 80–83.
- Wirdenius, F. & Nerlich, C. (2013). *Vasakronan issues the world's first green corporate bond*. Vasakronan. [Online] Available at: <https://vasakronan.se/pressmeddelande/vasakronan-issues-the-worlds-first-green-corporate-bond/> [Accessed 25 May 2023].
- Wobst, J., Gramlich, A., Röttger, P. & Spee, K. (2020). Which is the ‘right’ choice of the market portfolio of the CAPM? *Management Studies*, 10(1), pp. 25-29.
- WRDS. (2020). *Compustat Global in WRDS: The Basics*. [PowerPoint presentation] Available at: <https://wrds-www.wharton.upenn.edu/pages/grid-items/compustat-global-wrds-basics/> [Accessed 17 March 2023].
- Zerbib, O. D. (2019). The effect of pro-environmental preferences on bond prices: Evidence from green bonds. *Journal of Banking & Finance*, 98(1), pp. 39-60.
- Zhang, D., & Du, P. (2020). How China “Going green” impacts corporate performance?. *Journal of Cleaner Production*, 258(1), pp. 1-15.
- Zhang, R., Li, Y. & Liu, Y. (2021). Green bond issuance and corporate cost of capital. *Pacific-Basin Finance Journal*, 69(1), pp. 1-22.

# APPENDICES

## I. REITs

A Real Estate Investment Trust (REIT) is a tradeable company with a core business that revolves around owning and financing income-producing real estate (Nareit, 2023). REITs have been around since the United States Congress signed into the REIT Act title contained in the U.S. Cigar Excise Tax Act in 1960 in order to improve accessibility for investors to invest in real estate, functioning as a driver of economic recovery (Congressional Research Service, 2016).

Direct investments in real estate assets are of large size, lumpy and come with high transaction costs, as the market for real estate is illiquid and heterogenous. Furthermore, real estate assets are characterized by lacking information transparency and require specific know-how and expertise of the investor (Alcock & Steiner, 2017; Harrison et al., 2011; Giacomini et al., 2015; Niskanen & Falkenbach, 2012). REITs aim to overcome the aforementioned barriers of direct real estate investments. As traded indirect real estate investment vehicles, REITs enjoy more liquidity, require less lumpy investments and have lower transaction costs as opposed to direct real estate. REITs provide investors with access to the rental income and capital appreciation potential of all types of income-producing real estate across various countries without the need for real estate expertise and remove the effort required in the acquisition, disposition and management of the asset (Giacomini et al., 2015).

However, until the early 1990s, REITs only made up a small fraction of the total asset market capitalization. The development of new operating structures by resolving previous conflicts of interest between shareholders and the management of REITs caused a fundamental shift and rise in the popularity of REITs (Ambrose & Linneman, 1998)<sup>9</sup>. The rising interest in REITs led to the inclusion of the first REIT in the most popular stock market index, the S&P 500, by October 2001 (McIntosh, 2009, pp. 28). Thereafter, the market capitalization of U.S. REITs saw an average annual increase of 13% (Ryu et al., 2021). As of December 2021, approximately 40 countries have adopted a REIT regime, totalling 865 listed REITs with an approximate market capitalization of \$2.5 trillion (Nareit, 2021).

To put REIT-investments in a comparable position as investments in directly held real estate, REITs enjoy tax benefits that partially or completely remove corporate tax (Niskanen & Falkenbach, 2012). As such, a REIT investor will only pay income tax and is therefore not subject to double taxation, which more closely resembles an investment made in directly held real estate assets. However, in

---

<sup>9</sup> For more information on the development of REITs in the 1990s, interested readers are referred to the publication of Ambrose and Linneman (1998), who provide a comprehensive overview on the development of the subject matter.

order to classify as a REIT, several criteria must be met. The specifics of these criteria may differ from country to country, but broadly follow the same guideline principles (Giacomini et al., 2015).

The criteria to classify as a REIT can be summarized as follows (Niskanen & Falkenbach, 2012):

- The majority of income must be from real estate activities.
- A requirement on the distribution of income and a restriction on the amount of cash retained.
- Operational restrictions, which often entails a minimum amount of shareholders requirement.
- In some cases, REITs are restricted on the amount of leverage they can take on.
- In some countries, REITs must be listed on a public exchange

The criteria that must be met in order to classify as a REIT, combined with their tax-exempt status, results in substantial differences between REITs and other securities, particularly in terms of their investment strategies and capital structures (Van der Ee, 2019). First of all, REITs are restricted to a single asset class, being real estate. Therefore, REITs do not have the ability to diversify their funds into other asset classes such as commodities, equities or bonds, which pose as added costs of financial distress in economically challenging times and a sectoral risk when real estate assets underperform other asset classes (Harrison et al., 2011). Second, as REITs are already tax-exempt, they do not benefit from an interest cost tax shield. Hence, the comparable borrowing costs of REITs are higher than that of other real estate companies (Morri & Jostov, 2018). Indeed, Niskanen & Falkenbach (2012) finds that REITs are consistently less levered than real estate operating companies that are subject to corporate tax. Third, due to their dividend pay-out requirements and limitations on cash retention, REITs are constrained in their abilities to retain significant amounts of capital and have to rely on external sources in order to fund their future investments and growth (Ott et al., 2005).

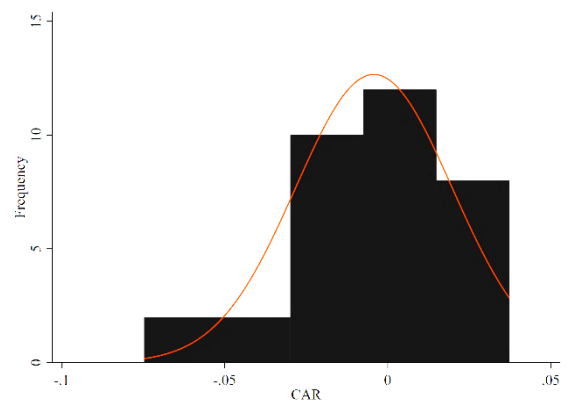
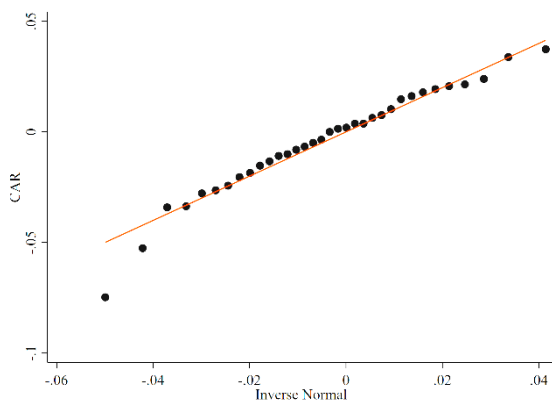


## II. Eyeball Analysis of CAAR distributions

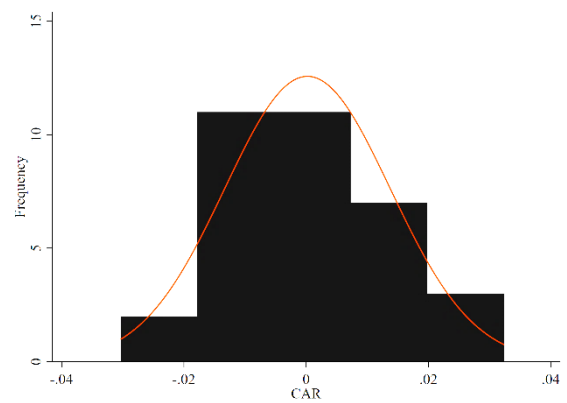
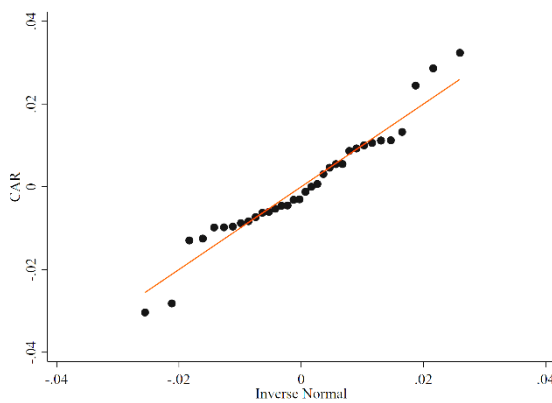
### Market Model

The histograms and Q-Q plots of the CARs over the different event windows may indicate that the CARs are normally distributed, where the histogram indicates resemblance to the classic bell-shape of the normal distribution. In the event windows  $[-1,1]$  and  $[0,1]$ , the distribution is weakly negatively skewed, while in the event window  $[-2,2]$ , the distribution is weakly positively skewed. Based on the Q-Q plots, some event windows show both positive as negative outliers. Lastly, the event windows  $[0,1]$ ,  $[-2,2]$  and  $[-10,10]$  are moderately leptokurtic. However, on aggregate the CARs seem normally distributed.

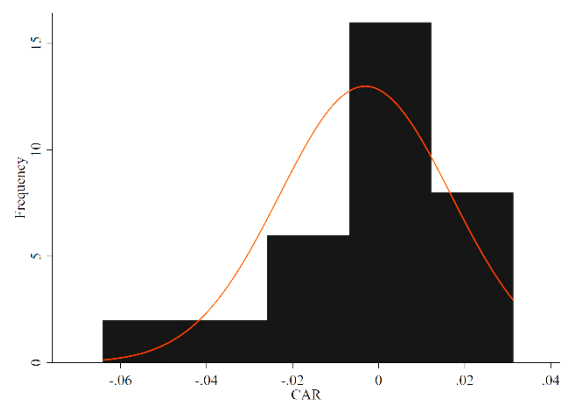
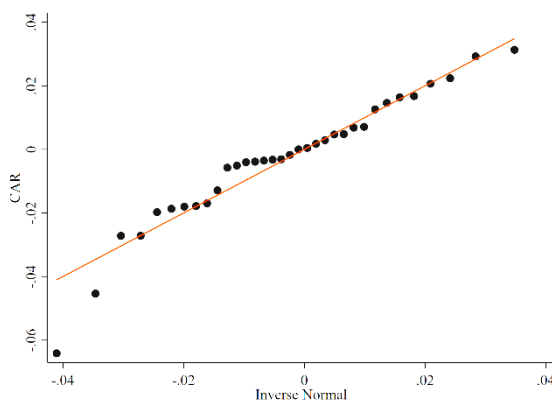
$[-1,1]$



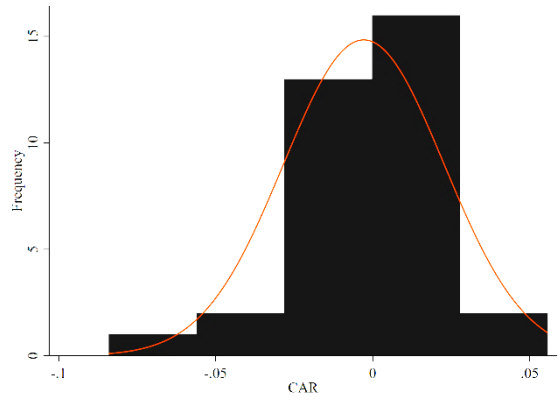
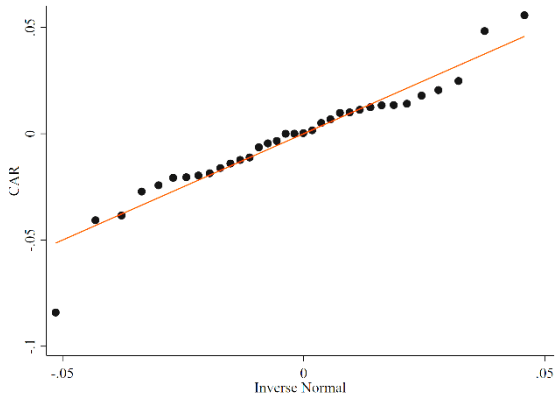
$[0,0]$



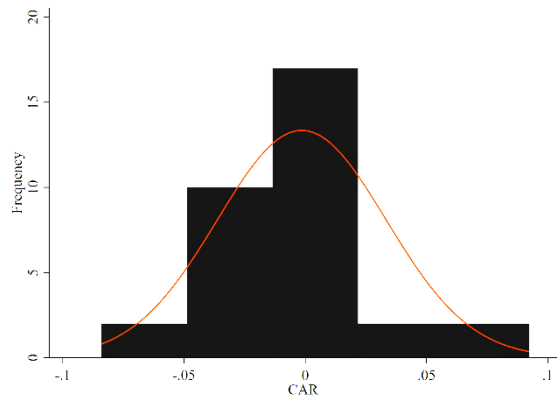
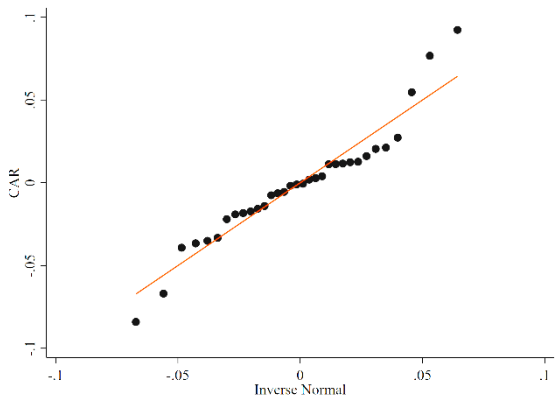
$[0,1]$



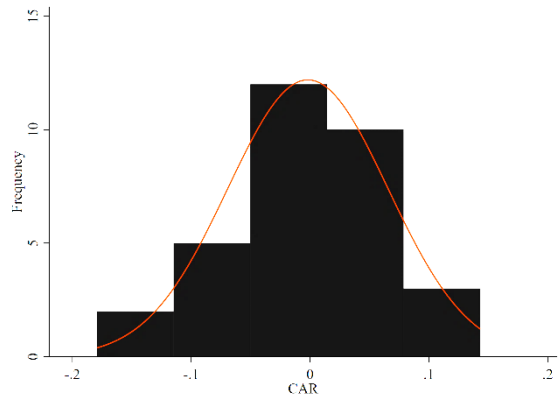
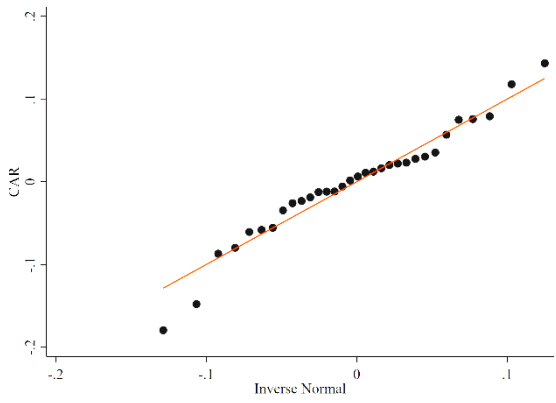
[-1,2]



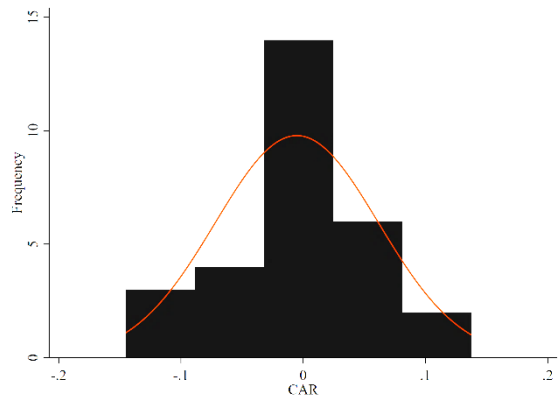
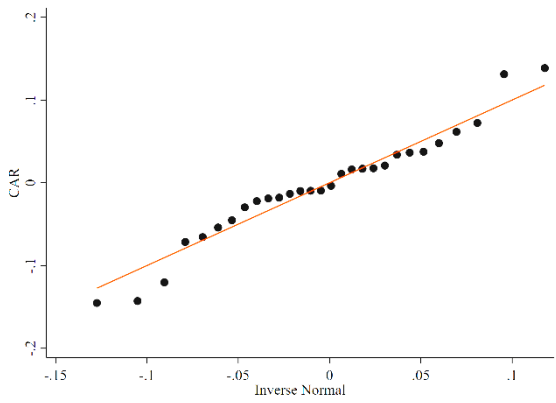
[-2,2]



[-5,10]

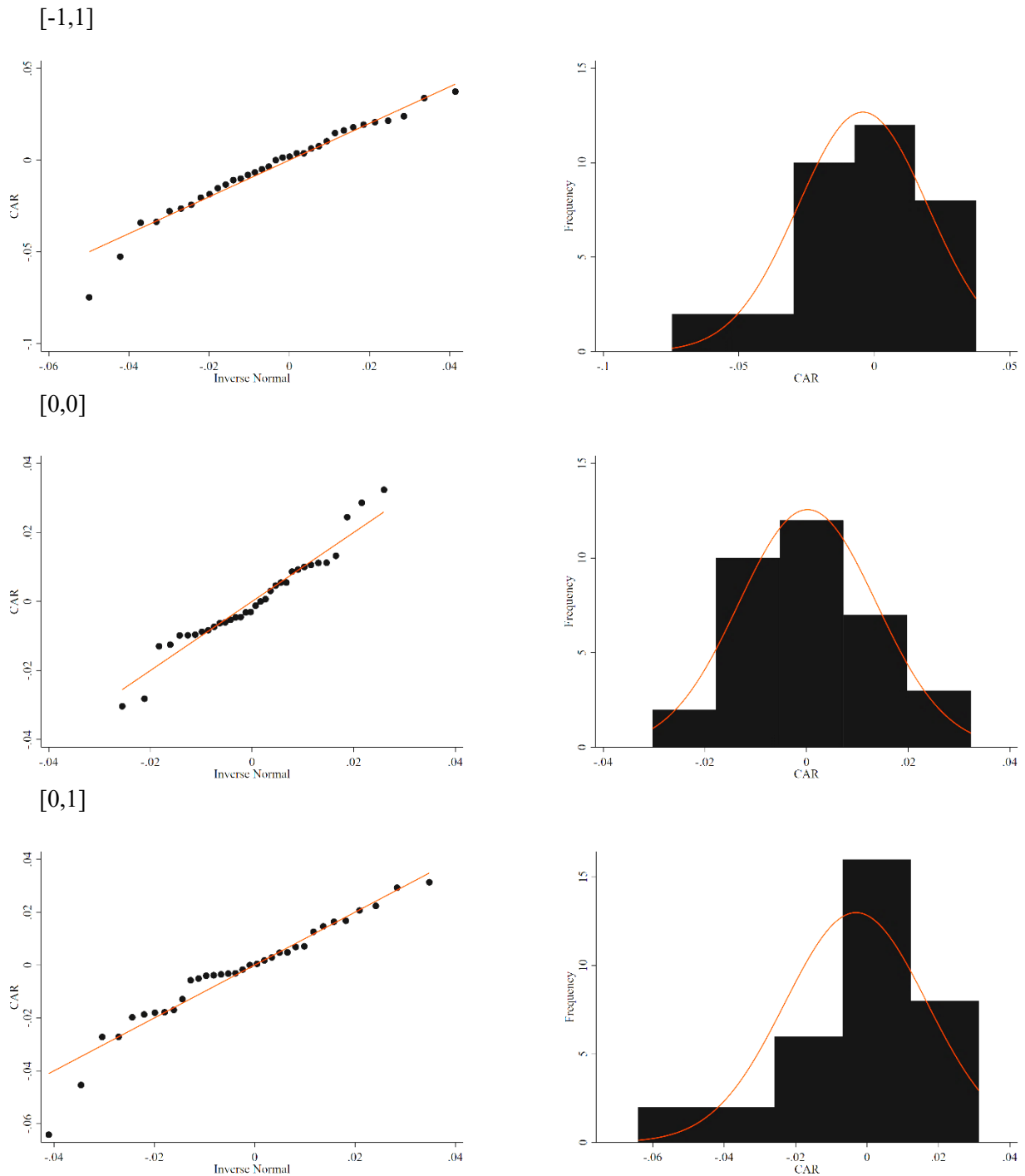


[-10,10]

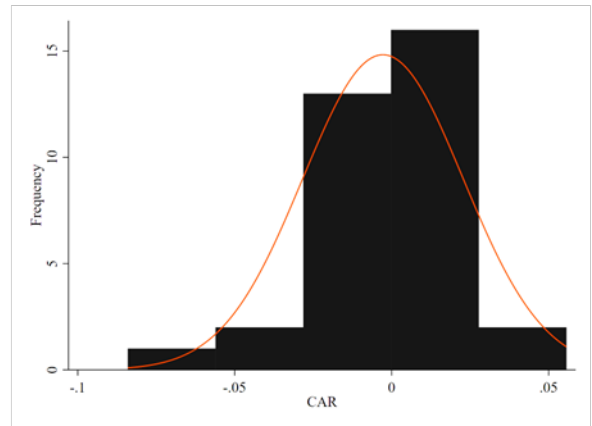
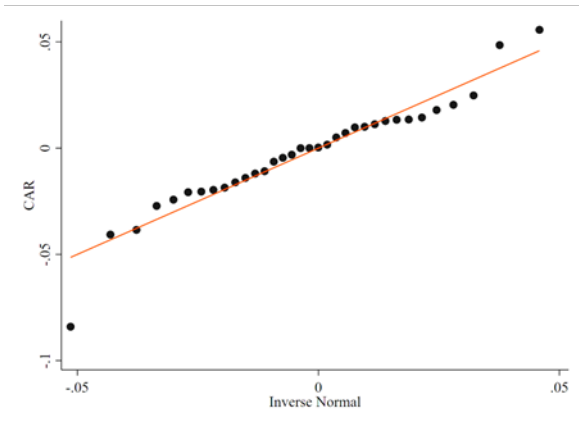


## CAPM

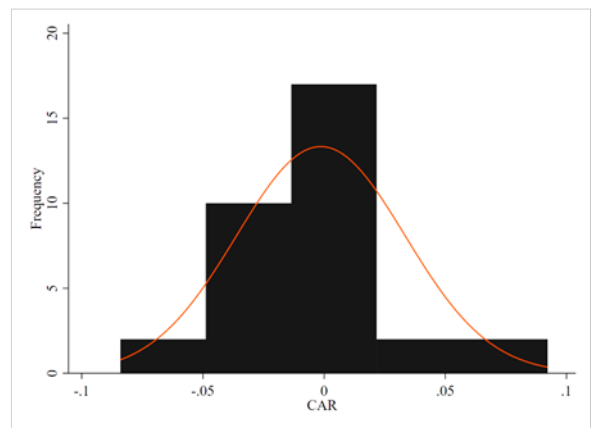
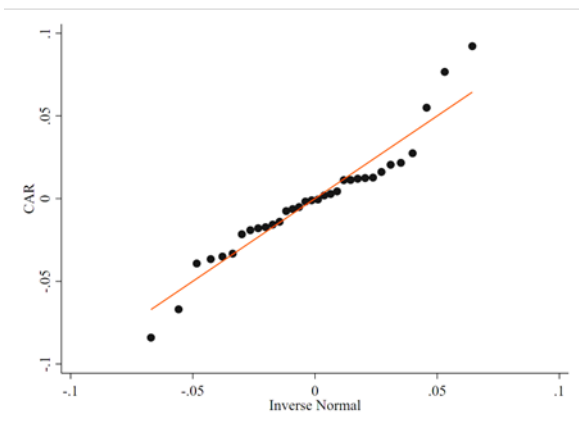
The distribution of the abnormal returns as estimated by the capital asset pricing model at a first glance appear virtually identical to the abnormal returns as estimated by the market model. The CARs are estimated over a period of extremely low interest rates (McCormick, 2019). A result of the low interest rates is a very return on the risk-free rate. The maximum return on the risk-free rate measured in the sample applied in this thesis is only 0.017%. As such, the risk-free rate added in the CAPM has little influence on the estimated CARs and hence yields similar distributions as the market model.



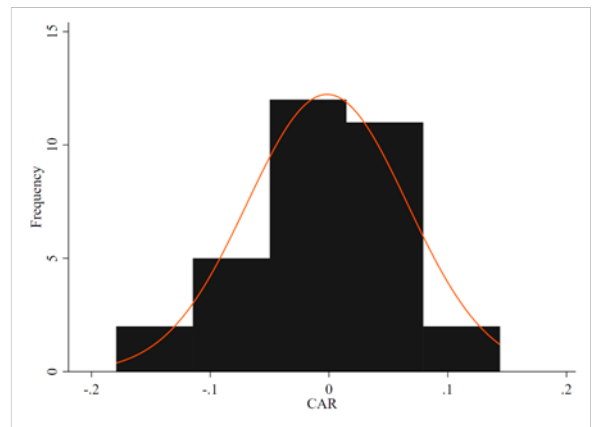
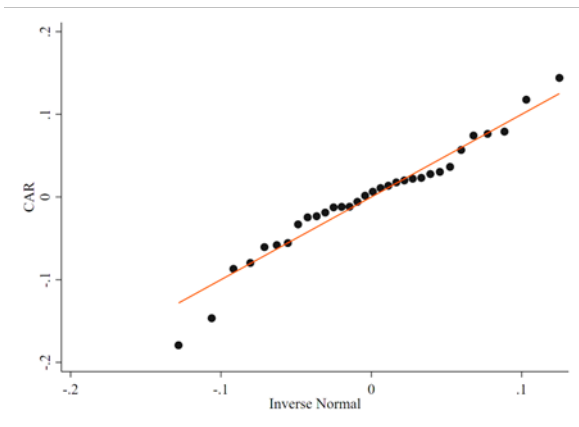
[-1,2]



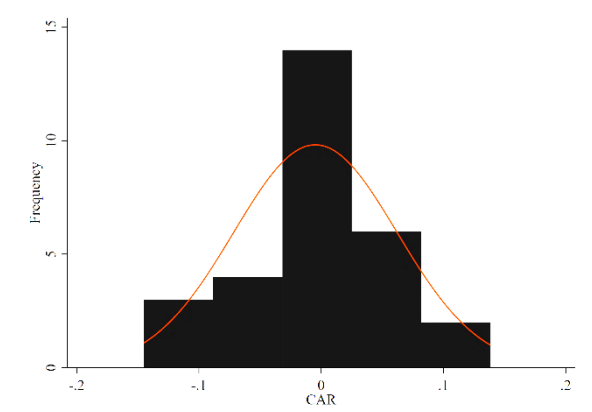
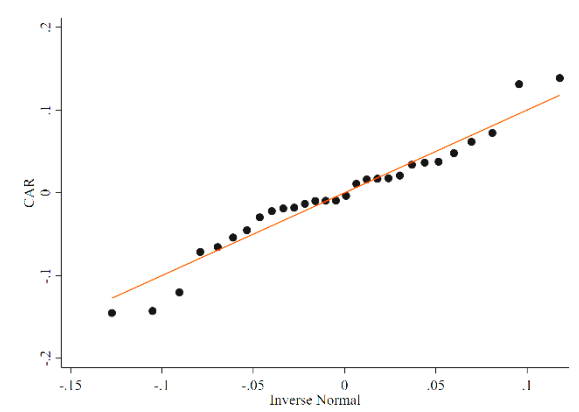
[-2,2]



[-5,10]

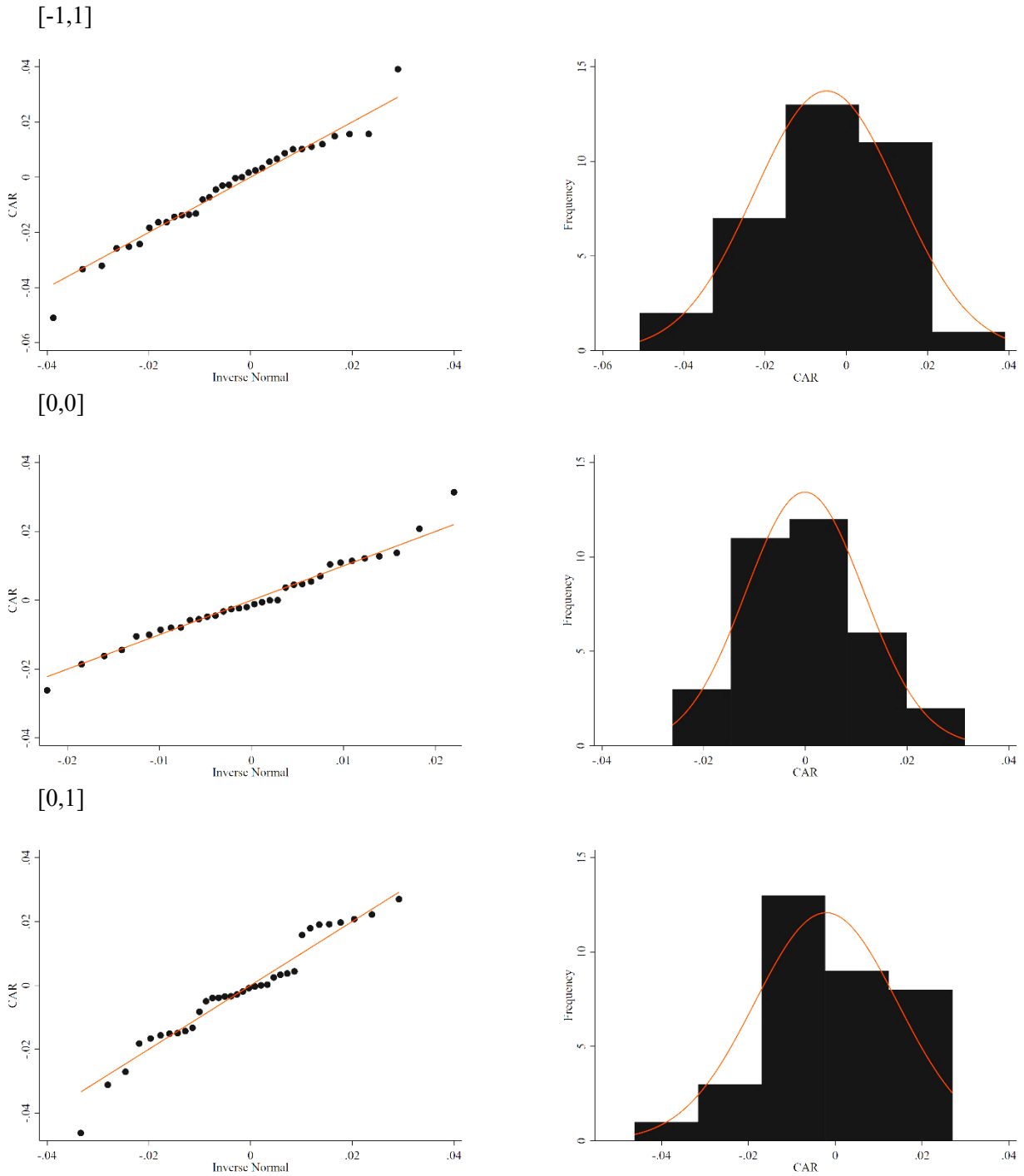


[-10,10]

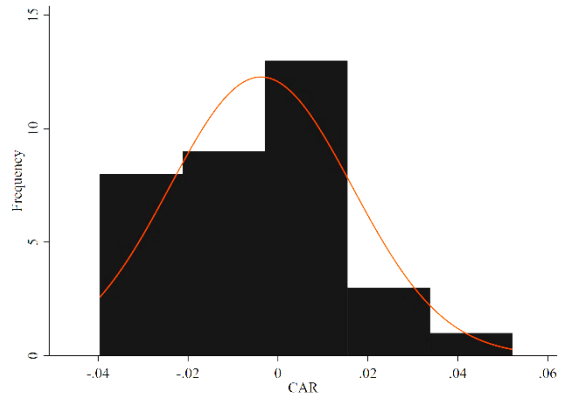
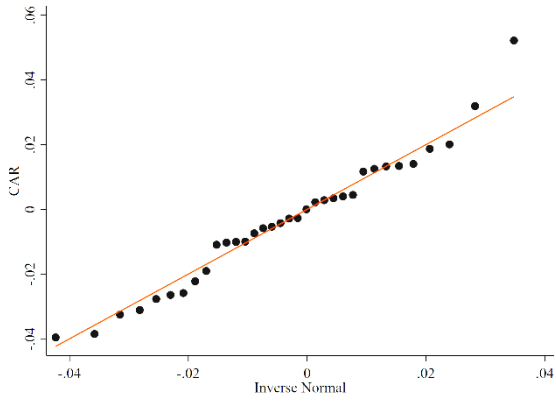


### Fama-French three-factor model

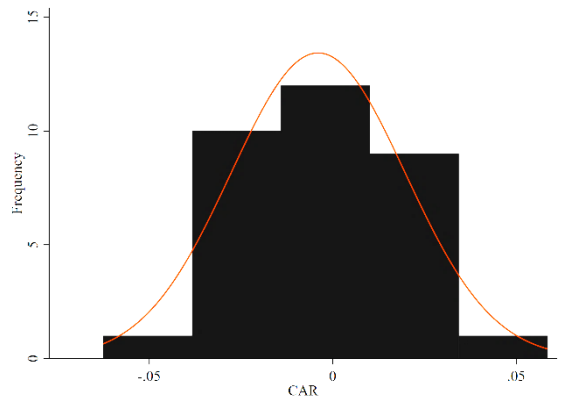
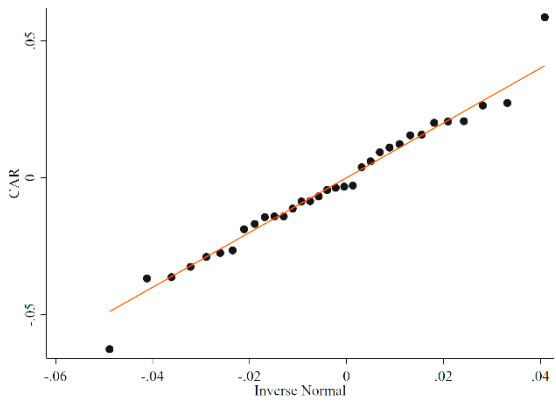
Compared to the distributions of the CARs under the estimations of market model and the CAPM, the estimations of the Fama-French three-factor resemble the classic bell-shaped normal distribution to an even higher degree. Under the event windows  $[-1,1]$ ,  $[-1,2]$  and  $[-2,2]$  there appears to be one non-influential positive outlier. The distributions are less leptokurtic and skewed than under the estimations of the CAPM or market model.



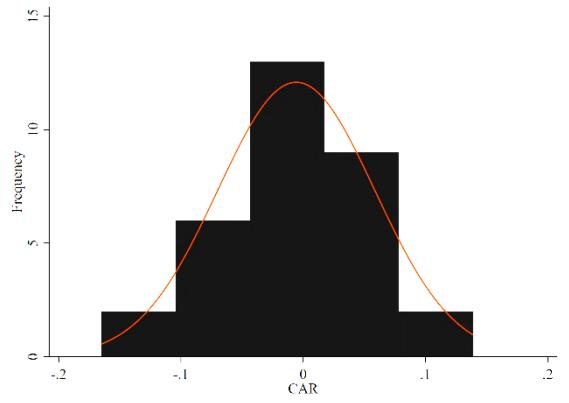
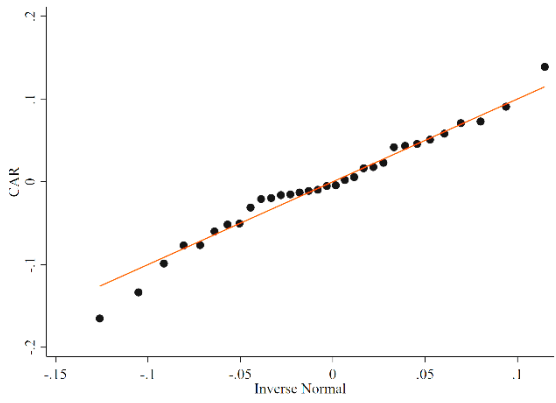
[-1,2]



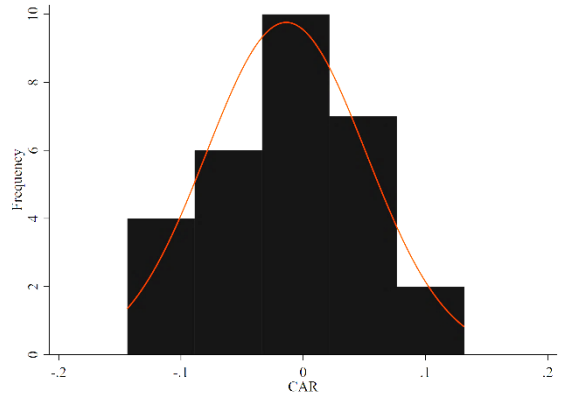
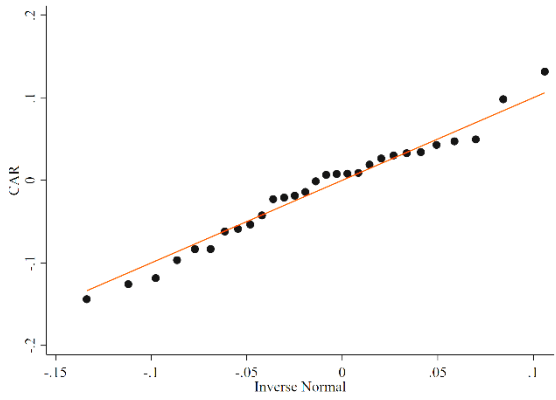
[-2,2]



[-5,10]



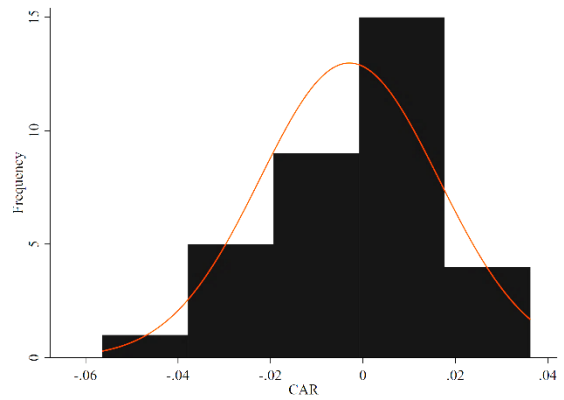
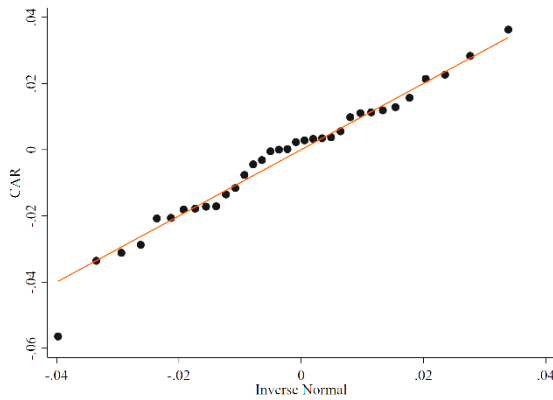
[-10,10]



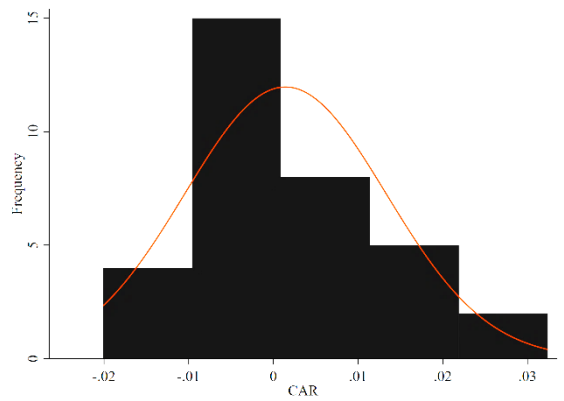
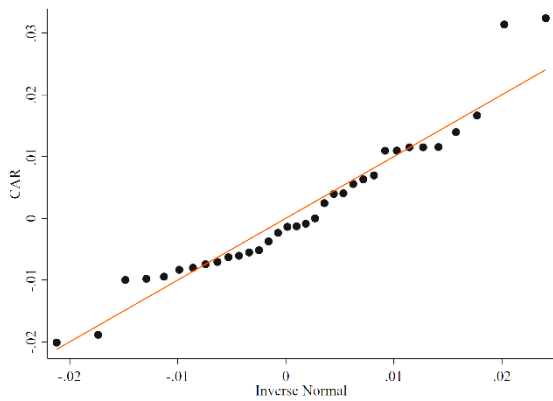
## Carhart four-factor model

Compared to the distributions as estimated under the Fama-French three-factor model, the Carhart four-factor model occasionally shows higher levels of kurtosis (event window  $[-10,10]$ ) and skewness, such as in the event window  $[-1,1]$  (negative) and the event window  $[0,0]$  (positive). In the event window  $[0,0]$  two positive possible influential outliers can be detected. Still, the eyeball analysis does not lead to a different conclusion, and the CARs seem to generally resemble a normal distribution.

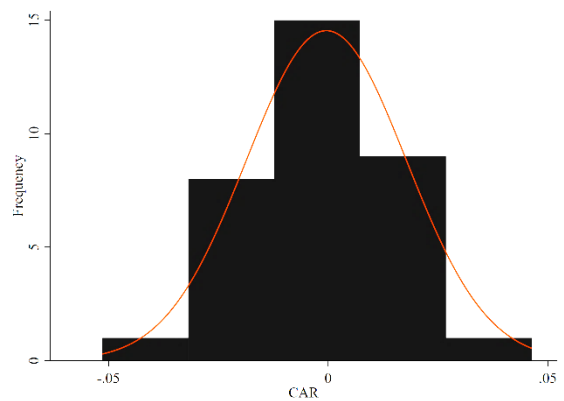
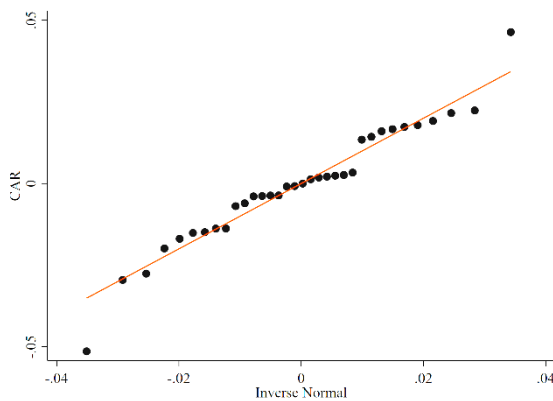
$[-1,1]$



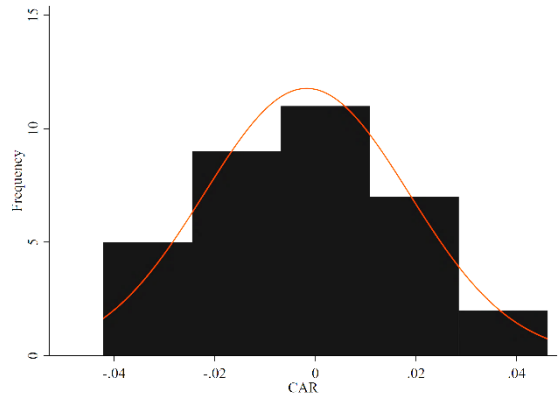
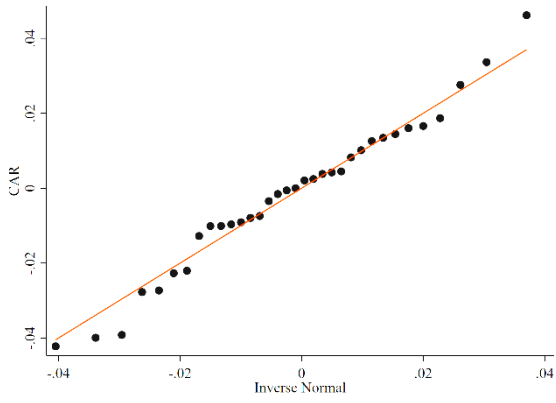
$[0,0]$



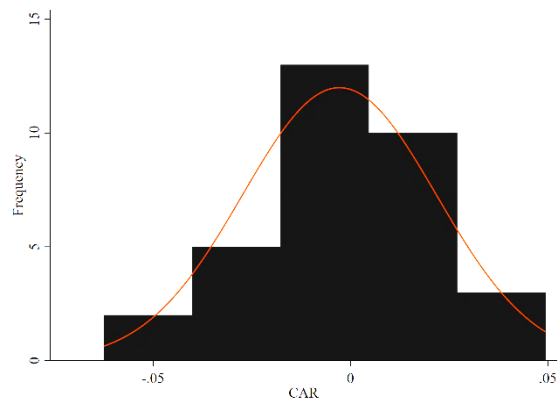
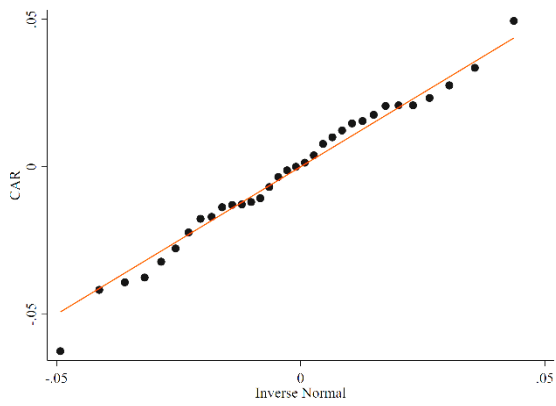
$[0,1]$



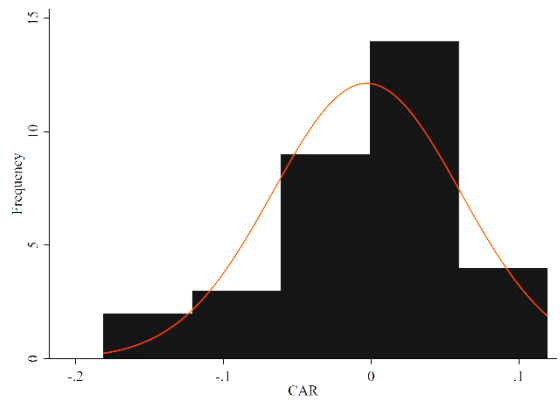
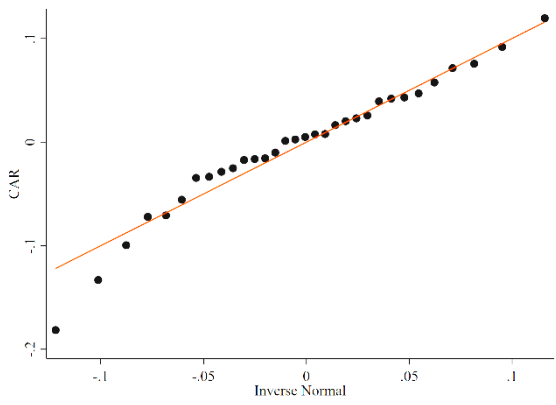
[-1,2]



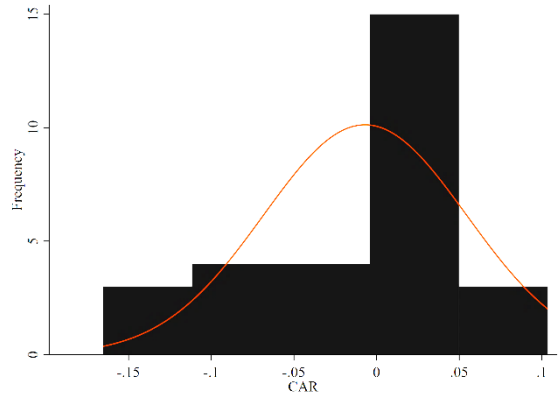
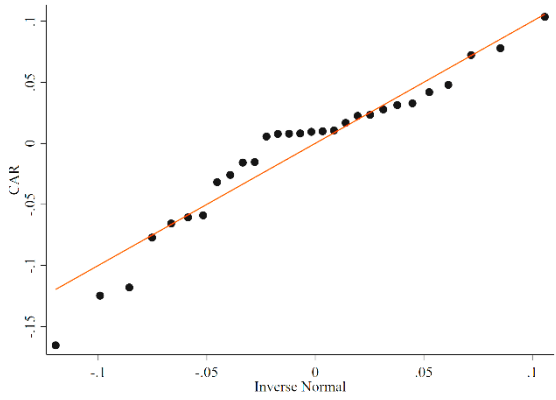
[-2,2]



[-5,10]

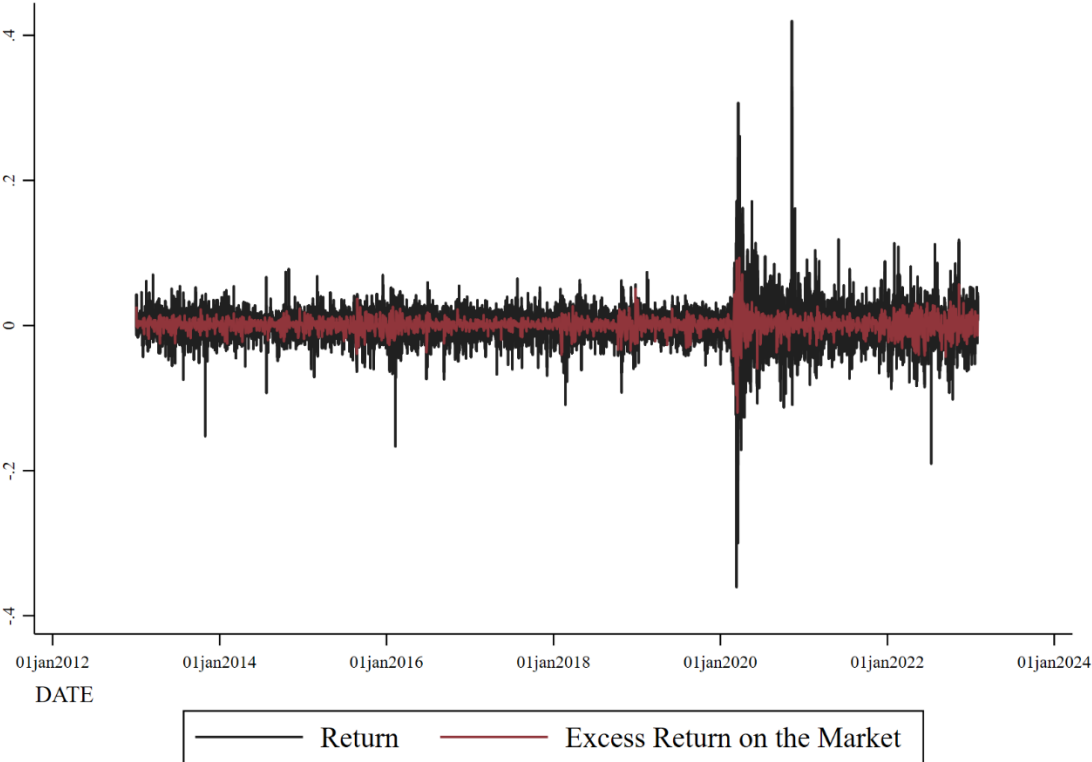


[-10,10]





### III. Time-series plot



The time series plot shows a clear volatility cluster occurring in February/March 2020 up until January 2023. The cluster of volatility fall is most likely attributable to the impact of the Covid-19 virus on global stock markets (Mazur et al., 2021).

## IV. Stata syntax

Before proceeding with the Stata syntax, please be aware of the following notes.

- For convenience, the various steps are dissected in different do-files.
- Some parts of the syntax may require manual adjustments. For example, the event window needs to be manually adjusted to fit the desired event window. The syntax contains instructions on the manual adjustments.
- Possible errors in the syntax are the responsibility of the author and not the thesis supervisor.

### **\*Start of do-file 1**

```
clear all
*For the Firms that issued Green Bonds, the daily information is
merged as follows
*Reshape Price Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergel.xlsx",
sheet("P") firstrow allstring
reshape long FIRM, i(DATE) j(price)
rename FIRM PRICE
rename price FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PRICE.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergel.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PRICE.dta"
destring PRICE, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PRICE.dta",
replace
clear all
*Reshape Volume Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergel.xlsx",
sheet("VOL") firstrow allstring
reshape long FIRM, i(DATE) j(volume)
rename FIRM VOLUME
rename volume FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\VOLUME.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergel.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\VOLUME.dta"
```

```

destring VOLUME, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\VOLUME.dta",
replace
clear all
*Reshape Market Value Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergel.xlsx",
sheet("MV") firstrow allstring
reshape long FIRM, i(DATE) j(marketvalue)
rename FIRM MV
rename marketvalue FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MV.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergel.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MV.dta"
destring MV, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MV.dta",
replace
clear all

*Reshape Dividend Yield Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergel.xlsx",
sheet("DIVY") firstrow allstring
reshape long FIRM, i(DATE) j(DIVY)
rename FIRM DIVYIELD
rename DIVY FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVY.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergel.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVY.dta"
destring DIVYIELD, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVY.dta",
replace
clear all

*Reshape P/E Ratio Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergel.xlsx",
sheet("PER") firstrow allstring

```

```

reshape long FIRM, i (DATE) j (Per)
rename FIRM PER
rename Per FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PER.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergel.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PER.dta"
destring PER, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PER.dta",
replace
clear all

*Merge reshaped data with master key names
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger"
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PRICE.dta"
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\VOLUME.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MV.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVY.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PER.dta"
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED.dta",
replace

*****
*****
*For the Firms that issued Green Bonds, the yearly/quarterly
information is merged as follows
*Reshape Dividends per Share Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("DIVps") firstrow allstring
reshape long FIRM, i (QY) j (divps)
rename FIRM DIVps
rename divps FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVps.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Master") firstrow

```

```

merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVps.dta"
destring DIVps, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVps.dta",
replace
clear all

*Reshape CapEx Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("CapEx") firstrow allstring
reshape long FIRM, i(QY) j(capex)
rename FIRM CapEx
rename capex FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\CapEx.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\CapEx.dta"
destring CapEx, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\CapEx.dta",
replace
clear all

*Reshape Total Assets Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Total Assets") firstrow allstring
reshape long FIRM, i(QY) j(taa)
rename FIRM TotalAssets
rename taa FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total
Assets.dta", replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total Assets.dta"
destring TotalAssets, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total
Assets.dta", replace
clear all

*Reshape Total Debt Green Bond firms
clear all

```

```

import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Total Debt") firstrow allstring
reshape long FIRM, i(QY) j(tdd)
rename FIRM TotalDebt
rename tdd FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total
Debt.dta", replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total Debt.dta"
destring TotalDebt, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total
Debt.dta", replace
clear all

*Reshape EBIT Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("EBIT") firstrow allstring
reshape long FIRM, i(QY) j(ebit)
rename FIRM EBIT
rename ebit FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBIT.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBIT.dta"
destring EBIT, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBIT.dta",
replace
clear all

*Reshape EBITDA Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("EBITDA") firstrow allstring
reshape long FIRM, i(QY) j(ebitda)
rename FIRM EBITDA
rename ebitda FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBITDA.dta",
replace
clear all

```

```

import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBITDA.dta"
destring EBITDA, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBITDA.dta",
replace
clear all

```

```

*Reshape FFO Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("FFO") firstrow allstring
reshape long FIRM, i(QY) j(ffo)
rename FIRM FFO
rename ffo FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\FFO.dta",
replace
clear all

```

```

import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\FFO.dta"
destring FFO, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\FFO.dta",
replace
clear all

```

```

*Reshape ROE Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("ROE") firstrow allstring
reshape long FIRM, i(QY) j(roe)
rename FIRM ROE
rename roe FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\ROE.dta",
replace
clear all

```

```

import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\ROE.dta"
destring ROE, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\ROE.dta",
replace
clear all

```

```

*Reshape Net Income Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Net Income") firstrow allstring
reshape long FIRM, i(QY) j(neti)
rename FIRM NetIncome
rename neti FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Net
Income.dta", replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Net Income.dta"
destring NetIncome, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Net
Income.dta", replace
clear all

*Reshape Common Equity Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Common Equity") firstrow allstring
reshape long FIRM, i(QY) j(comm)
rename FIRM CommonEquity
rename comm FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Common
Equity.dta", replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Common Equity.dta"
destring CommonEquity, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Common
Equity.dta", replace
clear all

*Reshape EPS Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("EPS") firstrow allstring
reshape long FIRM, i(QY) j(eps)
rename FIRM EnvPillarScore
rename eps FIRM
order FIRM

```



```

save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EnvPillarScore.dta"
, replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EnvPillarScore.dta"
destring EnvPillarScore, replace force
drop _merge
save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EnvPillarScore.dta"
, replace
clear all

*Merge reshaped data with master key names
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger"
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVps.dta"
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\CapEx.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total Assets.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total Debt.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBIT.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBITDA.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\FFO.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\ROE.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Net Income.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Common Equity.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EnvPillarScore.dta"
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGEDQ.dta",
replace

*****
clear all
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED.dta"

```

```

*Generate and format a Date variable based on the string Date
variable of the dataset
gen DATEvar = date(DATE, "MDY")
format DATEvar %td
drop DATE
rename DATEvar DATE

*Generation of Year, Month and Quarter dates. The purpose of these
variables is to generate the QY variable, which contains the same
string information as the quarterly financial dataset which will be
merged in the master dataset later on.
gen MONTH = month(DATE)
gen QUARTER = ceil(MONTH/3)
replace QUARTER = 4 if QUARTER == 0
gen YEAR = year(DATE)
gen QY = "Q" + string(QUARTER) + " " + string(YEAR)

*Merging of the daily dataset with the quarterly Firm financials
dataset
merge m:m FIRM QY using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGEDQ.dta"
tab _merge
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED.dta",
replace

*Start of do file 2

clear all

*For the Firms that issued Regular Bonds
*Reshape Price Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Merge2.xlsx",
sheet("P") firstrow allstring
reshape long FIRM, i(DATE) j(price)
rename FIRM PRICE
rename price FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PRICE2.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Merge2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PRICE2.dta"
destring PRICE, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PRICE2.dta",
replace
clear all

*Reshape Volume Green Bond firms
clear all

```

```

import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Merge2.xlsx",
sheet("VOL") firstrow allstring
reshape long FIRM, i(DATE) j(volume)
rename FIRM VOLUME
rename volume FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\VOLUME2.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Merge2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\VOLUME2.dta"
destring VOLUME, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\VOLUME2.dta",
replace
clear all

*Reshape Market Value Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Merge2.xlsx",
sheet("MV") firstrow allstring
reshape long FIRM, i(DATE) j(marketvalue)
rename FIRM MV
rename marketvalue FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MV2.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Merge2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MV2.dta"
destring MV, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MV2.dta",
replace
clear all

*Reshape Dividend Yield Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Merge2.xlsx",
sheet("DIVY") firstrow allstring
reshape long FIRM, i(DATE) j(DIVY)
rename FIRM DIVYIELD
rename DIVY FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVY2.dta",
replace
clear all

```

```

import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Merge2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVY2.dta"
destring DIVYIELD, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVY2.dta",
replace
clear all

*Reshape P/E Ratio Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Merge2.xlsx",
sheet("PER") firstrow allstring
reshape long FIRM, i(DATE) j(Per)
rename FIRM PER
rename Per FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PER2.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Merge2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PER2.dta"
destring PER, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PER2.dta",
replace
clear all

*Merge reshaped data with master key names
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger"
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PRICE2.dta"
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\VOLUME2.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MV2.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVY2.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PER2.dta"
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED2.dta",
replace

*****
*****
*For the Firms that issued Green Bonds, the yearly/quarterly
information is merged as follows

```

```

*Reshape Dividends per Share Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("DIVps") firstrow allstring
reshape long FIRM, i(QY) j(divps)
rename FIRM DIVps
rename divps FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVps2.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVps2.dta"
destring DIVps, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVps2.dta",
replace
clear all

```

```

*Reshape CapEx Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("CapEx") firstrow allstring
reshape long FIRM, i(QY) j(capex)
rename FIRM CapEx
rename capex FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\CapEx2.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\CapEx2.dta"
destring CapEx, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\CapEx2.dta",
replace
clear all

```

```

*Reshape Total Assets Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Total Assets") firstrow allstring
reshape long FIRM, i(QY) j(taa)
rename FIRM TotalAssets
rename taa FIRM
order FIRM

```

```

save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total
Assets2.dta", replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total Assets2.dta"
destring TotalAssets, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total
Assets2.dta", replace
clear all

```

```

*Reshape Total Debt Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Total Debt") firstrow allstring
reshape long FIRM, i(QY) j(tdd)
rename FIRM TotalDebt
rename tdd FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total
Debt2.dta", replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total Debt2.dta"
destring TotalDebt, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total
Debt2.dta", replace
clear all

```

```

*Reshape EBIT Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("EBIT") firstrow allstring
reshape long FIRM, i(QY) j(ebit)
rename FIRM EBIT
rename ebit FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBIT2.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBIT2.dta"
destring EBIT, replace force
drop _merge

```

```

save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBIT2.dta",
replace
clear all

*Reshape EBITDA Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("EBITDA") firstrow allstring
reshape long FIRM, i(QY) j(ebitda)
rename FIRM EBITDA
rename ebitda FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBITDA2.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBITDA2.dta"
destring EBITDA, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBITDA2.dta",
replace
clear all

*Reshape FFO Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("FFO") firstrow allstring
reshape long FIRM, i(QY) j(ffo)
rename FIRM FFO
rename ffo FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\FFO2.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\FFO2.dta"
destring FFO, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\FFO2.dta",
replace
clear all

*Reshape ROE Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("ROE") firstrow allstring
reshape long FIRM, i(QY) j(roe)

```

```

rename FIRM ROE
rename roe FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\ROE2.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\ROE2.dta"
destring ROE, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\ROE2.dta",
replace
clear all

*Reshape Net Income Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Net Income") firstrow allstring
reshape long FIRM, i(QY) j(neti)
rename FIRM NetIncome
rename neti FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Net
Income2.dta", replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Net Income2.dta"
destring NetIncome, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Net
Income2.dta", replace
clear all

*Reshape Common Equity Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Common Equity") firstrow allstring
reshape long FIRM, i(QY) j(comm)
rename FIRM CommonEquity
rename comm FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Common
Equity2.dta", replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Master") firstrow

```



```

merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Common Equity2.dta"
destring CommonEquity, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Common
Equity2.dta", replace
clear all
*Reshape EPS Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("EPS") firstrow allstring
reshape long FIRM, i(QY) j(eps)
rename FIRM EnvPillarScore
rename eps FIRM
order FIRM
save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EnvPillarScore2.dta
", replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY2.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EnvPillarScore2.dta
"
destring EnvPillarScore, replace force
drop _merge
save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EnvPillarScore2.dta
", replace
clear all

*Merge reshaped data with master key names
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger"
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVps2.dta"
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\CapEx2.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total Assets2.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total Debt2.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBIT2.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBITDA2.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\FFO2.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\ROE2.dta"

```

```

drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Net Income2.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Common Equity2.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EnvPillarScore2.dta"
"
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGEDQ2.dta",
replace

```

\*\*\*\*\*

```

clear all
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED2.dta"

```

```

*Generate and format a Date variable based on the string Date
variable of the dataset
gen DATEvar = date(DATE, "MDY")
format DATEvar %td
drop DATE
rename DATEvar DATE

```

```

*Generation of Year, Month and Quarter dates. The purpose of these
variables is to generate the QY variable, which contains the same
string information as the quarterly financial dataset which will be
merged in the master dataset later on.
gen MONTH = month(DATE)
gen QUARTER = ceil(MONTH/3)
replace QUARTER = 4 if QUARTER == 0
gen YEAR = year(DATE)
gen QY = "Q" + string(QUARTER) + " " + string(YEAR)

```

```

*Merging of the daily dataset with the quarterly Firm financials
dataset
merge m:m FIRM QY using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGEDQ2.dta"
tab _merge
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED2.dta",
replace

```

### **\*Start of Do-File 3**

```

clear all

```

```

*Merge the Files containing the firm level data
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger"
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED.dta"
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED2.dta"
drop _merge
sort FIRM

```

```

save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED3.dta",
replace

*Merge firm level data with Fama-French 3 factor model
clear all
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Data\Fama-french 3
factors"
import excel "C:\Users\julia\OneDrive\Dokumente\THESIS\Data\Fama-
french 3 factors\fama french 3fm in xlsx.xlsx", firstrow

rename RiskFreeReturnRateOneMonth RF1mo
rename ConservativeMinusAggressiveRe CMA
rename ExcessReturnontheMarket Rm
rename SmallMinusBigReturn SMB
rename HighMinusLowReturn HML
rename RobustMinusWeakReturn RMW
rename Momentum MOM
rename Date DATE
format DATE %td
tab DATE

save "C:\Users\julia\OneDrive\Dokumente\THESIS\Data\FF3.dta",
replace

cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED3.dta"
merge m:m DATE using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Data\FF3.dta"
tab _merge
drop _merge

save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED4.dta",
replace

*Data formatting and Clean-Up of Green Bond data
clear all
import excel "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Bond
Data\Green Bonds VS.xlsx", firstrow
format Maturity %td
format IssueDate %td

drop MoodysRating
drop SPRating
drop U
drop FitchsRating
drop IssuerName
drop MaturityDate
drop ParentTicker
drop IndustrySubSectorDescription
drop PreferredRIC
drop Currency
drop OriginalIssueCurrency
drop AJ
drop YieldType
drop IssuerCountry
drop FaceIssuedTotal

```

```

drop YieldTypeDescription
drop CouponEffectiveDate
drop CountryName
drop CouponCurrency
drop OriginalAmountIssued
drop RatingSourceTypeDescription

gen Announcement = date(FirstAnnouncementDate, "YMD")
format Announcement %td

format AmountIssuedUSD %14.2fc

drop FirstAnnouncementDate

drop if missing(FIRM)
drop if missing(Announcement)

destring Coupon, replace

save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Bond
Data\Green Bonds.dta", replace

*Data formatting and Clean-Up of Conventional Bond data
clear all
import excel "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Bond
Data\non green bonds.xlsx", firstrow
format Maturity %td
format IssueDate %td

drop MoodysRating
drop SPRating
drop FitchsRating
drop IssuerName
drop MaturityDate
drop PreferredRIC
drop Currency
drop YieldType
drop FaceIssuedTotal
drop CouponEffectiveDate
drop CountryName
drop T
drop AB
drop X
drop Z
drop S
drop W
drop IndustrySubSector
drop YieldToMaturity

gen Announcement = date(FirstAnnouncementDate, "YMD")
format Announcement %td

destring AmountIssuedUSD, ignore("--") replace
format AmountIssuedUSD %14.2fc

drop OriginalAmountIssued

```

```

drop FirstAnnouncementDate

drop if missing(FIRM)
drop if missing(Announcement)

tab Coupon
describe Coupon
summarize Coupon
destring Coupon, replace

save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Bond
Data\Conventional Bonds.dta", replace

*Merging bond data
merge m:m GreenBond using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Bond Data\Green
Bonds.dta"
drop _merge
sort FIRM
rename Announcement DATE

*Remove Bonds before 2013 (first issuance year of the green bond)
that have accidentally reached the dataset
drop if DATE < date("01jan2013", "DMY")
tab Maturity

*Check for bond duplicates (whether two bonds with identical
features have been issued on the same day) Duplicates entail
identical bonds, workaround can be achieved by doubling the issuance
amount and dropping the duplicates
duplicates report FIRM DATE Coupon AmountIssuedUSD
duplicates list FIRM DATE Coupon AmountIssuedUSD
duplicates tag FIRM DATE Coupon AmountIssuedUSD, gen(Duplicates)
gsort - Duplicates DATE
replace AmountIssuedUSD = AmountIssuedUSD * 2 if Duplicates == 1
egen seq = seq()
drop if Duplicates == 1 & mod(seq, 2) == 0
tab GreenBond
drop Duplicates seq

*****
duplicates report FIRM DATE Coupon AmountIssuedUSD Maturity
IssueDate GreenBond CountryofIssue
duplicates report FIRM DATE Coupon AmountIssuedUSD Maturity
IssueDate CountryofIssue
duplicates report FIRM DATE Coupon AmountIssuedUSD Maturity
CountryofIssue

*Duplicates only contain Commercial Papers with a discount Coupon
Type and missing issuance amount, they can therefore be dropped
duplicates report FIRM DATE Coupon AmountIssuedUSD CountryofIssue
duplicates list FIRM DATE Coupon AmountIssuedUSD CountryofIssue
duplicates tag FIRM DATE Coupon AmountIssuedUSD CountryofIssue,
gen(Duplicates)
gsort - Duplicates DATE

```

```

drop if Duplicates == 2
drop if Duplicates == 4
tab GreenBond
drop Duplicates

```

```

*Duplicates where the identical Bond has been Issued as a US bond
and Eurobond simultaneously, workaround can be achieved by doubling
the issuance amount and dropping the duplicates
duplicates report FIRM DATE Coupon AmountIssuedUSD
duplicates list FIRM DATE Coupon AmountIssuedUSD
duplicates tag FIRM DATE Coupon AmountIssuedUSD, gen(Duplicates)
gsort - Duplicates DATE Maturity
replace AmountIssuedUSD = AmountIssuedUSD * 2 if Duplicates == 1
egen seq = seq()
drop if Duplicates == 1 & mod(seq, 2) == 0
drop Duplicates seq

```

```

duplicates report FIRM DATE Coupon
duplicates list FIRM DATE Coupon
duplicates tag FIRM DATE Coupon, gen(Duplicates)
gsort - Duplicates DATE

```

```

*Duplicates contain large discrepancy in announcement date and
issuance date (Multiple years) and concerns Preferred Securities,
can therefore be safely dropped
drop if Duplicates == 10

```

```

*Duplicates where the Issuance Amount differs while all other values
are equal, the Issuance amounts need to be summed conditional on the
FIRM and whether the observation is a duplicate before dropping the
duplicates
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 10,
AmountIssuedUSD, .))
replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 10
drop sumAmount
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 119,
AmountIssuedUSD, .))
replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 119
drop sumAmount
egen seq = seq()
drop if Duplicates == 1 & mod(seq, 2) == 0
drop Duplicates seq

```

```

*Multiple duplicate issuances where issuance amount, maturity date
and Coupon rate may differ. Issuance amount is summed, while
maturity date and couponrate are weighted conditional on total
issuance amount, all other variables are equal, duplicates are then
dropped. The observation is therefore considered as if all bond
issuances by FIRM j on DATE t are pooled with a weighted average
coupon rate and maturity, with a total summed issuance volume. All
alterations from hereforth onwards are triple hand-checked on
errors.

```

```

*Realty Income Corp
duplicates report FIRM DATE
duplicates list FIRM DATE

```

```

duplicates tag FIRM DATE, gen(Duplicates)
gsort - Duplicates DATE

egen sumAmount = total(cond(Duplicates == 7 & FIRM == 46,
AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 7 & FIRM == 46,
Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 7 & FIRM == 46,
Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 7 & FIRM == 46,
Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 7 & FIRM == 46,
OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 7 & FIRM == 46,
OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 7 & FIRM == 46
replace Coupon = sumCoupon if Duplicates == 7 & FIRM == 46
replace CouponRate = sumCoupon if Duplicates == 7 & FIRM == 46
replace Maturity = sumMaturity if Duplicates == 7 & FIRM == 46
replace IssuePrice = sumIssue if Duplicates == 7 & FIRM == 46
replace OriginalSpread = sumOGSspread if Duplicates == 7 & FIRM == 46
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 7 &
FIRM == 46

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 7 & seq > 1
drop seq

*Prologis
egen sumAmount = total(cond(Duplicates == 6 & FIRM == 10,
AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 6 & FIRM == 10,
Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 6 & FIRM == 10,
Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 6 & FIRM == 10,
Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 6 & FIRM == 10,
OGMaturity_weighted, .))

```

```

gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 6 & FIRM == 10,
OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 6 & FIRM == 10
replace Coupon = sumCoupon if Duplicates == 6 & FIRM == 10
replace CouponRate = sumCoupon if Duplicates == 6 & FIRM == 10
replace Maturity = sumMaturity if Duplicates == 6 & FIRM == 10
replace IssuePrice = sumIssue if Duplicates == 6 & FIRM == 46
replace OriginalSpread = sumOGSspread if Duplicates == 6 & FIRM == 10
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 6 &
FIRM == 10

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 6 & seq > 2
drop seq

*Equinix
egen sumAmount = total(cond(Duplicates == 3 & FIRM == 4,
AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 3 & FIRM == 4,
Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 3 & FIRM == 4,
Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 3 & FIRM == 4,
Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 3 & FIRM == 4,
OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 3 & FIRM == 4,
OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 3 & FIRM == 4
replace Coupon = sumCoupon if Duplicates == 3 & FIRM == 4
replace CouponRate = sumCoupon if Duplicates == 3 & FIRM == 4
replace Maturity = sumMaturity if Duplicates == 3 & FIRM == 4
replace IssuePrice = sumIssue if Duplicates == 3 & FIRM == 4
replace OriginalSpread = sumOGSspread if Duplicates == 3 & FIRM == 4
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 3 &
FIRM == 4

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 3 & seq > 3
drop seq

```



```

*Simon Property Group
egen sumAmount = total(cond(Duplicates == 2 & DATE == mdy(9, 4,
2019) & FIRM == 50, AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 2 & FIRM == 50 & DATE ==
mdy(9, 4, 2019), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 2 & FIRM == 50 & DATE ==
mdy(9, 4, 2019), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 2 & FIRM == 50 & DATE ==
mdy(9, 4, 2019), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 2 & FIRM == 50 & DATE
== mdy(9, 4, 2019), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 2 & FIRM == 50 & DATE ==
mdy(9, 4, 2019), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 2 & FIRM == 50
& DATE == mdy(9, 4, 2019)
replace Coupon = sumCoupon if Duplicates == 2 & FIRM == 50 & DATE ==
mdy(9, 4, 2019)
replace CouponRate = sumCoupon if Duplicates == 2 & FIRM == 50 &
DATE == mdy(9, 4, 2019)
replace Maturity = sumMaturity if Duplicates == 2 & FIRM == 50 &
DATE == mdy(9, 4, 2019)
replace IssuePrice = sumIssue if Duplicates == 2 & FIRM == 50 & DATE
== mdy(9, 4, 2019)
replace OriginalSpread = sumOGSpread if Duplicates == 2 & FIRM == 50
& DATE == mdy(9, 4, 2019)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 2 &
FIRM == 50 & DATE == mdy(9, 4, 2019)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 2 & seq == 5
drop if Duplicates == 2 & seq == 6
drop seq

*Service Properties Trust
egen sumAmount = total(cond(Duplicates == 2 & FIRM == 121 & DATE ==
mdy(9, 10, 2019), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 2 & FIRM == 121 & DATE ==
mdy(9, 10, 2019), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 2 & FIRM == 121 & DATE
== mdy(9, 10, 2019), Maturity_weighted, .))
format sumMaturity %td

```

```

gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 2 & FIRM == 121 & DATE ==
mdy(9, 10, 2019), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 2 & FIRM == 121 & DATE
== mdy(9, 10, 2019), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 2 & FIRM == 121 & DATE
== mdy(9, 10, 2019), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 2 & FIRM == 121
& DATE == mdy(9, 10, 2019)
replace Coupon = sumCoupon if Duplicates == 2 & FIRM == 121 & DATE
== mdy(9, 10, 2019)
replace CouponRate = sumCoupon if Duplicates == 2 & FIRM == 121 &
DATE == mdy(9, 10, 2019)
replace Maturity = sumMaturity if Duplicates == 2 & FIRM == 121 &
DATE == mdy(9, 10, 2019)
replace IssuePrice = sumIssue if Duplicates == 2 & FIRM == 121 &
DATE == mdy(9, 10, 2019)
replace OriginalSpread = sumOGSspread if Duplicates == 2 & FIRM ==
121 & DATE == mdy(9, 10, 2019)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 2 &
FIRM == 121 & DATE == mdy(9, 10, 2019)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 2 & seq == 6 & DATE == mdy(9, 10, 2019)
drop if Duplicates == 2 & seq == 7 & DATE == mdy(9, 10, 2019)
drop seq

*Equinix#2
egen sumAmount = total(cond(Duplicates == 2 & FIRM == 4 & DATE ==
mdy(11, 6, 2019), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 2 & FIRM == 4 & DATE ==
mdy(11, 6, 2019), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 2 & FIRM == 4 & DATE ==
mdy(11, 6, 2019), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 2 & FIRM == 4 & DATE ==
mdy(11, 6, 2019), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 2 & FIRM == 4 & DATE
== mdy(11, 6, 2019), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 2 & FIRM == 4 & DATE ==
mdy(11, 6, 2019), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 2 & FIRM == 4 &
DATE == mdy(11, 6, 2019)

```

```

replace Coupon = sumCoupon if Duplicates == 2 & FIRM == 4 & DATE ==
mdy(11, 6, 2019)
replace CouponRate = sumCoupon if Duplicates == 2 & FIRM == 4 & DATE
== mdy(11, 6, 2019)
replace Maturity = sumMaturity if Duplicates == 2 & FIRM == 4 & DATE
== mdy(11, 6, 2019)
replace IssuePrice = sumIssue if Duplicates == 2 & FIRM == 4 & DATE
== mdy(11, 6, 2019)
replace OriginalSpread = sumOGSpread if Duplicates == 2 & FIRM == 4
& DATE == mdy(11, 6, 2019)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 2 &
FIRM == 4 & DATE == mdy(11, 6, 2019)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 2 & seq == 7 & DATE == mdy(11, 6, 2019)
drop if Duplicates == 2 & seq == 8 & DATE == mdy(11, 6, 2019)
drop seq

*Prologis#2
egen sumAmount = total(cond(Duplicates == 2 & FIRM == 10 & DATE ==
mdy(2, 3, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 2 & FIRM == 10 & DATE ==
mdy(2, 3, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 2 & FIRM == 10 & DATE ==
mdy(2, 3, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 2 & FIRM == 10 & DATE ==
mdy(2, 3, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 2 & FIRM == 10 & DATE
== mdy(2, 3, 2020), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 2 & FIRM == 10 & DATE ==
mdy(2, 3, 2020), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 2 & FIRM == 10
& DATE == mdy(2, 3, 2020)
replace Coupon = sumCoupon if Duplicates == 2 & FIRM == 10 & DATE ==
mdy(2, 3, 2020)
replace CouponRate = sumCoupon if Duplicates == 2 & FIRM == 10 &
DATE == mdy(2, 3, 2020)
replace Maturity = sumMaturity if Duplicates == 2 & FIRM == 10 &
DATE == mdy(2, 3, 2020)
replace IssuePrice = sumIssue if Duplicates == 2 & FIRM == 10 & DATE
== mdy(2, 3, 2020)
replace OriginalSpread = sumOGSpread if Duplicates == 2 & FIRM == 10
& DATE == mdy(2, 3, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 2 &
FIRM == 10 & DATE == mdy(2, 3, 2020)

```

```

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 2 & seq == 8 & DATE == mdy(2, 3, 2020)
drop if Duplicates == 2 & seq == 9 & DATE == mdy(2, 3, 2020)
drop seq

*American Tower Corp
egen sumAmount = total(cond(Duplicates == 2 & FIRM == 62 & DATE ==
mdy(6, 1, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 2 & FIRM == 62 & DATE ==
mdy(6, 1, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 2 & FIRM == 62 & DATE ==
mdy(6, 1, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 2 & FIRM == 62 & DATE ==
mdy(6, 1, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 2 & FIRM == 62 & DATE
== mdy(6, 1, 2020), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 2 & FIRM == 62 & DATE ==
mdy(6, 1, 2020), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 2 & FIRM == 62
& DATE == mdy(6, 1, 2020)
replace Coupon = sumCoupon if Duplicates == 2 & FIRM == 62 & DATE ==
mdy(6, 1, 2020)
replace CouponRate = sumCoupon if Duplicates == 2 & FIRM == 62 &
DATE == mdy(6, 1, 2020)
replace Maturity = sumMaturity if Duplicates == 2 & FIRM == 62 &
DATE == mdy(6, 1, 2020)
replace IssuePrice = sumIssue if Duplicates == 2 & FIRM == 62 & DATE
== mdy(6, 1, 2020)
replace OriginalSpread = sumOGSpread if Duplicates == 2 & FIRM == 62
& DATE == mdy(6, 1, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 2 &
FIRM == 62 & DATE == mdy(6, 1, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 2 & seq == 9 & DATE == mdy(6, 1, 2020)
drop if Duplicates == 2 & seq == 10 & DATE == mdy(6, 1, 2020)
drop seq

*Crown Castle Corp
egen sumAmount = total(cond(Duplicates == 2 & FIRM == 76 & DATE ==
mdy(6, 4, 2020), AmountIssuedUSD, .))

```

```

gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 2 & FIRM == 76 & DATE ==
mdy(6, 4, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 2 & FIRM == 76 & DATE ==
mdy(6, 4, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 2 & FIRM == 76 & DATE ==
mdy(6, 4, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 2 & FIRM == 76 & DATE
== mdy(6, 4, 2020), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 2 & FIRM == 76 & DATE ==
mdy(6, 4, 2020), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 2 & FIRM == 76
& DATE == mdy(6, 4, 2020)
replace Coupon = sumCoupon if Duplicates == 2 & FIRM == 76 & DATE ==
mdy(6, 4, 2020)
replace CouponRate = sumCoupon if Duplicates == 2 & FIRM == 76 &
DATE == mdy(6, 4, 2020)
replace Maturity = sumMaturity if Duplicates == 2 & FIRM == 76 &
DATE == mdy(6, 4, 2020)
replace IssuePrice = sumIssue if Duplicates == 2 & FIRM == 76 & DATE
== mdy(6, 4, 2020)
replace OriginalSpread = sumOGSspread if Duplicates == 2 & FIRM == 76
& DATE == mdy(6, 4, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 2 &
FIRM == 76 & DATE == mdy(6, 4, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 2 & seq == 10 & DATE == mdy(6, 4, 2020)
drop if Duplicates == 2 & seq == 11 & DATE == mdy(6, 4, 2020)
drop seq

*Iron Mountain
egen sumAmount = total(cond(Duplicates == 2 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 2 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 2 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 2 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio

```

```

egen sumOGMaturity = total(cond(Duplicates == 2 & FIRM == 38 & DATE
== mdy(6, 17, 2020), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 2 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 2 & FIRM == 38
& DATE == mdy(6, 17, 2020)
replace Coupon = sumCoupon if Duplicates == 2 & FIRM == 38 & DATE ==
mdy(6, 17, 2020)
replace CouponRate = sumCoupon if Duplicates == 2 & FIRM == 38 &
DATE == mdy(6, 17, 2020)
replace Maturity = sumMaturity if Duplicates == 2 & FIRM == 38 &
DATE == mdy(6, 17, 2020)
replace IssuePrice = sumIssue if Duplicates == 2 & FIRM == 38 & DATE
== mdy(6, 17, 2020)
replace OriginalSpread = sumOGSspread if Duplicates == 2 & FIRM == 38
& DATE == mdy(6, 17, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 2 &
FIRM == 38 & DATE == mdy(6, 17, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 2 & seq == 11 & DATE == mdy(6, 17, 2020)
drop if Duplicates == 2 & seq == 12 & DATE == mdy(6, 17, 2020)
drop seq

*American Tower Corp#2
egen sumAmount = total(cond(Duplicates == 2 & FIRM == 62 & DATE ==
mdy(11, 17, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 2 & FIRM == 62 & DATE ==
mdy(11, 17, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 2 & FIRM == 62 & DATE ==
mdy(11, 17, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 2 & FIRM == 62 & DATE ==
mdy(11, 17, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 2 & FIRM == 62 & DATE
== mdy(11, 17, 2020), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 2 & FIRM == 62 & DATE ==
mdy(11, 17, 2020), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 2 & FIRM == 62
& DATE == mdy(11, 17, 2020)
replace Coupon = sumCoupon if Duplicates == 2 & FIRM == 62 & DATE ==
mdy(11, 17, 2020)
replace CouponRate = sumCoupon if Duplicates == 2 & FIRM == 62 &
DATE == mdy(11, 17, 2020)

```

```

replace Maturity = sumMaturity if Duplicates == 2 & FIRM == 62 &
DATE == mdy(11, 17, 2020)
replace IssuePrice = sumIssue if Duplicates == 2 & FIRM == 62 & DATE
== mdy(11, 17, 2020)
replace OriginalSpread = sumOGSpread if Duplicates == 2 & FIRM == 62
& DATE == mdy(11, 17, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 2 &
FIRM == 62 & DATE == mdy(11, 17, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 2 & seq == 12 & DATE == mdy(11, 17, 2020)
drop if Duplicates == 2 & seq == 13 & DATE == mdy(11, 17, 2020)
drop seq

*Crown Castle Corp#2
egen sumAmount = total(cond(Duplicates == 2 & FIRM == 76 & DATE ==
mdy(2, 8, 2021), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 2 & FIRM == 76 & DATE ==
mdy(2, 8, 2021), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 2 & FIRM == 76 & DATE ==
mdy(2, 8, 2021), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 2 & FIRM == 76 & DATE ==
mdy(2, 8, 2021), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 2 & FIRM == 76 & DATE
== mdy(2, 8, 2021), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 2 & FIRM == 76 & DATE ==
mdy(2, 8, 2021), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 2 & FIRM == 76
& DATE == mdy(2, 8, 2021)
replace Coupon = sumCoupon if Duplicates == 2 & FIRM == 76 & DATE ==
mdy(2, 8, 2021)
replace CouponRate = sumCoupon if Duplicates == 2 & FIRM == 76 &
DATE == mdy(2, 8, 2021)
replace Maturity = sumMaturity if Duplicates == 2 & FIRM == 76 &
DATE == mdy(2, 8, 2021)
replace IssuePrice = sumIssue if Duplicates == 2 & FIRM == 76 & DATE
== mdy(2, 8, 2021)
replace OriginalSpread = sumOGSpread if Duplicates == 2 & FIRM == 76
& DATE == mdy(2, 8, 2021)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 2 &
FIRM == 76 & DATE == mdy(2, 8, 2021)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted

```

```

egen seq = seq()
drop if Duplicates == 2 & seq == 13 & DATE == mdy(2, 8, 2021)
drop if Duplicates == 2 & seq == 14 & DATE == mdy(2, 8, 2021)
drop seq

*Public Storage
egen sumAmount = total(cond(Duplicates == 2 & FIRM == 111 & DATE ==
mdy(4, 14, 2021), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 2 & FIRM == 111 & DATE ==
mdy(4, 14, 2021), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 2 & FIRM == 111 & DATE
== mdy(4, 14, 2021), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 2 & FIRM == 111 & DATE ==
mdy(4, 14, 2021), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 2 & FIRM == 111 & DATE
== mdy(4, 14, 2021), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 2 & FIRM == 111 & DATE
== mdy(4, 14, 2021), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 2 & FIRM == 111
& DATE == mdy(4, 14, 2021)
replace Coupon = sumCoupon if Duplicates == 2 & FIRM == 111 & DATE
== mdy(4, 14, 2021)
replace CouponRate = sumCoupon if Duplicates == 2 & FIRM == 111 &
DATE == mdy(4, 14, 2021)
replace Maturity = sumMaturity if Duplicates == 2 & FIRM == 111 &
DATE == mdy(4, 14, 2021)
replace IssuePrice = sumIssue if Duplicates == 2 & FIRM == 111 &
DATE == mdy(4, 14, 2021)
replace OriginalSpread = sumOGSspread if Duplicates == 2 & FIRM ==
111 & DATE == mdy(4, 14, 2021)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 2 &
FIRM == 111 & DATE == mdy(4, 14, 2021)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 2 & seq == 13 & DATE == mdy(4, 14, 2021)
drop if Duplicates == 2 & seq == 14 & DATE == mdy(4, 14, 2021)
drop seq

*Equinix#3
egen sumAmount = total(cond(Duplicates == 2 & FIRM == 4 & DATE ==
mdy(5, 3, 2021), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 2 & FIRM == 4 & DATE ==
mdy(5, 3, 2021), Coupon_weighted, .))

```



```

gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 2 & FIRM == 4 & DATE ==
mdy(5, 3, 2021), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 2 & FIRM == 4 & DATE ==
mdy(5, 3, 2021), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 2 & FIRM == 4 & DATE
== mdy(5, 3, 2021), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 2 & FIRM == 4 & DATE ==
mdy(5, 3, 2021), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 2 & FIRM == 4 &
DATE == mdy(5, 3, 2021)
replace Coupon = sumCoupon if Duplicates == 2 & FIRM == 4 & DATE ==
mdy(5, 3, 2021)
replace CouponRate = sumCoupon if Duplicates == 2 & FIRM == 4 & DATE
== mdy(5, 3, 2021)
replace Maturity = sumMaturity if Duplicates == 2 & FIRM == 4 & DATE
== mdy(5, 3, 2021)
replace IssuePrice = sumIssue if Duplicates == 2 & FIRM == 4 & DATE
== mdy(5, 3, 2021)
replace OriginalSpread = sumOGSpread if Duplicates == 2 & FIRM == 4
& DATE == mdy(5, 3, 2021)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 2 &
FIRM == 4 & DATE == mdy(5, 3, 2021)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 2 & seq == 14 & DATE == mdy(5, 3, 2021)
drop if Duplicates == 2 & seq == 15 & DATE == mdy(5, 3, 2021)
drop seq

*Public Storage#2
egen sumAmount = total(cond(Duplicates == 2 & FIRM == 111 & DATE ==
mdy(11, 4, 2021), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 2 & FIRM == 111 & DATE ==
mdy(11, 4, 2021), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 2 & FIRM == 111 & DATE
== mdy(11, 4, 2021), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 2 & FIRM == 111 & DATE ==
mdy(11, 4, 2021), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 2 & FIRM == 111 & DATE
== mdy(11, 4, 2021), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio

```

```

egen sumOGSpread = total(cond(Duplicates == 2 & FIRM == 111 & DATE
== mdy(11, 4, 2021), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 2 & FIRM == 111
& DATE == mdy(11, 14, 2021)
replace Coupon = sumCoupon if Duplicates == 2 & FIRM == 111 & DATE
== mdy(11, 4, 2021)
replace CouponRate = sumCoupon if Duplicates == 2 & FIRM == 111 &
DATE == mdy(11, 4, 2021)
replace Maturity = sumMaturity if Duplicates == 2 & FIRM == 111 &
DATE == mdy(11, 4, 2021)
replace IssuePrice = sumIssue if Duplicates == 2 & FIRM == 111 &
DATE == mdy(11, 4, 2021)
replace OriginalSpread = sumOGSpread if Duplicates == 2 & FIRM ==
111 & DATE == mdy(11, 4, 2021)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 2 &
FIRM == 111 & DATE == mdy(11, 4, 2021)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 2 & seq == 15 & DATE == mdy(11, 4, 2021)
drop if Duplicates == 2 & seq == 16 & DATE == mdy(11, 4, 2021)
drop seq

*Simon Property Group
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(9, 3, 2014), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(9, 3, 2014), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(9, 3, 2014), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(9, 3, 2014), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE
== mdy(9, 3, 2014), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(9, 3, 2014), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 50
& DATE == mdy(9, 3, 2014)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 50 & DATE ==
mdy(9, 3, 2014)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 50 &
DATE == mdy(9, 3, 2014)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 50 &
DATE == mdy(9, 3, 2014)

```

```

replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 50 & DATE
== mdy(9, 3, 2014)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 50
& DATE == mdy(9, 3, 2014)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 50 & DATE == mdy(9, 3, 2014)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 16 & DATE == mdy(9, 3, 2014)
drop seq

*Ventas Reality
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 128 & DATE ==
mdy(1, 07, 2015), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 128 & DATE ==
mdy(1, 07, 2015), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 128 & DATE
== mdy(1, 07, 2015), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 128 & DATE ==
mdy(1, 07, 2015), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 128 & DATE
== mdy(1, 07, 2015), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 128 & DATE
== mdy(1, 07, 2015), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 128
& DATE == mdy(1, 07, 2015)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 128 & DATE
== mdy(1, 07, 2015)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 128 &
DATE == mdy(1, 07, 2015)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 128 &
DATE == mdy(1, 07, 2015)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 128 &
DATE == mdy(1, 07, 2015)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM ==
128 & DATE == mdy(1, 07, 2015)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 128 & DATE == mdy(1, 07, 2015)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 17 & DATE == mdy(1, 07, 2015)
drop seq

```

```

*Avalonbay Communities Inc
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 2 & DATE ==
mdy(9, 26, 2016), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 2 & DATE ==
mdy(9, 26, 2016), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 2 & DATE ==
mdy(9, 26, 2016), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 2 & DATE ==
mdy(9, 26, 2016), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 2 & DATE
== mdy(9, 26, 2016), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 2 & DATE ==
mdy(9, 26, 2016), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 2 &
DATE == mdy(9, 26, 2016)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 2 & DATE ==
mdy(9, 26, 2016)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 2 & DATE
== mdy(9, 26, 2016)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 2 & DATE
== mdy(9, 26, 2016)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 2 & DATE
== mdy(9, 26, 2016)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 2
& DATE == mdy(9, 26, 2016)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 2 & DATE == mdy(9, 26, 2016)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 18 & DATE == mdy(9, 26, 2016)
drop seq

*Kimco Realty
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 9 & DATE ==
mdy(11, 1, 2016), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 9 & DATE ==
mdy(11, 1, 2016), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 9 & DATE ==
mdy(11, 1, 2016), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio

```

```

egen sumIssue = total(cond(Duplicates == 1 & FIRM == 9 & DATE ==
mdy(11, 1, 2016), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 9 & DATE
== mdy(11, 1, 2016), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 9 & DATE ==
mdy(11, 1, 2016), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 9 &
DATE == mdy(11, 1, 2016)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 9 & DATE ==
mdy(11, 1, 2016)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 9 & DATE
== mdy(11, 1, 2016)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 9 & DATE
== mdy(11, 1, 2016)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 9 & DATE
== mdy(11, 1, 2016)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 9
& DATE == mdy(11, 1, 2016)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 9 & DATE == mdy(11, 1, 2016)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 19 & DATE == mdy(11, 1, 2016)
drop seq

*Simon Property Group#2
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(11, 15, 2016), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(11, 15, 2016), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(11, 15, 2016), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(11, 15, 2016), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE
== mdy(11, 15, 2016), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(11, 15, 2016), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 50
& DATE == mdy(11, 15, 2016)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 50 & DATE ==
mdy(11, 15, 2016)

```

```

replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 50 &
DATE == mdy(11, 15, 2016)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 50 &
DATE == mdy(11, 15, 2016)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 50 & DATE
== mdy(11, 15, 2016)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 50
& DATE == mdy(11, 15, 2016)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 50 & DATE == mdy(11, 15, 2016)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 20 & DATE == mdy(11, 15, 2016)
drop seq

*VICI Properties 2 LP
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 54 & DATE ==
mdy(2, 1, 2017), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 54 & DATE ==
mdy(2, 1, 2017), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 54 & DATE ==
mdy(2, 1, 2017), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 54 & DATE ==
mdy(2, 1, 2017), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 54 & DATE
== mdy(2, 1, 2017), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 54 & DATE ==
mdy(2, 1, 2017), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 54
& DATE == mdy(2, 1, 2017)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 54 & DATE ==
mdy(2, 1, 2017)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 54 &
DATE == mdy(2, 1, 2017)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 54 &
DATE == mdy(2, 1, 2017)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 54 & DATE
== mdy(2, 1, 2017)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 54
& DATE == mdy(2, 1, 2017)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 54 & DATE == mdy(2, 1, 2017)

```

```

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 21 & DATE == mdy(2, 1, 2017)
drop seq

*Crown Castle Inc 2
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(7, 25, 2017), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(7, 25, 2017), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(7, 25, 2017), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(7, 25, 2017), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 76 & DATE
== mdy(7, 25, 2017), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(7, 25, 2017), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 76
& DATE == mdy(7, 25, 2017)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 76 & DATE ==
mdy(7, 25, 2017)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 76 &
DATE == mdy(7, 25, 2017)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 76 &
DATE == mdy(7, 25, 2017)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 76 & DATE
== mdy(7, 25, 2017)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 76
& DATE == mdy(7, 25, 2017)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 76 & DATE == mdy(7, 25, 2017)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 22 & DATE == mdy(7, 25, 2017)
drop seq

*Kimco Realty#2
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 9 & DATE ==
mdy(8, 1, 2017), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio

```

```

egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 9 & DATE ==
mdy(8, 1, 2017), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 9 & DATE ==
mdy(8, 1, 2017), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 9 & DATE ==
mdy(8, 1, 2017), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 9 & DATE
== mdy(8, 1, 2017), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 9 & DATE ==
mdy(18, 1, 2017), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 9 &
DATE == mdy(8, 1, 2017)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 9 & DATE ==
mdy(8, 1, 2017)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 9 & DATE
== mdy(8, 1, 2017)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 9 & DATE
== mdy(8, 1, 2017)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 9 & DATE
== mdy(8, 1, 2017)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 9
& DATE == mdy(8, 1, 2017)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 9 & DATE == mdy(8, 1, 2017)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 23 & DATE == mdy(8, 1, 2017)
drop seq

*Simon Property Group#3
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(11, 30, 2017), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(11, 30, 2017), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(11, 30, 2017), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(11, 30, 2017), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE
== mdy(11, 30, 2017), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio

```



```

egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(11, 30, 2017), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 50
& DATE == mdy(11, 30, 2017)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 50 & DATE ==
mdy(11, 30, 2017)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 50 &
DATE == mdy(11, 30, 2017)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 50 &
DATE == mdy(11, 30, 2017)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 50 & DATE
== mdy(11, 30, 2017)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 50
& DATE == mdy(11, 30, 2017)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 50 & DATE == mdy(11, 30, 2017)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 24 & DATE == mdy(11, 30, 2017)
drop seq

*American Tower Corp
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(12, 5, 2017), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(12, 5, 2017), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(12, 5, 2017), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(12, 5, 2017), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE
== mdy(12, 5, 2017), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(12, 5, 2017), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 62
& DATE == mdy(12, 5, 2017)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 62 & DATE ==
mdy(12, 5, 2017)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 62 &
DATE == mdy(12, 5, 2017)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 62 &
DATE == mdy(12, 5, 2017)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 62 & DATE
== mdy(12, 5, 2017)

```

```

replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 62
& DATE == mdy(12, 5, 2017)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 62 & DATE == mdy(12, 5, 2017)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 25 & DATE == mdy(12, 5, 2017)
drop seq

*Crown Castle Inc 2#2
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(1, 9, 2018), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(1, 9, 2018), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(1, 9, 2018), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(1, 9, 2018), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 76 & DATE
== mdy(1, 9, 2018), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(1, 9, 2018), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 76
& DATE == mdy(1, 9, 2018)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 76 & DATE ==
mdy(1, 9, 2018)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 76 &
DATE == mdy(1, 9, 2018)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 76 &
DATE == mdy(1, 9, 2018)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 76 & DATE
== mdy(1, 9, 2018)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 76
& DATE == mdy(1, 9, 2018)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 76 & DATE == mdy(1, 9, 2018)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 26 & DATE == mdy(1, 9, 2018)
drop seq

*Prologis

```

```

egen sumAmount = total(cond(Duplicates == 1 & FIRM == 10 & DATE ==
mdy(6, 11, 2018), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 10 & DATE ==
mdy(6, 11, 2018), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 10 & DATE ==
mdy(6, 11, 2018), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 10 & DATE ==
mdy(6, 11, 2018), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 10 & DATE
== mdy(6, 11, 2018), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 10 & DATE ==
mdy(6, 11, 2018), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 10
& DATE == mdy(6, 11, 2018)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 10 & DATE ==
mdy(6, 11, 2018)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 10 &
DATE == mdy(6, 11, 2018)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 10 &
DATE == mdy(6, 11, 2018)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 10 & DATE
== mdy(6, 11, 2018)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 10
& DATE == mdy(6, 11, 2018)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 10 & DATE == mdy(6, 11, 2018)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 27 & DATE == mdy(6, 11, 2018)
drop seq

*National Retail Properties
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 41 & DATE ==
mdy(9, 18, 2018), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 41 & DATE ==
mdy(9, 18, 2018), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 41 & DATE ==
mdy(9, 18, 2018), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 41 & DATE ==
mdy(9, 18, 2018), Issue_weighted, .))

```

```

gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 41 & DATE
== mdy(9, 18, 2018), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 41 & DATE ==
mdy(9, 18, 2018), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 41
& DATE == mdy(9, 18, 2018)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 41 & DATE ==
mdy(9, 18, 2018)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 41 &
DATE == mdy(9, 18, 2018)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 41 &
DATE == mdy(9, 18, 2018)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 41 & DATE
== mdy(9, 18, 2018)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 41
& DATE == mdy(9, 18, 2018)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 41 & DATE == mdy(9, 18, 2018)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 28 & DATE == mdy(9, 18, 2018)
drop seq

*Pebblebrook Hotel Trust is causing outliers and is therefore
dropped from the dataset
drop if FIRM == 44

*Crown Castle Inc 2#3
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(1, 29, 2019), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(1, 29, 2019), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(1, 29, 2019), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(1, 29, 2019), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 76 & DATE
== mdy(1, 29, 2019), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(1, 29, 2019), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 76
& DATE == mdy(1, 29, 2019)

```

```

replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 76 & DATE ==
mdy(1, 29, 2019)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 76 &
DATE == mdy(1, 29, 2019)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 76 &
DATE == mdy(1, 29, 2019)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 76 & DATE
== mdy(1, 29, 2019)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 76
& DATE == mdy(1, 29, 2019)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 76 & DATE == mdy(1, 29, 2019)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 30 & DATE == mdy(1, 29, 2019)
drop seq

*Welltower OP LLC
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 14 & DATE ==
mdy(2, 13, 2019), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 14 & DATE ==
mdy(2, 13, 2019), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 14 & DATE ==
mdy(2, 13, 2019), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 14 & DATE ==
mdy(2, 13, 2019), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 14 & DATE
== mdy(2, 13, 2019), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 14 & DATE ==
mdy(2, 13, 2019), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 14
& DATE == mdy(2, 13, 2019)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 14 & DATE ==
mdy(2, 13, 2019)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 14 &
DATE == mdy(2, 13, 2019)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 14 &
DATE == mdy(2, 13, 2019)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 14 & DATE
== mdy(2, 13, 2019)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 14
& DATE == mdy(2, 13, 2019)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 14 & DATE == mdy(2, 13, 2019)

```

```

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 31 & DATE == mdy(2, 13, 2019)
drop seq

*Ventas Realty LP
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 128 & DATE ==
mdy(2, 19, 2019), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 128 & DATE ==
mdy(2, 19, 2019), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 128 & DATE
== mdy(2, 19, 2019), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 128 & DATE ==
mdy(2, 19, 2019), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 128 & DATE
== mdy(2, 19, 2019), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 128 & DATE
== mdy(2, 19, 2019), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 128
& DATE == mdy(2, 19, 2019)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 128 & DATE
== mdy(2, 19, 2019)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 128 &
DATE == mdy(2, 19, 2019)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 128 &
DATE == mdy(2, 19, 2019)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 128 &
DATE == mdy(2, 19, 2019)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM ==
128 & DATE == mdy(2, 19, 2019)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 128 & DATE == mdy(2, 19, 2019)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 32 & DATE == mdy(2, 19, 2019)
drop seq

*American Tower Corp#2
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 12, 2019), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio

```

```

egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 12, 2019), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 12, 2019), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 12, 2019), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE
== mdy(3, 12, 2019), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 12, 2019), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 62
& DATE == mdy(3, 12, 2019)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 12, 2019)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 62 &
DATE == mdy(3, 12, 2019)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 62 &
DATE == mdy(3, 12, 2019)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 62 & DATE
== mdy(3, 12, 2019)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 62
& DATE == mdy(3, 12, 2019)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 62 & DATE == mdy(3, 12, 2019)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 33 & DATE == mdy(3, 12, 2019)
drop seq

*American Tower Corp#3
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(6, 10, 2019), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(6, 10, 2019), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(6, 10, 2019), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(6, 10, 2019), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE
== mdy(6, 10, 2019), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio

```

```

egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(6, 10, 2019), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 62
& DATE == mdy(6, 10, 2019)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 62 & DATE ==
mdy(6, 10, 2019)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 62 &
DATE == mdy(6, 10, 2019)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 62 &
DATE == mdy(6, 10, 2019)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 62 & DATE
== mdy(6, 10, 2019)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 62
& DATE == mdy(6, 10, 2019)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 62 & DATE == mdy(6, 10, 2019)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 34 & DATE == mdy(6, 10, 2019)
drop seq

*Healthpeak Properties Inc
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 7 & DATE ==
mdy(6, 20, 2019), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 7 & DATE ==
mdy(6, 20, 2019), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 7 & DATE ==
mdy(6, 20, 2019), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 7 & DATE ==
mdy(6, 20, 2019), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 7 & DATE
== mdy(6, 20, 2019), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 7 & DATE ==
mdy(6, 20, 2019), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 7 &
DATE == mdy(6, 20, 2019)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 7 & DATE ==
mdy(6, 20, 2019)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 7 & DATE
== mdy(6, 20, 2019)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 7 & DATE
== mdy(6, 20, 2019)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 7 & DATE
== mdy(6, 20, 2019)

```



```

replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 7
& DATE == mdy(6, 20, 2019)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 7 & DATE == mdy(6, 20, 2019)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 35 & DATE == mdy(6, 20, 2019)
drop seq

*Alexandra Real Estate Equities Inc
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 1 & DATE ==
mdy(7, 8, 2019), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 1 & DATE ==
mdy(7, 8, 2019), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 1 & DATE ==
mdy(7, 8, 2019), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 1 & DATE ==
mdy(7, 8, 2019), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 1 & DATE
== mdy(7, 8, 2019), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 1 & DATE ==
mdy(7, 8, 2019), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 1 &
DATE == mdy(7, 8, 2019)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 1 & DATE ==
mdy(7, 8, 2019)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 1 & DATE
== mdy(7, 8, 2019)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 1 & DATE
== mdy(7, 8, 2019)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 1 & DATE
== mdy(7, 8, 2019)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 1
& DATE == mdy(7, 8, 2019)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 1 & DATE == mdy(7, 8, 2019)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 36 & DATE == mdy(7, 8, 2019)
drop seq

*Crown Castle Inc 2#4

```

```

egen sumAmount = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(8, 1, 2019), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(8, 1, 2019), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(8, 1, 2019), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(8, 1, 2019), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 76 & DATE
== mdy(8, 1, 2019), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(8, 1, 2019), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 76
& DATE == mdy(8, 1, 2019)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 76 & DATE ==
mdy(8, 1, 2019)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 76 &
DATE == mdy(8, 1, 2019)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 76 &
DATE == mdy(8, 1, 2019)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 76 & DATE
== mdy(8, 1, 2019)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 76
& DATE == mdy(8, 1, 2019)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 76 & DATE == mdy(8, 1, 2019)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 37 & DATE == mdy(8, 1, 2019)
drop seq

*American Tower Corp#4
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(9, 30, 2019), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(9, 30, 2019), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(9, 30, 2019), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(9, 30, 2019), Issue_weighted, .))

```

```

gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE
== mdy(9, 30, 2019), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(9, 30, 2019), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 62
& DATE == mdy(9, 30, 2019)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 62 & DATE ==
mdy(9, 30, 2019)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 62 &
DATE == mdy(9, 30, 2019)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 62 &
DATE == mdy(9, 30, 2019)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 62 & DATE
== mdy(9, 30, 2019)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 62
& DATE == mdy(9, 30, 2019)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 62 & DATE == mdy(9, 30, 2019)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 38 & DATE == mdy(9, 30, 2019)
drop seq

*American Tower Corp#5
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(1, 7, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(1, 7, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(1, 7, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(1, 7, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE
== mdy(1, 7, 2020), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(1, 7, 2020), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 62
& DATE == mdy(1, 7, 2020)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 62 & DATE ==
mdy(1, 7, 2020)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 62 &
DATE == mdy(1, 7, 2020)

```

```

replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 62 &
DATE == mdy(1, 7, 2020)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 62 & DATE
== mdy(1, 7, 2020)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 62
& DATE == mdy(1, 7, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 62 & DATE == mdy(1, 7, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 39 & DATE == mdy(1, 7, 2020)
drop seq

*National Retail Properties
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 41 & DATE ==
mdy(2, 18, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 41 & DATE ==
mdy(2, 18, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 41 & DATE ==
mdy(2, 18, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 41 & DATE ==
mdy(2, 18, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 41 & DATE
== mdy(2, 18, 2020), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 41 & DATE ==
mdy(2, 18, 2020), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 41
& DATE == mdy(2, 18, 2020)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 41 & DATE ==
mdy(2, 18, 2020)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 41 &
DATE == mdy(2, 18, 2020)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 41 &
DATE == mdy(2, 18, 2020)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 41 & DATE
== mdy(2, 18, 2020)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 41
& DATE == mdy(2, 18, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 41 & DATE == mdy(2, 18, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()

```

```

drop if Duplicates == 1 & seq == 40 & DATE == mdy(2, 18, 2020)
drop seq

*Crown Castle Inc 2#5
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(3, 31, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(3, 31, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(3, 31, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(3, 31, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 76 & DATE
== mdy(3, 31, 2020), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 76 & DATE ==
mdy(3, 31, 2020), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 76
& DATE == mdy(3, 31, 2020)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 76 & DATE ==
mdy(3, 31, 2020)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 76 &
DATE == mdy(3, 31, 2020)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 76 &
DATE == mdy(3, 31, 2020)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 76 & DATE
== mdy(3, 31, 2020)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 76
& DATE == mdy(3, 31, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 76 & DATE == mdy(3, 31, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 41 & DATE == mdy(3, 31, 2020)
drop seq

*Scentre Group Trust
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 120 & DATE ==
mdy(5, 19, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 120 & DATE ==
mdy(5, 19, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 120 & DATE
== mdy(5, 19, 2020), Maturity_weighted, .))

```

```

format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 120 & DATE ==
mdy(5, 19, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 120 & DATE
== mdy(5, 19, 2020), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 120 & DATE
== mdy(5, 19, 2020), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 120
& DATE == mdy(5, 19, 2020)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 120 & DATE
== mdy(5, 19, 2020)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 120 &
DATE == mdy(5, 19, 2020)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 120 &
DATE == mdy(5, 19, 2020)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 120 &
DATE == mdy(5, 19, 2020)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM ==
120 & DATE == mdy(5, 19, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 120 & DATE == mdy(5, 19, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 42 & DATE == mdy(5, 19, 2020)
drop seq

*Scentre Group Trust
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 38 & DATE
== mdy(6, 17, 2020), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 38
& DATE == mdy(6, 17, 2020)

```

```

replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 38 & DATE ==
mdy(6, 17, 2020)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 38 &
DATE == mdy(6, 17, 2020)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 38 &
DATE == mdy(6, 17, 2020)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 38 & DATE
== mdy(6, 17, 2020)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 38
& DATE == mdy(6, 17, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 38 & DATE == mdy(6, 17, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 43 & DATE == mdy(6, 17, 2020)
drop seq

*Simon Property Group#3
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(7, 6, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(7, 6, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(7, 6, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(7, 6, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE
== mdy(7, 6, 2020), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(7, 6, 2020), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 50
& DATE == mdy(7, 6, 2020)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 50 & DATE ==
mdy(7, 6, 2020)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 50 &
DATE == mdy(7, 6, 2020)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 50 &
DATE == mdy(7, 6, 2020)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 50 & DATE
== mdy(7, 6, 2020)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 50
& DATE == mdy(7, 6, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 50 & DATE == mdy(7, 6, 2020)

```

```

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 44 & DATE == mdy(7, 6, 2020)
drop seq

*Essex Portfolio LP
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 32 & DATE ==
mdy(8, 10, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 32 & DATE ==
mdy(8, 10, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 32 & DATE ==
mdy(8, 10, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 32 & DATE ==
mdy(8, 10, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 32 & DATE
== mdy(8, 10, 2020), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 32 & DATE ==
mdy(8, 10, 2020), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 32
& DATE == mdy(8, 10, 2020)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 32 & DATE ==
mdy(8, 10, 2020)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 32 &
DATE == mdy(8, 10, 2020)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 32 &
DATE == mdy(8, 10, 2020)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 32 & DATE
== mdy(8, 10, 2020)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 32
& DATE == mdy(8, 10, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 32 & DATE == mdy(8, 10, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 45 & DATE == mdy(8, 10, 2020)
drop seq

*Realty Income Corp
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 46 & DATE ==
mdy(12, 9, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio

```



```

egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 46 & DATE ==
mdy(12, 9, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 46 & DATE ==
mdy(12, 9, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 46 & DATE ==
mdy(12, 9, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 46 & DATE
== mdy(12, 9, 2020), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 46 & DATE ==
mdy(12, 9, 2020), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 46
& DATE == mdy(12, 9, 2020)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 46 & DATE ==
mdy(12, 9, 2020)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 46 &
DATE == mdy(12, 9, 2020)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 46 &
DATE == mdy(12, 9, 2020)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 46 & DATE
== mdy(12, 9, 2020)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 46
& DATE == mdy(12, 9, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 46 & DATE == mdy(12, 9, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 46 & DATE == mdy(12, 9, 2020)
drop seq

*Simon Property Group#5
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(1, 11, 2021), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(1, 11, 2021), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(1, 11, 2021), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(1, 11, 2021), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE
== mdy(1, 11, 2021), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio

```

```

egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(1, 11, 2021), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 50
& DATE == mdy(1, 11, 2021)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 50 & DATE ==
mdy(1, 11, 2021)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 50 &
DATE == mdy(1, 11, 2021)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 50 &
DATE == mdy(1, 11, 2021)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 50 & DATE
== mdy(1, 11, 2021)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 50
& DATE == mdy(1, 11, 2021)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 50 & DATE == mdy(1, 11, 2021)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 47 & DATE == mdy(1, 11, 2021)
drop seq

*American Tower Corp#6
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 24, 2021), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 24, 2021), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 24, 2021), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 24, 2021), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE
== mdy(3, 24, 2021), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 24, 2021), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 62
& DATE == mdy(3, 24, 2021)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 24, 2021)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 62 &
DATE == mdy(3, 24, 2021)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 62 &
DATE == mdy(3, 24, 2021)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 62 & DATE
== mdy(3, 24, 2021)

```

```

replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 62
& DATE == mdy(3, 24, 2021)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 62 & DATE == mdy(3, 24, 2021)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 48 & DATE == mdy(3, 24, 2021)
drop seq

*Agree LP
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 18 & DATE ==
mdy(5, 5, 2021), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 18 & DATE ==
mdy(5, 5, 2021), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 18 & DATE ==
mdy(5, 5, 2021), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 18 & DATE ==
mdy(5, 5, 2021), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 18 & DATE
== mdy(5, 5, 2021), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 18 & DATE ==
mdy(5, 5, 2021), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 18
& DATE == mdy(5, 5, 2021)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 18 & DATE ==
mdy(5, 5, 2021)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 18 &
DATE == mdy(5, 5, 2021)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 18 &
DATE == mdy(5, 5, 2021)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 18 & DATE
== mdy(5, 5, 2021)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 18
& DATE == mdy(5, 5, 2021)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 18 & DATE == mdy(5, 5, 2021)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 49 & DATE == mdy(5, 5, 2021)
drop seq

*Simon Property Group#6

```

```

egen sumAmount = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(8, 9, 2021), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(8, 9, 2021), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(8, 9, 2021), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(8, 9, 2021), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE
== mdy(8, 9, 2021), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(8, 9, 2021), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 50
& DATE == mdy(8, 9, 2021)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 50 & DATE ==
mdy(8, 9, 2021)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 50 &
DATE == mdy(8, 9, 2021)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 50 &
DATE == mdy(8, 9, 2021)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 50 & DATE
== mdy(8, 9, 2021)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 50
& DATE == mdy(8, 9, 2021)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 50 & DATE == mdy(8, 9, 2021)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 50 & DATE == mdy(8, 9, 2021)
drop seq

*American Tower Corp#7
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(9, 23, 2021), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(9, 23, 2021), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(9, 23, 2021), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(9, 23, 2021), Issue_weighted, .))

```

```

gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE
== mdy(9, 23, 2021), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(9, 23, 2021), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 62
& DATE == mdy(9, 23, 2021)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 62 & DATE ==
mdy(9, 23, 2021)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 62 &
DATE == mdy(9, 23, 2021)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 62 &
DATE == mdy(9, 23, 2021)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 62 & DATE
== mdy(9, 23, 2021)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 62
& DATE == mdy(9, 23, 2021)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 62 & DATE == mdy(9, 23, 2021)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 51 & DATE == mdy(9, 23, 2021)
drop seq

*American Tower Corp#8
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 29, 2022), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 29, 2022), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 29, 2022), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 29, 2022), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE
== mdy(3, 29, 2022), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 29, 2022), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 62
& DATE == mdy(3, 29, 2022)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 62 & DATE ==
mdy(3, 29, 2022)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 62 &
DATE == mdy(3, 29, 2022)

```

```

replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 62 &
DATE == mdy(3, 29, 2022)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 62 & DATE
== mdy(3, 29, 2022)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 62
& DATE == mdy(3, 29, 2022)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 62 & DATE == mdy(3, 29, 2022)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 52 & DATE == mdy(3, 29, 2022)
drop seq

*Healthcare Realty Holdings LP
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 86 & DATE ==
mdy(6, 28, 2022), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 86 & DATE ==
mdy(6, 28, 2022), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 86 & DATE ==
mdy(6, 28, 2022), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 86 & DATE ==
mdy(6, 28, 2022), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 86 & DATE
== mdy(6, 28, 2022), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 86 & DATE ==
mdy(6, 28, 2022), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 86
& DATE == mdy(6, 28, 2022)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 86 & DATE ==
mdy(6, 28, 2022)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 86 &
DATE == mdy(6, 28, 2022)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 86 &
DATE == mdy(6, 28, 2022)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 86 & DATE
== mdy(6, 28, 2022)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 86
& DATE == mdy(6, 28, 2022)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 86 & DATE == mdy(6, 28, 2022)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()

```

```

drop if Duplicates == 1 & seq == 53 & DATE == mdy(6, 28, 2022)
drop seq

*Healthcare Realty Holdings LP#2
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 86 & DATE ==
mdy(6, 30, 2022), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 86 & DATE ==
mdy(6, 30, 2022), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 86 & DATE ==
mdy(6, 30, 2022), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 86 & DATE ==
mdy(6, 30, 2022), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 86 & DATE
== mdy(6, 30, 2022), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 86 & DATE ==
mdy(6, 30, 2022), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 86
& DATE == mdy(6, 30, 2022)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 86 & DATE ==
mdy(6, 30, 2022)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 86 &
DATE == mdy(6, 30, 2022)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 86 &
DATE == mdy(6, 30, 2022)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 86 & DATE
== mdy(6, 30, 2022)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 86
& DATE == mdy(6, 30, 2022)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 86 & DATE == mdy(6, 30, 2022)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 54 & DATE == mdy(6, 30, 2022)
drop seq

*Realty Income Corp#2
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 46 & DATE ==
mdy(1, 9, 2023), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 46 & DATE ==
mdy(1, 9, 2023), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 46 & DATE ==
mdy(1, 9, 2023), Maturity_weighted, .))

```

```

format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 46 & DATE ==
mdy(1, 9, 2023), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 46 & DATE
== mdy(1, 9, 2023), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 46 & DATE ==
mdy(1, 9, 2023), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 46
& DATE == mdy(1, 9, 2023)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 46 & DATE ==
mdy(1, 9, 2023)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 46 &
DATE == mdy(1, 9, 2023)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 46 &
DATE == mdy(1, 9, 2023)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 46 & DATE
== mdy(1, 9, 2023)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 46
& DATE == mdy(1, 9, 2023)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 46 & DATE == mdy(1, 9, 2023)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 55 & DATE == mdy(1, 9, 2023)
drop seq

*American Tower Corp#9
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(2, 28, 2023), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(2, 28, 2023), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(2, 28, 2023), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(2, 28, 2023), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE
== mdy(2, 28, 2023), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(2, 28, 2023), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 62
& DATE == mdy(2, 28, 2023)

```



```

replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 62 & DATE ==
mdy(2, 28, 2023)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 62 &
DATE == mdy(2, 28, 2023)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 62 &
DATE == mdy(2, 28, 2023)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 62 & DATE
== mdy(2, 28, 2023)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 62
& DATE == mdy(2, 28, 2023)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 62 & DATE == mdy(2, 28, 2023)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 56 & DATE == mdy(2, 28, 2023)
drop seq

*Simon Property Group#7
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(3, 1, 2023), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(3, 1, 2023), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(3, 1, 2023), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(3, 1, 2023), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE
== mdy(3, 1, 2023), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(3, 1, 2023), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 50
& DATE == mdy(3, 1, 2023)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 50 & DATE ==
mdy(3, 1, 2023)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 50 &
DATE == mdy(3, 1, 2023)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 50 &
DATE == mdy(3, 1, 2023)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 50 & DATE
== mdy(3, 1, 2023)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 50
& DATE == mdy(3, 1, 2023)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 50 & DATE == mdy(3, 1, 2023)

```

```

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 57 & DATE == mdy(3, 1, 2023)
drop seq

*Prologis#3
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 10 & DATE ==
mdy(3, 23, 2023), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 10 & DATE ==
mdy(3, 23, 2023), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 10 & DATE ==
mdy(3, 23, 2023), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 10 & DATE ==
mdy(3, 23, 2023), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 10 & DATE
== mdy(3, 23, 2023), OGMaturity_weighted, .))
gen OGSpread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 10 & DATE ==
mdy(3, 23, 2023), OGSpread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 10
& DATE == mdy(3, 23, 2023)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 10 & DATE ==
mdy(3, 23, 2023)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 10 &
DATE == mdy(3, 23, 2023)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 10 &
DATE == mdy(3, 23, 2023)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 10 & DATE
== mdy(3, 23, 2023)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 10
& DATE == mdy(3, 23, 2023)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 10 & DATE == mdy(3, 23, 2023)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 58 & DATE == mdy(3, 23, 2023)
drop seq

duplicates report FIRM DATE

*Ammerican Tower Corp last
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(11, 17, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount

```

```

gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(11, 17, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(11, 17, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(11, 17, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 62 & DATE
== mdy(11, 17, 2020), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSspread = total(cond(Duplicates == 1 & FIRM == 62 & DATE ==
mdy(11, 17, 2020), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 62
& DATE == mdy(11, 17, 2020)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 62 & DATE ==
mdy(11, 17, 2020)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 62 &
DATE == mdy(11, 17, 2020)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 62 &
DATE == mdy(11, 17, 2020)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 62 & DATE
== mdy(11, 17, 2020)
replace OriginalSpread = sumOGSspread if Duplicates == 1 & FIRM == 62
& DATE == mdy(11, 17, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 62 & DATE == mdy(11, 17, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSspread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 2 & seq == 11 & DATE == mdy(11, 17, 2020)
drop seq

*Simon Property Group last#2
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(7, 6, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(7, 6, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(7, 6, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(7, 6, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 50 & DATE
== mdy(7, 6, 2020), OGMaturity_weighted, .))

```

```

gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 50 & DATE ==
mdy(7, 6, 2020), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 50
& DATE == mdy(7, 6, 2020)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 50 & DATE ==
mdy(7, 6, 2020)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 50 &
DATE == mdy(7, 6, 2020)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 50 &
DATE == mdy(7, 6, 2020)
replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 50 & DATE
== mdy(7, 6, 2020)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 50
& DATE == mdy(7, 6, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 50 & DATE == mdy(7, 6, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSspread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 41 & DATE == mdy(7, 6, 2020)
drop seq

*Iron Mountain Last#3
egen sumAmount = total(cond(Duplicates == 1 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), AmountIssuedUSD, .))
gen amount_ratio = AmountIssuedUSD / sumAmount
gen Coupon_weighted = Coupon * amount_ratio
egen sumCoupon = total(cond(Duplicates == 1 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), Coupon_weighted, .))
gen Maturity_weighted = Maturity * amount_ratio
egen sumMaturity = total(cond(Duplicates == 1 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), Maturity_weighted, .))
format sumMaturity %td
gen Issue_weighted = IssuePrice * amount_ratio
egen sumIssue = total(cond(Duplicates == 1 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), Issue_weighted, .))
gen OGMaturity_weighted = OriginalYieldMaturity * amount_ratio
egen sumOGMaturity = total(cond(Duplicates == 1 & FIRM == 38 & DATE
== mdy(6, 17, 2020), OGMaturity_weighted, .))
gen OGSspread_weighted = OriginalSpread * amount_ratio
egen sumOGSpread = total(cond(Duplicates == 1 & FIRM == 38 & DATE ==
mdy(6, 17, 2020), OGSspread_weighted, .))

replace AmountIssuedUSD = sumAmount if Duplicates == 1 & FIRM == 38
& DATE == mdy(6, 17, 2020)
replace Coupon = sumCoupon if Duplicates == 1 & FIRM == 38 & DATE ==
mdy(6, 17, 2020)
replace CouponRate = sumCoupon if Duplicates == 1 & FIRM == 38 &
DATE == mdy(6, 17, 2020)
replace Maturity = sumMaturity if Duplicates == 1 & FIRM == 38 &
DATE == mdy(6, 17, 2020)

```

```

replace IssuePrice = sumIssue if Duplicates == 1 & FIRM == 38 & DATE
== mdy(6, 17, 2020)
replace OriginalSpread = sumOGSpread if Duplicates == 1 & FIRM == 38
& DATE == mdy(6, 17, 2020)
replace OriginalYieldMaturity = sumOGMaturity if Duplicates == 1 &
FIRM == 38 & DATE == mdy(6, 17, 2020)

drop sumAmount sumCoupon sumMaturity Maturity_weighted
Coupon_weighted amount_ratio sumIssue sumOGMaturity sumOGSpread
OGMaturity_weighted OGSpread_weighted Issue_weighted
egen seq = seq()
drop if Duplicates == 1 & seq == 40 & DATE == mdy(6, 17, 2020)
drop seq

//Rechecking the duplicates
duplicates report FIRM DATE
duplicates list FIRM DATE
tab FIRM Duplicates
drop Duplicates
tab Maturity

*A loop constructed to replace missing values by the value 0
foreach var of varlist IssuePrice OriginalSpread
OriginalYieldMaturity {
    replace `var' = . if `var' == 0
}

save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Bond
Data\AllBonds.dta", replace
sort Issuer
tab Issuer
tab FIRM
tab DATE
tab Maturity

*Merge Bond Data and REIT Data\AllBonds
clear all
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED4.dta"
sort DATE
sort FIRM
merge m:m DATE FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Bond
Data\AllBonds.dta"
sort DATE
sum DATE
sort GreenBond

save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset.dta",
replace
drop _merge
sort NAME
sort DATE
sort Issuer

```

```

summarize
tab GreenBond

*Specifying the event dates
generate Eventtype = .
replace Eventtype = 1 if GreenBond == "Yes"
replace Eventtype = 2 if GreenBond == "No"
replace Eventtype = 0 if missing(Eventtype)

save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset.dta",
replace

clear all
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
use
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset.dta"

tab Eventtype
tab Maturity
tab AmountIssuedUSD

*Start of Do-File 4

clear all
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
use
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset.dta"

*Sorting the Data and re-checking for duplicates
sort DATE
duplicates report FIRM DATE

*Setting the Panel data
tsset FIRM DATE, daily
sort FIRM DATE

*Generating the return variable. The variable is expressed in
decimals to be concise with the market return and risk free rates.
The return is expressed as the normal return as opposed to the
logarithmic return as to remove the risk over overcomplicating the
event study estimations.
bys FIRM (DATE): gen RETURN = ((PRICE - PRICE[_n-1])/PRICE[_n-1])
sum Rm RETURN
gsort - Eventtype

// For reference, the log return variables computations are the
following. Although computationally different, the log returns do
not produce different research results. The interested reader may
however proceed with logarithmic to his or her liking.
*bys FIRM (DATE): gen lnRETURN = ln(PRICE / PRICE[_n-1])
*generate lnRm = ln(Rm+1)
*generate lnSMB = ln(SMB+1)
*generate lnHML = ln(HML+1)
*generate lnMOM = ln(MOM+1)

```

```

save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset.dta",
replace

clear all
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
use
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset.dta"

//Descriptive Statistics Green Bonds. Notice that this part needs to
be ran seperately in order to display the descriptive statistics
properly.

*Green bond issuer year
tab YEAR GreenBond
keep if Eventtype == 1

*Harmonise the Rating variable to contain 1 rating system (Standard
& Poor's)
tab Rating
replace Rating = substr(Rating, "Aaa", "AAA", .)
replace Rating = substr(Rating, "Aa1", "AA+", .)
replace Rating = substr(Rating, "Aa2", "AA", .)
replace Rating = substr(Rating, "Aa3", "AA-", .)
replace Rating = substr(Rating, "A1", "A+", .)
replace Rating = substr(Rating, "A2", "A", .)
replace Rating = substr(Rating, "A3", "A-", .)
replace Rating = substr(Rating, "Baa1", "BBB+", .)
replace Rating = substr(Rating, "Baa3", "BBB", .)
replace Rating = substr(Rating, "Baa3", "BBB-", .)
replace Rating = substr(Rating, "Ba1", "BB+", .)
replace Rating = substr(Rating, "Ba2", "BB", .)
replace Rating = substr(Rating, "Ba3", "BB-", .)
replace Rating = substr(Rating, "B1", "B+", .)
replace Rating = substr(Rating, "B2", "B", .)
replace Rating = substr(Rating, "B3", "B-", .)
replace Rating = substr(Rating, "Caa1", "CCC+", .)
replace Rating = substr(Rating, "Caa3", "CCC", .)
replace Rating = substr(Rating, "Caa3", "CCC-", .)
replace Rating = substr(Rating, "Ca", "CC", .)
replace Rating = substr(Rating, "C", "D", .)

*For descriptive statistics, the variables need to be transformed in
the same format
gen IssueAmountPer1Mln = AmountIssuedUSD / 1000000
gen Maturityfromstart = (dofd(Maturity) - dofd(IssueDate)) / 365.25

summarize Coupon IssueAmountPer1Mln IssuePrice OriginalSpread
OriginalYieldMaturity Maturityfromstart
summarize Coupon IssueAmountPer1Mln IssuePrice OriginalSpread
OriginalYieldMaturity Maturityfromstart, detail
tab Rating
tab EnvironmentalPillarScoreGrade

collapse (sum) IssueAmountPer1Mln, by(YEAR)
format IssueAmountPer1Mln %15.2f

```

```

list IssueAmountPer1Mln YEAR

clear all
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
use
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset.dta"

//Descriptive Statistics Conventional Bonds Notice that this part
needs to be ran seperately in order to display the descriptive
statistics properly.
keep if Eventtype == 2
tab Eventtype YEAR

*Harmonise the Rating variable to contain 1 rating system (Standard
& Poor's)

tab Rating
replace Rating = subinstr(Rating, "Aaa", "AAA", .)
replace Rating = subinstr(Rating, "Aa1", "AA+", .)
replace Rating = subinstr(Rating, "Aa2", "AA", .)
replace Rating = subinstr(Rating, "Aa3", "AA-", .)
replace Rating = subinstr(Rating, "A1", "A+", .)
replace Rating = subinstr(Rating, "A2", "A", .)
replace Rating = subinstr(Rating, "A3", "A-", .)
replace Rating = subinstr(Rating, "Baa1", "BBB+", .)
replace Rating = subinstr(Rating, "Baa3", "BBB", .)
replace Rating = subinstr(Rating, "Baa3", "BBB-", .)
replace Rating = subinstr(Rating, "Ba1", "BB+", .)
replace Rating = subinstr(Rating, "Ba2", "BB", .)
replace Rating = subinstr(Rating, "Ba3", "BB-", .)
replace Rating = subinstr(Rating, "B1", "B+", .)
replace Rating = subinstr(Rating, "B2", "B", .)
replace Rating = subinstr(Rating, "B3", "B-", .)
replace Rating = subinstr(Rating, "Caa1", "CCC+", .)
replace Rating = subinstr(Rating, "Caa3", "CCC", .)
replace Rating = subinstr(Rating, "Caa3", "CCC-", .)
replace Rating = subinstr(Rating, "Ca", "CC", .)
replace Rating = subinstr(Rating, "C", "D", .)

*For descriptive statistics, the variables need to be transformed in
the same format
gen IssueAmountPer1Mln = AmountIssuedUSD / 1000000
gen Maturityfromstart = (dofd(Maturity) - dofd(IssueDate)) / 365.25
sort Maturityfromstart
sort Maturity

summarize Coupon IssueAmountPer1Mln IssuePrice OriginalSpread
OriginalYieldMaturity Maturityfromstart
summarize Coupon IssueAmountPer1Mln IssuePrice OriginalSpread
OriginalYieldMaturity Maturityfromstart, detail
tab Rating
tab EnvironmentalPillarScoreGrade

collapse (sum) IssueAmountPer1Mln, by(YEAR)
format IssueAmountPer1Mln %15.2f
list IssueAmountPer1Mln YEAR

```



```

*Descriptive Statistics of REITs that issue Green Bonds
clear all
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
use
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset.dta"

//First, data is sorted in such a way that we only get the Firm-
level observations in the year of the REIT's first green bond
issuance
sort FIRM GreenBond
gen GREEN = .
replace GREEN = 1 if GreenBond == "Yes"
replace GREEN = 0 if missing(GREEN)
sort FIRM DATE
gsort - GREEN
egen ISGREEN = max(GREEN), by(FIRM YEAR)
sort YEAR ISGREEN
tab ISGREEN
gsort - ISGREEN
tab FIRM ISGREEN
drop if ISGREEN == 0
drop GREEN
sort DATE
sort FIRM ISGREEN
egen YearofIssue = min(YEAR), by (FIRM ISGREEN)
drop if YEAR != YearofIssue
sort QUARTER YEAR

```

\*Next, Quarterly firm-level data is averaged over the year. The SSC command EREPLACE, at created by Cox & Baum (2016) is installed and applied. EREPLACE is the replace equivalent of EGEN, which allows to replace a variable with its mean() variable without the need to generate new variables. Full link: <https://www.statalist.org/forums/forum/general-stata-discussion/general/1416516-ereplace-now-on-ssc>. Market Value is expressed in millions, whilst the other variables are expressed in thousands, hence we multiply the MV by 1000. ROE is set to decimal points.

```

ssc install EREPLACE
bys FIRM: ereplace CapEx = mean(CapEx)
bys FIRM: ereplace TotalAssets = mean(TotalAssets)
bys FIRM: ereplace TotalDebt = mean(TotalDebt)
bys FIRM: ereplace FFO = mean(FFO)
bys FIRM: ereplace NetIncome = mean(NetIncome)
bys FIRM: ereplace DIVYIELD = mean(DIVYIELD)
bys FIRM: ereplace ROE = mean(ROE)
bys FIRM: ereplace MV = mean(MV)
bys FIRM: replace MV = MV * 1000
bys FIRM: replace ROE = ROE / 100

```

```

*Then, 1 observation for each REIT in the respective first issuance
year is created
keep if Eventtype == 1
duplicates list FIRM

```

```

bys FIRM: gen NUMBER = _n
drop if NUMBER > 1

//The variables that concern the descriptive statistics

gen SIZE = ln(TotalAssets)
gen Cashflowratio = FFO / TotalAssets
gen Leverage = TotalDebt / TotalAssets
gen ROA = NetIncome / TotalAssets
gen CFCapEX = FFO / CapEx
gen TOBINq = MV / (TotalAssets)

sum SIZE Cashflowratio Leverage ROA ROE TOBINq
sum SIZE Cashflowratio Leverage ROA ROE TOBINq, detail

*Tests for normality and Skewness/Kurtosis
swilk SIZE Cashflowratio Leverage ROA ROE TOBINq
sktest SIZE Cashflowratio Leverage ROA ROE TOBINq

*Do not save, for descriptive statistics only!
clear all

*Start of Do-File 5

**Event Study on Green Bonds** ONLY FOR FIRST TIME ISSUERS! These
steps are also conducted in do-file 7
clear all
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
use
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset.dta"

*This event study is conducted via the Event study guide produced by
Dr. Steffen Eriksen, who is an assistant professor in Finance at the
Faculty of Economics and Business of the University of Groningen. In
order to trace the steps made, a link to the guide by Dr. Eriksen is
provided here https://tinyurl.com/Guide-by-Eriksen

*Drop missing data
drop if missing(AmountIssuedUSD) & Eventtype == 2
drop if missing(Coupon) & Eventtype == 2
drop if missing(Maturity) & Eventtype == 2

*Sorting Firm Data
sort FIRM DATE

*Generating a date count for the trading days from 1 up until the
last trading day in the dataset, per REIT
by FIRM: generate DATENumber = _n

*Generating a target date for the day of a green bond announcement
by FIRM: generate Target = DATENumber if Eventtype == 2
list FIRM Target if !missing(Target)

*Spread the day that the green bond announcement occurred over the
FIRM values
egen td=min(Target), by (FIRM)

```

```

egen td2=max(Target), by (FIRM)
replace td=td2 if td2==Target
drop Target
drop td2

*Generate the number of days before and after the green bond
announcement per firm
generate Dif = DATEnumber-td
drop if missing(Dif)

*Creating the event window, for the thesis we apply [-1,1]
by FIRM: generate Eventwindow = 1 if Dif >= -1 & Dif <= 1

*Check event window length
egen Count = count(Eventwindow), by(FIRM)
tab Count
sum Count
drop Count

*Creating the estimation window, for the thesis we apply [-252,-10]
by FIRM: gen Estimationwindow = 1 if Dif < -10 & Dif >= -252

*Check estimation window length
egen Count2 = count(Estimationwindow), by(FIRM)
tab Count2
sum Count2
drop if missing(Count2)
drop if Count2 == 0
drop Count2

*Replacing the missing values by 0
replace Eventwindow=0 if Eventwindow==.
replace Estimationwindow=0 if Estimationwindow==.

*Drop FIRMS that contain no return or market return data on the
event date, or have short event dates
list FIRM if missing(RETURN) & Eventwindow == 1
list FIRM if missing(Rm) & Eventwindow == 1
replace RETURN = 0 if missing(RETURN)
replace Rm = 0 if missing(Rm)
replace SMB = 0 if missing(SMB)
replace HML = 0 if missing(HML)
replace MOM = 0 if missing(MOM)

*Estimating normal returns via the Market Model
generate MMreturn =.
egen id = group(FIRM)
generate SE_residual =.
tab id

*****
*****
generate Rmbase = Rm + RF1mo
generate RETURNbase = RETURN - RF1mo

```

```
*****
*****
```

```
*Estimation of the Market Model Returns
```

```
forvalues i=1(1)72 {
    regress RETURN Rmbase if id == `i' & Estimationwindow == 1
    predict p if id == `i'
    predict std_err_residual, stdr
    replace SE_residual = std_err_residual if id == `i'
    replace MMreturn = p if id == `i'
    drop p
    drop std_err_residual
}
```

```
*Calculating the abnormal returns for each day within the event window
```

```
sort id DATENumber
gen ABNORMAL = RETURN - MMreturn
```

```
*Generating the cumulative abnormal return for each day within the event window
```

```
by id: egen CAR = total(ABNORMAL) if Eventwindow == 1
```

```
*Generating the Standard Deviation on the Estimation window
```

```
sort id DATENumber
by id: egen ar_sd_est = sd(ABNORMAL) if Estimationwindow == 1
bysort id: egen ar_sd = max(ar_sd_est)
corr SE_residual ar_sd
drop ar_sd_est
```

```
*Generating the Test statistic J for each REIT over the event window length
```

```
gen test =(1/sqrt(3)) * (CAR / ar_sd)
```

```
*Comparing the test statistic
```

```
list FIRM CAR test if Dif == 0
swilk CAR if Dif == 0
sktest CAR if Dif == 0
regress CAR if Dif == 0, robust
sum CAR if Dif == 0
gsort - CAR
```

```
*Wilcoxon-Signed-Rank test
```

```
signrank CAR = 0 if Dif == 0
```

```
*Eyeball analysis plots
```

```
histogram CAR if Dif == 0, frequency normal
qnorm CAR if Dif == 0
```

```
*Start of Do-File 6. The steps here are identical to dofiles 1-5 but now we have formatted the data to be suitable for analysis with multiple green bond issuances.
```

```
clear all
```

```
*For the Firms that issued Green Bonds, the daily information is merged as follows
```

```

*Reshape Price Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergell.xlsx",
sheet("P") firstrow allstring
reshape long FIRM, i(DATE) j(price)
rename FIRM PRICE
rename price FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PRICE.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergell.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PRICE.dta"
destring PRICE, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PRICE.dta",
replace
clear all

*Reshape Volume Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergell.xlsx",
sheet("VOL") firstrow allstring
reshape long FIRM, i(DATE) j(volume)
rename FIRM VOLUME
rename volume FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\VOLUME.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergell.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\VOLUME.dta"
destring VOLUME, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\VOLUME.dta",
replace
clear all

*Reshape Market Value Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergell.xlsx",
sheet("MV") firstrow allstring
reshape long FIRM, i(DATE) j(marketvalue)
rename FIRM MV
rename marketvalue FIRM
order FIRM

```

```

save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MV.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergell.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MV.dta"
destring MV, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MV.dta",
replace
clear all

*Reshape Dividend Yield Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergell.xlsx",
sheet("DIVY") firstrow allstring
reshape long FIRM, i(DATE) j(DIVY)
rename FIRM DIVYIELD
rename DIVY FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVY.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergell.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVY.dta"
destring DIVYIELD, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVY.dta",
replace
clear all

*Reshape P/E Ratio Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergell.xlsx",
sheet("PER") firstrow allstring
reshape long FIRM, i(DATE) j(Per)
rename FIRM PER
rename Per FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PER.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Mergell.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PER.dta"
destring PER, replace force
drop _merge

```

```

save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PER.dta",
replace
clear all

*Merge reshaped data with master key names
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger"
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PRICE.dta"
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\VOLUME.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MV.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVY.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\PER.dta"
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED11.dta",
replace

*****
*****
*For the Firms that issued Green Bonds, the yearly/quarterly
information is merged as follows
*Reshape Dividends per Share Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("DIVps") firstrow allstring
reshape long FIRM, i(QY) j(divps)
rename FIRM DIVps
rename divps FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVps.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVps.dta"
destring DIVps, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVps.dta",
replace
clear all

*Reshape CapEx Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("CapEx") firstrow allstring
reshape long FIRM, i(QY) j(capex)
rename FIRM CapEx

```

```

rename capex FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\CapEx.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\CapEx.dta"
destring CapEx, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\CapEx.dta",
replace
clear all

*Reshape Total Assets Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Total Assets") firstrow allstring
reshape long FIRM, i(QY) j(taa)
rename FIRM TotalAssets
rename taa FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total
Assets.dta", replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total Assets.dta"
destring TotalAssets, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total
Assets.dta", replace
clear all

*Reshape Total Debt Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Total Debt") firstrow allstring
reshape long FIRM, i(QY) j(tdd)
rename FIRM TotalDebt
rename tdd FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total
Debt.dta", replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total Debt.dta"

```



```

destring TotalDebt, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total
Debt.dta", replace
clear all

*Reshape EBIT Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("EBIT") firstrow allstring
reshape long FIRM, i(QY) j(ebit)
rename FIRM EBIT
rename ebit FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBIT.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBIT.dta"
destring EBIT, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBIT.dta",
replace
clear all

*Reshape EBITDA Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("EBITDA") firstrow allstring
reshape long FIRM, i(QY) j(ebitda)
rename FIRM EBITDA
rename ebitda FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBITDA.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBITDA.dta"
destring EBITDA, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBITDA.dta",
replace
clear all

*Reshape FFO Green Bond firms
clear all

```

```

import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("FFO") firstrow allstring
reshape long FIRM, i(QY) j(ffo)
rename FIRM FFO
rename ffo FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\FFO.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\FFO.dta"
destring FFO, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\FFO.dta",
replace
clear all

*Reshape ROE Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("ROE") firstrow allstring
reshape long FIRM, i(QY) j(roe)
rename FIRM ROE
rename roe FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\ROE.dta",
replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\ROE.dta"
destring ROE, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\ROE.dta",
replace
clear all

*Reshape Net Income Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Net Income") firstrow allstring
reshape long FIRM, i(QY) j(neti)
rename FIRM NetIncome
rename neti FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Net
Income.dta", replace
clear all

```

```

import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Net Income.dta"
destring NetIncome, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Net
Income.dta", replace
clear all

*Reshape Common Equity Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Common Equity") firstrow allstring
reshape long FIRM, i(QY) j(comm)
rename FIRM CommonEquity
rename comm FIRM
order FIRM
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Common
Equity.dta", replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Common Equity.dta"
destring CommonEquity, replace force
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Common
Equity.dta", replace
clear all
*Reshape EPS Green Bond firms
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("EPS") firstrow allstring
reshape long FIRM, i(QY) j(eps)
rename FIRM EnvPillarScore
rename eps FIRM
order FIRM
save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EnvPillarScore.dta"
, replace
clear all
import excel
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\GBQY11.xlsx",
sheet("Master") firstrow
merge 1:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EnvPillarScore.dta"
destring EnvPillarScore, replace force
drop _merge
save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EnvPillarScore.dta"
, replace

```

```

clear all

*Merge reshaped data with master key names
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger"
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\DIVps.dta"
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\CapEx.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total Assets.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Total Debt.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBIT.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EBITDA.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\FFO.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\ROE.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Net Income.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Common Equity.dta"
drop _merge
merge m:m FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\EnvPillarScore.dta"
drop _merge
save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGEDQ11.dta",
replace

*****
clear all
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED11.dta"

*Generate and format a Date variable based on the string Date
variable of the dataset
gen DATEvar = date(DATE, "MDY")
format DATEvar %td
drop DATE
rename DATEvar DATE

*Generation of Year, Month and Quarter dates. The purpose of these
variables is to generate the QY variable, which contains the same
string information as the quarterly financial dataset which will be
merged in the master dataset later on.
gen MONTH = month(DATE)
gen QUARTER = ceil(MONTH/3)

```

```

replace QUARTER = 4 if QUARTER == 0
gen YEAR = year(DATE)
gen QY = "Q" + string(QUARTER) + " " + string(YEAR)

*Merging of the daily dataset with the quarterly Firm financials
dataset
merge m:m FIRM QY using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGEDQ11.dta"
tab _merge
drop _merge
save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED11.dta",
replace

*Merge firm level data with Fama-French 3 factor model
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED11.dta"
merge m:m DATE using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Data\FF3.dta"
tab _merge
drop _merge

save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED411.dta",
replace

/////////Formatting of green bonds

clear all
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Bond Data\"
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Bond Data\Green
Bonds.dta"

sort FIRM
rename Announcement DATE

drop if DATE < date("01jan2013", "DMY")
tab Maturity

*A loop constructed to replace missing values by the value 0
foreach var of varlist IssuePrice OriginalSpread
OriginalYieldMaturity {
    replace `var' = . if `var' == 0
}

sort FIRM DATE

*Specifying the event dates
generate Eventtype = .
replace Eventtype = 1 if GreenBond == "Yes"
replace Eventtype = 2 if GreenBond == "No"
replace Eventtype = 0 if missing(Eventtype)

*Checking on duplicate bonds
duplicates report FIRM DATE
duplicates list FIRM DATE Coupon AmountIssuedUSD
duplicates tag FIRM DATE Coupon AmountIssuedUSD, gen(Duplicates)

```

```

gsort - Duplicates DATE
replace AmountIssuedUSD = AmountIssuedUSD * 2 if Duplicates == 1
egen seq = seq()
drop if Duplicates == 1 & mod(seq, 2) == 0
tab GreenBond
drop Duplicates seq
duplicates report FIRM DATE

sort FIRM DATE
egen seq = seq()
drop FIRM
rename seq FIRM

save "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Bond
Data\Green Bonds.dta", replace

*Merge Green Bond Data and REIT Data
clear all
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
use "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\MERGED411.dta"
sort DATE
sort FIRM
merge m:m DATE FIRM using
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Bond Data\Green
Bonds.dta"
sort DATE
sum DATE
sort GreenBond

save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset2.dta",
replace
drop _merge
sort NAME
sort DATE
sort Issuer
summarize
tab GreenBond

clear all
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
use
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset2.dta"

*Sorting the Data and re-checking for duplicates
sort DATE
duplicates report FIRM DATE

*Setting the Panel data
tsset FIRM DATE, daily
sort FIRM DATE

*Generating the return variable. The variable is expressed in
decimals to be concise with the market return and risk free rates.
The return is expressed as the normal return as opposed to the

```

logarithmic return as to remove the risk over overcomplicating the event study estimations.

```
bys FIRM (DATE): gen RETURN = ((PRICE - PRICE[_n-1])/PRICE[_n-1])
sum Rm RETURN
tab Eventtype
```

// For reference, the log return variables computations are the following. Although computationally different, the log returns do not produce different research results. The interested reader may however proceed with logarithmic to his or her liking.

```
*bys FIRM (DATE): gen lnRETURN = ln(PRICE / PRICE[_n-1])
*generate lnRm = ln(Rm+1)
*generate lnSMB = ln(SMB+1)
*generate lnHML = ln(HML+1)
*generate lnMOM = ln(MOM+1)
```

```
drop _merge
```

```
save
```

```
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset2.dta",
replace
```

### **\*Start of Do-File 7**

\*Not there are two different datasets containing the fully formatted dataset. The first full dataset is for descriptive statistics and analysis of first time/conventional issuers. The second dataset is for green bond analysis purposes as this contains firm duplicates based on the amount of bond issuances.

```
**Event Study on Green Bonds**
```

```
clear all
```

```
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
```

```
use
```

```
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset2.dta"
```

\*This event study is conducted via the Event study guide produced by Dr. Steffen Eriksen, who is an assistant professor in Finance at the Faculty of Economics and Business of the University of Groningen. In order to trace the steps made, a link to the guide by Dr. Eriksen is provided here <https://tinyurl.com/Guide-by-Eriksen>.

\*Depending on the model applied, use either Rmbase (CAPM+Risk free rate) or RETURNbase \*Return less risk free rate

```
generate Rmbase = Rm + Rflmo
```

```
generate RETURNbase = RETURN - Rflmo
```

```
*Tsline
```

```
twoway tsline RETURNbase Rm
```

```
*Sorting Firm Data
```

```
sort FIRM DATE
```

\*Generating a date count for the trading days from 1 up until the last trading day in the dataset, per REIT

```
by FIRM: generate DATEnumber = _n
```

```

*Generating a target date for the day of a green bond announcement
by FIRM: generate Target = DATEnumber if Eventtype == 1

*Checking whether each firm id has 1 green bond observation
list FIRM DATE Target if ! missing(Target)
by FIRM: egen Rank = rank(Target)
tab Rank
egen Maxrank=max(Rank), by(FIRM)
drop if missing(Maxrank)

*Spread the day that the green bond announcement occurred over the
FIRM values
egen td=min(Target), by (FIRM)

drop Target

*Generate the number of days before and after the green bond
announcement per firm
generate Dif = DATEnumber-td

drop if missing(Dif)

list FIRM DATE NAME if Dif==0

save
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset2.dta",
replace

*****
*****

clear all
cd "C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\"
use
"C:\Users\julia\OneDrive\Dokumente\THESIS\Merger\Fulldataset2.dta"

*Drop observations where the event window overlaps.

*Creating the event window, for the thesis we apply [-1,1] If
running over a different estimation window, change the dif values
by FIRM: generate Eventwindow = 1 if Dif >= -1 & Dif <= 1

*Check event window length
egen Count = count(Eventwindow), by(FIRM)
tab Count
sum Count
drop Count

*Creating the estimation window, for the thesis we apply [-252,-10]
by FIRM: gen Estimationwindow = 1 if Dif < -10 & Dif >= -252

*Check estimation window length
egen Count2 = count(Estimationwindow), by(FIRM)
tab Count2
sum Count2

```



```

drop Count2

*Replacing the missing values by 0
replace Eventwindow=0 if Eventwindow==.
replace Estimationwindow=0 if Estimationwindow==.

*Estimating normal returns via the Market Model
generate MMreturn =.
egen id = group(FIRM)
generate SE_residual =.
tab id

*** From this part onwards, the robustness tests based on the model
can be ran by using the following commands in the market model
estimation loop

//Market model
*regress RETURN Rmbase if id == `i' & Estimationwindow == 1
//CAPM
*regress RETURNbase Rm if id == `i' & Estimationwindow == 1
//Fama french 3 factor model
*regress RETURNbase SMB HML if id == `i' & Estimationwindow ==
1
//Carhart 4 factor model
**regress RETURNbase SMB HML MOM if id == `i' &
Estimationwindow == 1

*Estimation of the Market Model Returns *IMPORTANT* Set the
forvalues number to fit the max of ID, with larger event windows,
this figure will need to decrease otherwise the loop fails
forvalues i=1(1)34 {
    regress RETURN Rmbase if id == `i' & Estimationwindow == 1
    predict p if id == `i'
    predict std_err_residual, stdr
    replace SE_residual = std_err_residual if id == `i'
    replace MMreturn = p if id == `i'
    drop p
    drop std_err_residual
}

*Calculating the abnormal returns for each day within the event
window
sort id DATENumber
gen ABNORMAL = RETURN - MMreturn

*Generating the cumulative abnormal return for each day within the
event window
by id: egen CAR = total(ABNORMAL) if Eventwindow == 1

*Generating the Standard Deviation on the Estimation window
sort id DATENumber
by id: egen ar_sd_est = sd(ABNORMAL) if Estimationwindow == 1
bysort id: egen ar_sd = max(ar_sd_est)
corr SE_residual ar_sd
drop ar_sd_est

```

```
*Generating the Test statistic J for each REIT over the event window
length. Divide by the square root of event window days.
gen test =(1/sqrt(3)) * (CAR / ar_sd)
```

```
*Comparing the test statistic
list FIRM CAR test if Dif == 0
swilk CAR if Dif == 0
sktest CAR if Dif == 0
regress CAR if Dif == 0, robust
sum CAR if Dif == 0
```

```
*Eyeball analysis plots
histogram CAR if Dif == 0, frequency normal
qnorm CAR if Dif == 0
```

```
*Wilcoxon-Signed-Rank test
signrank CAR = 0 if Dif
```

## V. Additional references

- Ambrose, B.W. & Linneman, P.D. (1998). *Old REITs and New REITs*. Real Estate Center, Wharton School of the University of Pennsylvania.
- Amihud, Y. & Mendelson, H. (2000). The liquidity route to a lower cost of capital. *Journal of Applied Corporate Finance*, 12(4), pp. 8-25.
- Asimakopoulous, S., Asimakopoulous, P. & Li, X. (2021). The Role of Environmental, Social, and Governance Rating on Corporate Debt Structure. Available at: SSRN: <https://ssrn.com/abstract=3889307>
- Baser, O. (2006). Too much ado about propensity score models? Comparing methods of propensity score matching. *Value in Health*, 9(6), pp. 377-385.
- Bonsall IV, S.B., Green, J. & Muller III, K.A. (2020). Market uncertainty and the importance of media coverage at earnings announcements. *Journal of Accounting and Economics*, 69(1), pp. 1-23.
- Black, B.S., Lalkiya, P. & Lerner, J.Y. (2020). The trouble with coarsened exact matching. Northwestern Law & Econ Research Paper Forthcoming. Available at: SSRN: <https://ssrn.com/abstract=3694749> [Accessed 9 March 2020].
- Chacon, R., Feng, Z. & Wu, Z. (2022). Does Investing in ESG Pay Off? Evidence from REITs around the COVID-19 Pandemic. Available at: SSRN: <https://ssrn.com/abstract=4147749>
- Climate Bond Initiative (CBI) (2021). Sustainable Debt Global State of the Market 2021. [Online] Available at: [https://www.climatebonds.net/files/reports/cbi\\_global\\_sotm\\_2021\\_02h\\_0.pdf](https://www.climatebonds.net/files/reports/cbi_global_sotm_2021_02h_0.pdf) [Accessed 4 March 2023].
- Dhaliwal, D.S., Li, O.Z., Tsang, A. & Yang, Y.G. (2011). Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting. *The accounting review*, 86(1), pp. 59-100.
- Giacomini, E., Ling, D.C. & Naranjo, A. (2017). REIT Leverage and Return Performance: Keep Your Eye on the Target. *Real Estate Economics*, 45(4), pp. 1-49
- Harrison, D.M., Panasian, C.A. & Seiler, M.J. (2011). Further evidence on the capital structure of REITs. *Real Estate Economics*, 39(1), 133-166.
- Högfeldt, P. (2005). The history and politics of corporate ownership in Sweden. In: R.K. Mock, ed, *A history of corporate governance around the world: Family business groups to professional managers*, first ed., Chicago: University of Chicago Press, pp. 517-580.

- Hsieh, H.C., Claresta, V. & Bui, T.M.N. (2020). Green building, cost of equity capital and corporate governance: Evidence from US real estate investment trusts. *Sustainability*, 12(9), pp. 1-21.
- Jelemensky, J. (2022). *Quantitative Comparison of the Issue Yield of Green Bonds and Conventional Bonds*. Wiesbaden: Springer Fachmedien Wiesbaden GmbH.
- Karpf, A. & Mandel, A. (2018). The changing value of the ‘green’ label on the US municipal bond market. *Nature Climate Change*, 8(2), pp. 161-165.
- Leuven, E. & Sianesi, B. (2003). *PSMATCH2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing*. [Online] Available at: <http://ideas.repec.org/c/boc/bocode/s432001.html>. [Accessed 6 March 2023].
- Mazur, M., Dang, M. & Vega, M. (2021). COVID-19 and the march 2020 stock market crash. Evidence from S&P 1500. *Finance research letters*, 38, pp. 1-8.
- McIntosh, W. (2009). The US Real Estate Investment Trust (REIT) Market. In: G. Newell, K. Sieracki, ed, *Global Trends in Real Estate Finance*, first ed., Singapore: Wiley-Blackwell, pp. 19-33.
- Nguyen, L.D. (2019). Decomposing Industry Leverage in the US: The Real Estate Investment Trust (REIT) Debt Puzzle. PhD. KTH Royal Institute of Technology, Stockholm.
- Pástor, L. & Stambaugh, R.F. (1999). Costs of equity capital and model mispricing. *The Journal of Finance*, 54(1), pp. 67-121.
- Pástor, L., Stambaugh, R.F. & Taylor, L.A. (2021). Sustainable investing in equilibrium. *Journal of Financial Economics*, 142(2), pp. 550-571.
- Rosenbaum, P.R. & Rubin, D.B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), pp. 41-55.
- Ryu, I., Jang, H., Kim, D., & Ahn, K. (2021). Market Efficiency of US REITs: A Revisit. *Chaos, Solitons & Fractals*, 150(1), pp. 1-7.
- Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. *Statistical science: a review journal of the Institute of Mathematical Statistics*, 25(1), pp. 1-21.
- Verbeek, B. (2021). *Green bond benefits*. Msc. Thesis. Erasmus University Rotterdam, Rotterdam.