EUROPEAN CLOSED-END FUND DISCOUNTS: EFFECT OF COVID-19

A Master's Thesis

by
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Ankara
September 2022

To my family

EUROPEAN CLOSED-END FUND DISCOUNTS:
EFFECT OF COVID-19

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by

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In Partial Fulfilment of the Requirements for the
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By Ferda Çetin

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science in Management.

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ABSTRACT

EUROPEAN CLOSED-END FUND DISCOUNTS:

EFFECT OF COVID-19

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September 2022

This thesis analyzes behavior of Closed-end fund discounts (CEF) under the novel circumstances of the global pandemic that crushed the financial markets starting from early 2020. As literature argues CEF discounts to be affected and explained by the investor sentiment, I expect discounts display the sentiment shifts in the market. Using the CEFs trading in European Exchange Markets, for the period of 2017-2021, I apply linear regression, and found that discounts significantly increase with risk factor (beta) and transaction costs proxy and decrease with dividend yield, turnover, size of the fund, and market returns including House Price Index, controlling for country and fund portfolio asset class focus fixed effects. Results of regression models indicate that CEF discounts widen after the first cases confirmed in the country, as Covid-19 pandemic create a negative shock on investor sentiment. The optimism in the market after the administration of vaccination started is also reflected through CEF discounts as they shrink with vaccination effect. Moreover, I find that new cases and new deaths of Covid-19 are significant predictors for CEF discounts, implying that investors are affected by the main Covid-19 related publicly available data.

Keywords: Closed-End Fund Discounts, Covid-19, Investor Sentiment, Vaccination effect

ÖZET

AVRUPA'DAKI YATIRIM ORTAKLIKLARININ ISKONTOSU:

COVID-19 ETKISI

Çetin, Ferda

Yüksek Lisans, İşletme Bölümü

Tez Yöneticisi: Doç. Dr. Zeynep Önder

Eylül 2022

Bu tez, 2020'nin başlarından itibaren finansal piyasaları etkisi altına alan küresel pandeminin koşulları altında yatırım ortaklıklarının iskontolarının davranışlarını analiz etmeyi amaçlamıştır. Literatürün, yatırımcı duyarlılığının yatırım ortaklıklarının iskontolarının üzerindeki etkisini ve açıklayıcı gücünü öne sürmesinden dolayı, iskontoların piyasadaki duygu değişikliklerinden etkilenmesi beklenmektedir. Bu tezde Avrupa'daki yedi ülkenin hisse senedi borsalarında işlem gören yatırım ortaklıklarının iskontoları 2017-2021 döneminde incelenmiştir. Doğrusal regresyon modeli ile ülke ve fon portföyü varlık sınıfları kontrol edilerek elde edilen analizlerde, fonların iskontolarının, risk faktörü (beta) ve işlem maliyetleri ile önemli ölçüde arttığı, temettü verimi, ciro ve fon büyüklüğü ile orantılı olarak azaldığı, Covid-19'un yatırımcı psikolojisi üzerindeki negatif şoku ile ülkede teyit edilen ilk vakaların ardından yatırım ortaklıklarının iskontolarının arttığı, ilk doz aşı uygulanmaya başladıktan sonra piyasada gözlenen iyimserliğin de yatırım ortaklıklarının iskontolarına yansıdığı bulundu. Ayrıca, Covid-19 kaynaklı vakaların ve ölümlerin de iskontolar üzerinde anlamlı etkisi olduğu sonucu, yatırımcıların Covid-19 ile ilgili kamuya açık ana verilerden etkilendiğini göstermektedir.

Anahtar Kelimeler: Aşı Etkisi, Covid-19, Yatırımcı Duyarlılığı, Yatırım Ortaklıkları İskontoları

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CHAPTER 1

Introduction

Closed-end fund (CEF) discounts are one of the most debated aspects of modern finance literature. CEFs are a tiny portion of the mutual funds' universe, organized as an exchange-listed corporation that issue a fixed number of shares. Unlike open-end funds, the corporation has no obligation to redeem investors' shares, and unlike open end funds, CEFs usually trade at a discount referring to the percentage difference between the fund's underlying assets' net asset value (NAV) and its price. The very existence of discounts violates the law of one price and challenge neoclassical theory (Ross (2002)). Moreover, literature argues that CEF discounts cannot be fully explained by classical finance models (Pratt (1996), Malkiel (1977)). Lee, Shleifer, and Thaler (1991) argue that although rational explanations can somewhat rationalize why discounts exist, they cannot account unconventional behavior of CEF discount such as why funds start at a premium, why the discounts fluctuate over time, and why prices increase when the fund is open-ended, so-called the closed-end discount puzzle. They conclude that the component that is missing

from the explanation of CEF discounts is the investor sentiment (Lee, Shleifer and Thaler (1991)).

The investor sentiment can be defined briefly as the expectations and beliefs about the market of individual investors. Also called noise traders (Black 1986), individual investors mainly trade based on incomplete or inaccurate data whereas rational investors which are characterized as investors who form fully rational expectations about asset returns. Moreover, noise-traders have higher marginal research costs than professionals and new information flows to them in a non-systematic fashion because they make investment decisions through their own research or on the advice of finance gurus, news, trends (Shleifer et al,1990), or their social groups (Brown 2008). Their aggregate demand affects the market in a powerful manner because a large number of small events is often a causal factor much more powerful than a small number of large events can be (Black 1986).

The investor sentiment theory creates a reciprocal relationship between CEF discounts and investor sentiment, since as investor sentiment justifies CEF discounts better than rational explanations, CEF discounts can be used as a measure of investor sentiment in the market. This relationship creates the motivation for this paper, as it examines CEF discounts under the contemporary setting of Coronavirus outbreak that strongly affected financial markets around the world starting at the end of 2019.

After the first cases confirmed in China, the virus spread to the US and Europe in less than two months. With increasing cases, the World Health Organization (WHO) announced Covid-19 as a global pandemic and the whole world entered an era of panic and fear for about a year until the administration of vaccination was started.

Unsurprisingly, the effect of this situation on the financial markets was destructive. Covid-19 affected US market more than any other global pandemic, including influenza in 1920s (Baker et al, 2020). The public attention to Covid-19 developed immediately and intensely (Ramelli and Wagner, 2020), and investors sentiment was at least partly responsible for the extreme amount of value loss in global markets (Lyócsa et al, 2020).

While the literature argues that Covid-19 impact on investor sentiment was tremendous, I examine CEF discounts in the European market for this period as the discounts are interpreted as a measure of investor sentiment in the market. In addition to impact of Covid-19, I also expect markets to be affected by vaccination, hence, the first hypothesis in this paper is constructed to test that the CEF discounts on average increased after the start of Covid-19 outbreak and decreased after the first dose of vaccination started to be administered publicly, controlling for fund characteristics and market conditions. For the first hypothesis, controlling for variables that are mainly used in the literature (Bradley et al 2010, Cherkes 2012), I test the effect of the start of Covid and vaccination, by dividing my sample period to three sub-samples that reflect the before Covid, from start of Covid until vaccination and after vaccination periods.

The second hypothesis is motivated from the literature, that investors relied on their own research to resolve uncertainty during the COVID-19 crisis rather than fundamental information (Goel and Dash, 2021) and the Google search volume (GSV) for the "coronavirus" keyword is a significant measure of sentiment for retail investors (Smales, 2021). Since daily new cases and new deaths were the main Coronavirus related data that were publicly shared by authorities, I expect these variables to have a significant effect on CEF discounts. Therefore, I test the second hypothesis: CEF discounts increase

significantly as the new cases and/ or new deaths increases, controlling for fund characteristics and market conditions.

I focus on European markets, and the whole sample period is from the start of January 2017 to end of December 2021, covering about three years before and two years after the first case was reported in the UK. The data are constructed from active CEFs traded in European Stock Exchange Markets as the year ending in 2021, consisting of 261 weeks. There are 227 CEFs in the sample and most of the CEFs are trading at London Stock Exchange and Swiss Stock Exchange. Most of these funds invest in equity and real estate. I retrieved all data concerning these CEFs from Bloomberg, including volume, dividend yield, leverage, total assets, number of outstanding shares, beta, and fund characteristics as their country of availability and asset class focus.

The first analysis reveals that CEFs are indeed traded at a discount. Uni-variate analysis displays that mean discount of the whole sample period is 5.97% while it significantly varies between three Covid periods. As the mean discount is 6.40%, before Covid, it increases to 7.53% after Covid period, and decreases to 3.16% following vaccination. Because of the autocorrelation and heteroscedasticity in the data, I apply Newey-West adjustment to my regressions. For the analysis of CEF discounts, I regress discount on control variables with asset class focus and country fixed effects. I find that transaction costs proxy, dividend yield, beta, turnover and size of the fund have a significant relationship with discounts, while fund age, turnover, lagged NAV returns do not have significant coefficients, either with or without country and asset class fixed effects. When HPI is included in the model to control the market conditions for Real Estate Funds, market returns become a significant factor explaining discounts. The t-tests and

regression results indicate that equity funds trade at a higher discount than real estate funds, and Swiss funds trade at a higher premium than the UK funds.

The regression findings are consistent with the literature. CEF discounts in parallel to investor sentiment were affected by Covid-19 and vaccination. As investor sentiment decreased with the start of Covid, CEF discounts widened, and as the optimism that vaccination supplied increased, CEF discounts shrunk. Moreover, new information about deaths and new cases that was publicly available on main Coronavirus statistics affected investor sentiment and CEF discounts accordingly.

This thesis is organized as follows: Chapter II reviews literature relevant for this study. Chapter III presents the hypotheses development, sample construction and methodology that will be employed to test hypotheses for this study. Chapter IV provides empirical results of the study and lastly, Chapter V concludes.

CHAPTER 2

Literature Review

In this section, I first review the theoretical and empirical models that examine the CEF puzzle and the investor sentiment theory as a possible explanation for the behavior of CEF discounts. Second, I summarize the literature available on the relationship between CEF discounts and the impact of Coronavirus on investor sentiment.

2.1 Closed-end Funds and Investor Sentiment

Closed-end funds are a subset of mutual fund which are organized as an exchange-listed corporation; it holds annual shareholder meetings, elects a board of directors, pays dividends, and hires outside portfolio-management advisors. Closed-end funds generally issue a fixed number of shares that are listed on a stock exchange or trade in the over-the-counter market. The market price of closed-end fund shares fluctuates like that of other publicly traded securities and is determined by supply and demand in the marketplace (A Guide to Closed-End Funds, 2021). Unlike open end funds, the CEF has no obligation to redeem investors' shares. Investors can exit a CEF by selling shares in a secondary

market. The aspect of CEFs that have been long debated by the academic literature is the discounts, which refer to the percentage difference between the fund's underlying assets' net asset value (NAV) and price of the fund. According to Ross (2002) the existence of CEF discounts violates the law of one price and challenge neoclassical theory.

The justifications of the behavior of discounts are summarized under two categories: the behavioral explanations, based on the irrationality or the sentiment of the investors and the rational explanations such as agency costs, tax liabilities, and illiquidity of assets. Pratt (1966) started the academic discussion of possible reasons underlying the CEF discounts, in the US, analyzed both the rational and behavioral explanations. Taking the built-in-capital gains liability (tax effect), liquidation and the capital gain liability, the cost of management, performance, the redemption factor (as a comparison with open end funds) and selling effort into account; he explains all the reasons except the selling effort, which expresses the investors' unawareness of CEFs, are myths that have little explanatory power over the discounts. He comments that CEF do not get the advertisement and the attention that Open End Funds (OEFs) and mutual funds have, thus leads to lack of public understanding and discounts.

Malkiel (1977) provides a more elaborative analysis on the CEF discounts, analyzing the possible explanations for the discounts as the bookkeeping procedures, managerial fees, managerial skills, and unrealized capital appreciation alongside investors' irrationality and market segmentation. Similar to Pratt (1966), Malkiel concludes that the rational possible reasons offer only a small part of explanation to the phenomenon.

The so-called CEF Discount Puzzle consist of four parts, first they start at a premium with IPO, but within 120 days after the initial offering, discounts increase to an average of 10 percent (Weiss, 1977), and the discounts disappear upon termination, through open-ending of the funds (Brauer, 1984). Open ending of a fund includes techniques such as converting the fund to an open-ended structure or merging the fund with an OEF, liquidating the funds' assets and tender offers for all assets fund have (Dimson, Elroy, and Carolina Minio-Kozerski, 1999). Moreover, the discounts fluctuate, meaning that they are not a fixed portion of NAVs (Lee, Shleifer, and Thaler,1991). They contemplate how the most cited rational explanations (agency costs, tax liabilities, and illiquidity of assets) cannot account for all parts of the puzzle, on their US sample of CEFs.

Agency costs are argued to be one of the reasons why CEFs trade at a discount, if future portfolio management is expected to be poor or if fund management fees are high (Boudreaux, 1973). However, agency costs cannot account for the fluctuations of the discount because they are usually a fixed ratio of NAV. Moreover, agency costs lack of explanation power over the fact that rational investors buy CEFs at a premium after IPO, while matured CEFs are trading at a discount (Lee, Shleifer, and Thaler,1991). Also, studies found no significant relationship between management fees and/or fund performance and discount levels Malkiel (1977).

Illiquidity of Assets is argued to be another reason why CEF discounts exist. Bookkeeping procedures of restricted of letter stocks can potentially cause overestimation of the NAV. Malkiel (1977) finds a significant relationship between the measurement of portion of restricted stock and discounts while Lee, Shleifer, and Thaler, 1991) dispute the theory by stating that restricted holdings cannot be a rationale for CEF discounts.

They show that many large CEFs that hold only liquid publicly traded securities still trade at a discount.

NAV of a fund can also be overestimated because of capital gains tax liabilities on unrealized appreciations. The tax liability associated with assets which have appreciated in value would reduce the liquidation value of the fund's assets. However, this theory conflicts with the third part of the puzzle, that the discounts disappear upon termination, through open-ending of the funds. Brauer (1984) and Brickley and Schallheim (1985) show that through open-ending of the funds' prices move up to net asset values rather than the net asset values falling down to the fund share prices. If NAV was overestimated because of tax liabilities, the opposite situation would be expected to happen.

To conclude, Lee, Shleifer, and Thaler (1991) argue that although rational explanations can somewhat rationalize why discounts exist, they cannot account for why funds get started at a premium, why the discounts fluctuate over time, and why prices increase when the fund is open-ended. Hence, they lean more strongly towards the behavioral explanations.

Behavioral explanations for CEF discounts concentrate around the beliefs and expectations, or in other words sentiment of small investors whom the literature represents as "noise traders". Individual investors mainly trade based on incomplete or inaccurate data unlike rational investors, also known as, "arbitrageurs" or "smart money" or "rational speculators" which are characterized as investors who form fully rational expectations about asset returns. In addition, noise traders typically fail to diversify, holding instead a single stock or a small number of stocks, or when they do diversify, they prefer already diversified portfolios such as mutual funds. Noise traders often pick

stocks through their own research or on the advice of finance gurus, news, trends (Shleifer, Andrei, and Summers, 1990), or even their social groups (Brown 2008)). Hence, noise-traders have higher marginal research costs than professionals and new information flows to them in a non-systematic fashion. Accordingly, their demands shift in an irrational manner. These demand shifts will only matter if they are correlated across noise traders. If all investors trade randomly, their trades cancel out and there are no aggregate shifts in demand, however, many trading strategies based on pseudo-signals, noise, and popular models are correlated, leading to aggregate demand shifts. Much like the subjects in psychological experiments tend to make the same mistake; as they do not make random mistakes, judgment biases afflicting investors in processing information tend to be the same. (Shleifer, 1990). Demonstrated as investor sentiment, noise in the sense of a large number of small events is often a causal factor much more powerful than a small number of large events can be (Black, 1986).

Empirical evidence suggests that investor sentiment is a significant driver of CEF discounts. Zweig (1973) was the first to demonstrate the effect of investor sentiment on CEF discounts. Zweig suggests that there is a high possibility of a reverse affect in the unanticipated direction on stock prices once the expectations of noise traders are become sufficiently one-sided.

Lee, Shleifer and Thaler in (1991), as discussed before, examine closed end puzzle in the US market and offer extension to Delong, Shleifer, Summers, and Waldmann (1990) (DSSW) model. DSSW examines noise trader risk and how it affects the limits of arbitrage. They argue that the arbitrageur is not only limited by fundamental risks but also the risk created by unpredictable noise traders. Since the expectations of noise

traders will not revert back to the mean and may become more extreme over time, which hinder short time arbitrage opportunities, arbitrageurs have to bear additional risk, that drives CEF prices down, resulting in discounts. Additionally, their model argues that noise trader risk offers explanation for several financial market anomalies including but not limited to CEF discount puzzle.

Lee, Shleifer and Thaler in (1991) introduced three implications to enhance the DSSW (1990) theory additional to compliance with investor sentiment explanation to the puzzle. First, they argue that levels of and changes in discounts should be highly correlated across funds, and by empirical evidence, demonstrate that discounts on different funds are driven by the same investor sentiment. Second implication of the model is regarding when the new funds start. The statistical evidence is consistent with the model, arguing that new funds should start when seasoned funds sell at a premium or smaller discount than usual. The third implication indicates the correlation with CEF discounts and returns on stock baskets that are not related to CEFs as they ranked the firms according to their capitalization and showed that smaller stock returns have higher correlation with CEF discounts.

While the Lee, Shleifer and Thaler in (1991) remains the most cited article in the CEF discount analysis with many validating papers on their explanation, there are some who dispute their theory. Chen, Kan & Miller (1993), argues that their results are misinterpreted due to econometric grounds. They challenge the economic significance of the relationship between returns on small stocks and CEF discounts stated in Lee et al (1991). By creating sub-samples of stocks with respect to their size and institutional ownership, they do not find a stronger relationship between CEF discounts and the

smallest firms than firms in other size classes. However, their critique is rebuffed by Chopra et al (1993) continuing the discussion.

Another research supporting the rational explanation for CEF discounts is Gemmill & Thomas (2002). Studying a sample of 158 U.K. equity funds, they investigate the existence of discounts and the fluctuations in the discounts. Their particular finding is the level of the discount is mainly affected by arbitrage costs and managerial expenses, not by noise-trader sentiment. On the other hand, Flynn (2012) replicates this study using US data and reaches to an opposite conclusion. They find that, the proxy for noise-trader risk is the only statistically significant coefficient for both bond and stock funds, whereas the UK data yielded statistically significant coefficients for the five rational factors, stated as the expense ratio, the log of fund ages, replication risk, dividend yield, and fund size. Flynn (2012) argues the difference between UK and US data can be due to the different groups of investors hold the majority of fund shares, since US CEFs are mainly held by individual investors and large majority of UK shares are held by institutions, and/or a selection bias in the UK data.

2.2 Covid-19 and Investor Sentiment

According to Centers for Disease Control and Prevention (CDC Museum COVID-19 Timeline, 2022), first symptoms of Covid-19 recorded in December 12, 2019, when a cluster of patients started to encounter shortness of breath and fever in Wuhan China. After the WHO report on the identification of novel Coronavirus around early January 2020, Covid spread through countries and shortly after new cases of were confirmed in South Korea, Iran, Thailand and Japan. The first case in Europe was confirmed in France on 24 January and by mid-March every country in Europe was affected by Covid-19. The

first cases confirmed in the UK was on 1 February and in Switzerland on 24 February. By 31 of January WHO Issued Global Health Emergency (A Timeline of COVID-19 Developments in 2020, 2021) and in March 11, WHO Declared COVID-19 a Pandemic. In 13 of February, Extraordinary Health Council adopts conclusions on COVID-19 (Timeline - Council actions on COVID-19, 2022). While Covid was spreading in a fast and lethal trend, vaccination research was introduced, and in early September, the first clinical human trials was conducted by Sanofi and GlaxoSmithKline (GSK). First COVID-19 vaccine authorized for use in the EU in 21 of December and by January 11, the first dose of Covid vaccine developed by BioNTech and Pfizer started to be administered in the UK. While medical authorities were full at war with the pandemic, many research areas became practicable with the availability of new data under the novel setting of the COVID-19 outbreak.

It is not surprising for investor sentiment theory was one of the areas that was in need of research during this time period, since it has been extensively studied for recessions and negative and exogenous shocks, by various methods. Diego (2013) argues that investor sentiment has a prominent effect during recessions, using proxy for market sentiment by counting the number of positive and negative words from financial columns from the New York Times. Similarly, aggregation of the volume of queries related to household concerns such as recession, unemployment and bankruptcy, Da et al (2015) construct a Financial and Economic Attitudes Revealed by Search (FEARS) index as a new measure of investor sentiment. De Long & Andrei Shleifer examined CEF discounts to measure investor sentiment during the Bubble of 1929. Burch et al studied events of September 11, 2001 (“nine-eleven”) in the US and confirmed CEF discounts reflect the sentiment of

small investors. Smales (2017) find a strong relationship between investor sentiment and stock returns, using volatility index (VIX), showing stock market returns are more affected from sentiment during recession.

Complementary to the literature recent studies focus on the exogenous shock of Covid-19 on financial markets, because it affected investors' expectations and sentiment greatly. Ramelli and Wagner (2020), as an early study of Covid-19, indicate how immediate and strong the public attention advanced and how it negatively affected the expectations of stock market returns. Lyócsa et al (2021) concluded similar results, indicating that short-term investors' sentiment was at least partly responsible for the extreme amount of value loss in global markets. According to Baker et al (2020) no other pandemic has affected the U.S. stock market in such extraordinary ways. Goel and Dash (2021) analyzed the Covid-19 effect on investor sentiment using the FEARS index, in a wide scope of 53 countries. They found investors rely on their own research to resolve uncertainty about household FEARS during the COVID-19 crisis rather than fundamental information. Moreover, the effect is robust to the inclusion of daily confirmed cases, pandemic search intensity, macroeconomic controls and government regulatory interventions. Similarly, Google search volume (GSV) for the "coronavirus" keyword is a measure of attention for retail investors, and a significant proxy for investor sentiment (Smales., 2021). On the grounds of reviewed literature and many more, it is evident that investor sentiment was predominantly affected by Covid-19.

Ma (2021), examines CEF discounts under the Covid-19 setting. His first hypothesis is that CEF discounts on average should widen due to Covid-19 effect. The regression of discounts onto a dummy variable POST that equals one in the post-COVID period and

controlled for fund fixed effects, resulted in statistically significant and economically sizable change in average CEF discounts, consistent with the hypothesis. His second and main hypothesis argues that CEFs with shares that are subject to more noise trading experience a larger increase in discounts, complying with the behavioral explanation of CEF discount puzzle. After controlling for fund and time fixed effects and commonly-used determinants of CEF discounts (such as transaction costs, market capitalization, dividend yield, annual share turnover, firm age, and expense ratio etc.), they found that CEFs with higher sentiment beta (the sensitivity of changes in its premiums to changes in individual investor sentiment, as a measure of its degree of noise trading), experienced a larger increase in discounts, after the COVID-19 outbreak. They also examined and ruled out other possible explanations to the change in CEF discounts by rational models, these are referred as the liquidity channel, the expense (managers' fees) channel, the payout channel, and the leverage channel. Using difference-in-differences approach, they show that CEFs with higher sentiment beta or retail ownership did not experience a significant change in liquidity/expense/ payout/ leverage channels after the COVID-19 outbreak. Hence, he concludes that increase in CEF discounts are due to the sentiment shifts rather than rational explanations during Covid-19.

CHAPTER 3

Hypotheses, Data and Empirical Models

In this section of the thesis, I first develop and explain the hypotheses I aim to test in my analysis. Then I describe the data, my sample, data sources, variables definitions and data statistics. Finally, I provide empirical models developed in order to test the hypotheses.

3.1 Hypotheses Tested

Two main hypotheses are tested in this paper. The first hypothesis are about the effect of Coronavirus pandemic and the Covid-19 vaccination on the magnitude of CEF discounts.

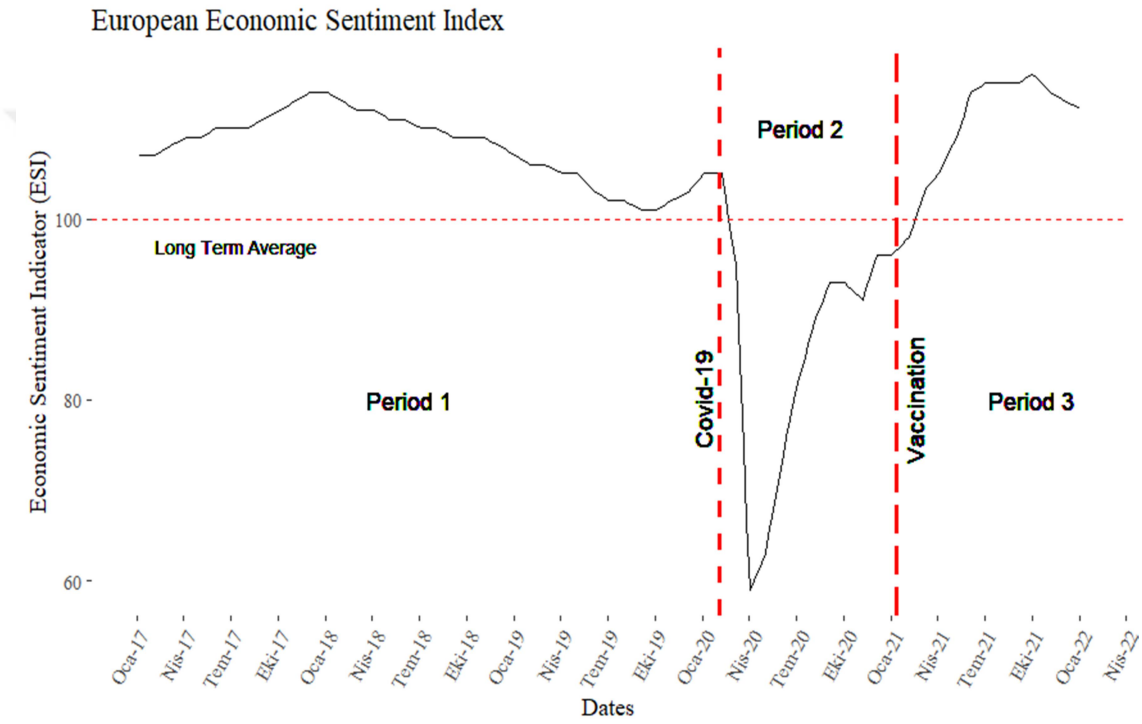
H1: CEF discounts on average increased after the start of Covid-19 outbreak and decreased after the first dose of vaccination started to be administered publicly, controlling for fund characteristics and market conditions.

The reason for expecting higher CEF discounts after the start of Covid-19 is the negative shock to investor sentiment due to the pandemic outbreak. The early Covid-19 literature argues that the negative shock is sizable and effective, compared to other pandemics in

world history and other economic crises (Ramelli and Wagner (2020), Lyócsa et al (2020), Baker et al (2020)).

Moreover, according to the European Commission Business and Consumer Surveys, Economic Sentiment Indicator (ESI) have decreased 43.3% in two months of the

Figure 1: European Sentiment Index

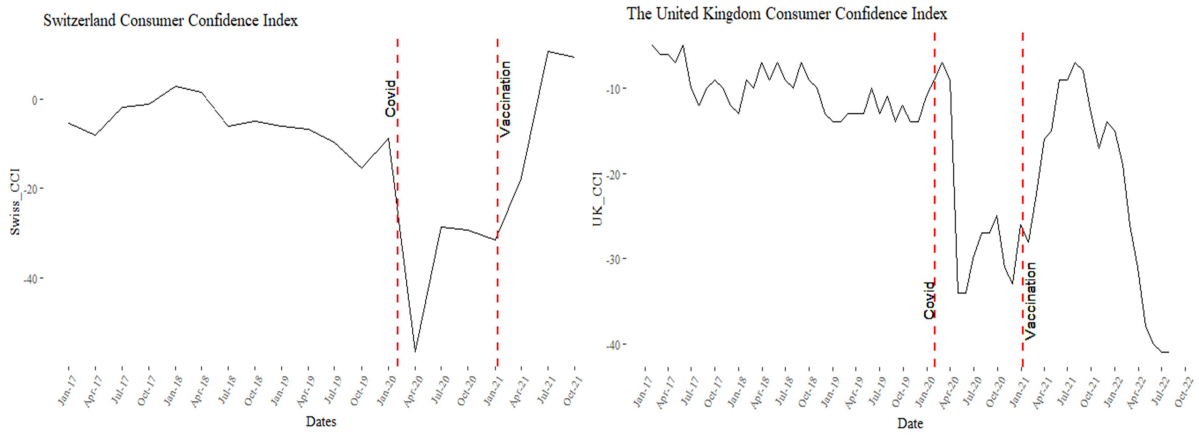


announcement of first case in Europe. While the ESI was 105.3 points in the beginning of 2020, by April, it declined to 59.9 points.

Similar pattern is observable from the UK Consumer Confidence index and Switzerland Consumer Sentiment index. The UK Consumer Confidence Indicator reveals a huge negative shock after the first cases of Covid confirmed, decreasing from -9 to as low as -33, with average of -27.63 during the Covid period, while the average consumer confidence was -10.18 before Covid. The UK CCI also captures the vaccination effect,

with 68% increase in the first 6 months of vaccination returning to its before Covid level. The Switzerland Consumer Sentiment Index displays the corresponding pattern. In the first three months of Covid, Swiss consumer sentiment index decreased from -8.70 to -56.61, then after a period of lower sentiment, the index levels increased 43.8% in the first quarter of vaccination. Hence, as a proxy for investor sentiment, the discounts on CEFs are expected to widen as the first cases of Covid-19 are confirmed by authorities. The visual representations are presented in Figure 2.

Figure 2: Switzerland and the UK Consumer Confidence Index



There is 12-month period between the first case of Covid in Europe and the administration of the first dose of Covid vaccine. After the first shock on investor sentiment in January 2020, there is gradual increase on ESI at the second half of 2020, before the vaccination started, reaching up to 96.3 points at the end of the year. It takes three more months for ESI to return its before-Covid level, 105.5, after the first dose of

the vaccination were available for public. Accordingly, discounts on CEFs are expected to decrease after the vaccination announcement.

H2: CEF discounts increase significantly as the new cases and/ or new deaths increases, controlling for fund characteristics and market conditions.

During Covid-19 pandemic, all around the world, the statistics of cases and deaths due to Coronavirus were published to the public on a daily basis. Hence it is reasonable to assume, market and more specifically individual investors were affected from this publicly available data. Upon that, recent studies show that, investors pay more attention to searching information to resolve uncertainty about household FEARS during the COVID-19 crisis rather than fundamental information (Goel and Dash (2021)), and google search volume (GSV) for the "coronavirus" keyword and new Covid cases are measures of attention for retail investors, and significant proxies for investor sentiment (Smales, 2021).

Pearson correlation coefficient between ESI and natural logarithm of new cases after the first confirmed Coronavirus case was in a significant 27.3%. Accordingly, I expect a positive relationship between CEF discounts and natural logarithm of new cases, controlling for fund characteristics and market conditions.

3.2 Data and Sample

As stated in the official UK government sources I use February 2, 2020 as the date on which the outbreak of COVID-19 took place, and accordingly the start of the post-COVID period. The whole sample period for this study is from the start of January 2017 to end of December 2021, covering about three years before and two years after the first

case was reported in UK. I constructed my sample from active CEFs traded in Europe as the year ending in 2021, consisting of 261 weeks.

The sample period is divided in three sub-periods. The first period is before Covid stage, covering the dates from the start of January 2017 until the Covid outbreak in February 2, 2020. The second period is the Covid-effect stage, covering the dates from the start of Covid-19 outbreak until the administration of the first dose of Covid-19 vaccination, January 11, 2021. Finally, the third period contains the values after the administration of the first dose of Covid-19 vaccination started, from January 11, 2021 to end of my whole sample period, end of December 2021.

I obtained data on daily prices and NAVs for CEFs from Bloomberg, and ruled out the ones with no valid data for either NAV or price. My sample consists of 227 CEFs, from those 185 CEFs are traded on London Stock Exchange. 2 CEFs are available on Jersey, and 3 of them on Guernsey, that are covered under London Stock Exchange. There are 29 CEFs trading on Swiss Stock Exchange and the remaining 16 CEF are classified as "others". Others include 6 Italy (IM), 2 Spain (SM), 1 United States (US) that operates in Bermuda, a British island territory in the North Atlantic Ocean, 1 Netherlands (NA), 1 Poland (PW), 2 Greece (GA) CEFs.

I obtained weekly closing prices of market indices for each exchange market, in the same currency of Euro, for the sample time period.

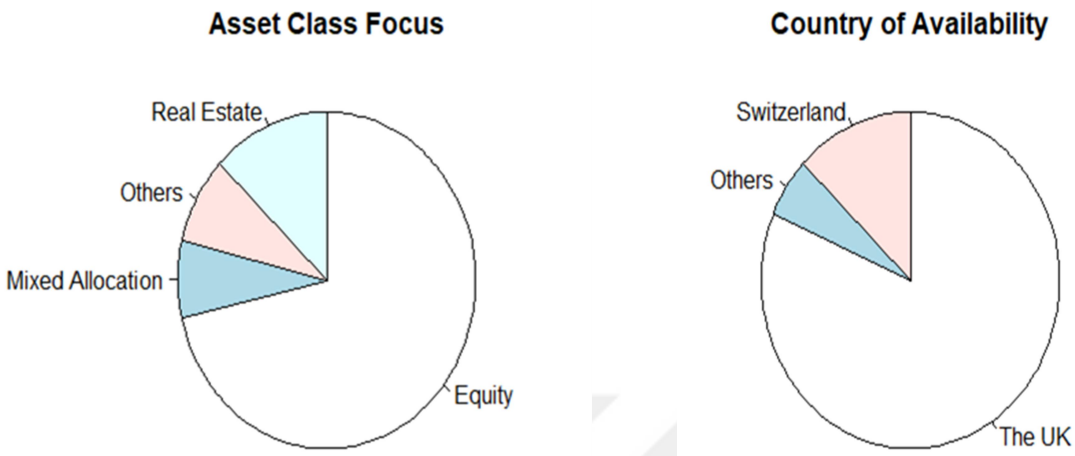
In addition to the NAVs and prices, I gathered data from Bloomberg, about volume, dividend yield, leverage, total assets, number of outstanding shares, beta for those 227 CEFs.

Bloomberg provides information about funds` inception date, that is used to calculate fund age, and asset class focus. The asset class focus classification in Bloomberg represent the broad asset sector the fund will invest in as stated in the source document. If 80% of a fund's portfolio is composed of an asset class, Bloomberg classifies as the fund asset class focus. Equity funds are investing in stocks, real estate funds are focused on tangible real estate assets but real estate investment trusts (REITS) are not included in this classification. Mixed allocation asset class focus indicates that fund is investing in a combination of variable and fixed income securities. It is important to note that out of 29 Swiss funds in the sample 21 of them are classified as Real Estate Funds, while none of the UK funds` asset class is real estate. The reason why the UK have no real estate funds is due to the Bloomberg classification, because real estate funds in the UK are specified as REITs. According to London Stock Exchange the legislation for REITs in the UK became effective in January 2007, and REITs may contain commercial and/or residential property but not owner-occupied buildings. REITs provide favorable tax advantages to both companies and investors.

Very similar structure exists in Switzerland; however, they are not classified as REITs but real estate investment funds, that are even more tax flexible than REITs. Swiss investors do not pay any income tax on the income received from the fund, moreover it also protects foreign investors under some Swiss double taxation treaties which state that the investors` home country cannot tax the income received by the investor.

The distribution of CEFs according to Asset Class Focus and Country is displayed in Figure 3.

Figure 3: Distribution of CEFs according to Asset Class Focus and Country



I retrieved monthly sentiment data for European countries except the United Kingdom and Switzerland from Joint Harmonised EU Programme of Business and Consumer Surveys. The Economic Sentiment Indicator (ESI) is defined as an intermixture indicator of judgements and attitudes of businesses (in industry, construction, retail trade, services) and consumers by means of a weighted aggregation of standardized input series. The UK customer confidence information is provided by Growth from Knowledge (GFK) and obtained from Bloomberg under UKCCI: IND ticker. The consumer confidence tracks sentiment among households or consumers based on surveys conducted among a random sample of households, every first half of the month. The Switzerland Consumer Sentiment data is gathered from Swiss State Secretariat for Economic Affairs (SECO). They conduct a private household survey aiming to capture consumer expectations in several aspects including the general state of the economy, financial situation of consumers, inflation and job security.

The daily and accumulated Coronavirus cases and death rates, and the first dose vaccination information are obtained from World Health Organization. The data WHO provides are collected from confirmed COVID-19 cases and deaths through official communications under the International Health Regulations (IHR, 2005) addition to official ministries of health websites and social media accounts. Data reflects laboratory-confirmed cases and deaths based on WHO case definitions, with some local with some divergence because of local adaptations.

3.2 Variable Definitions

Main Variables

Discount

Using weekly CEF prices relative to their NAVs, the percentage discount for a CEF *i* in a given week *t*, $DISC_{it}$, is calculated as follows:

$$\text{Discount}_{it} = \left[\frac{\text{NAV}_{it} - \text{Price}_{it}}{\text{NAV}_{it}}\right] \times 100,$$

NAV_{it} and P_{it} are the NAV per share and share price of CEF i on at the end of week t, respectively. With this definition, a positive $Discount_{it}$ value indicates a discount and a negative value indicates a premium. In order to dismiss the outliers, I also winsorized and trimmed the discounts at 5%-95% interval. They are indicated as winsorized discounts and trimmed discounts.

Net Asset Value: The NAV of a closed-end fund is calculated as the difference of the current market value of the portfolio and the fund's liabilities, divided by the total

number of shares outstanding, while the price is the per share price of the funds on the market.

Price: The per share price of the funds are obtained in the same currency, Euro.

Covid-19 Related Variables

P1 -Before Covid

I use February 2, 2020 as the date on which the outbreak of COVID-19 took place, and accordingly the start of the post-COVID period. Hence, P1 is a dummy variable, equals one if day t is on or before February 2, 2020 and zero otherwise.

P2 - Covid-effect Stage

I use January 11, 2021 as the date on which the all countries in the sample administered the first dose of Covid-19 vaccination. Hence, P2 is a dummy variable, equals one if week t is between February 2 2020 and January 11, 2021 and zero otherwise.

P3 -After Vaccination

The last sub-period of my analysis indicates the after-vaccination stage. P3 is a dummy variable, equals one if week t is after January 11, 2021 and zero otherwise.

New Cases and New Deaths

Data reflects laboratory-confirmed cases and deaths based on WHO case definitions. I use natural logarithm of New Cases (CASE) and New Deaths (DEATH) for regression analysis.

Fund Characteristics

Turnover (TO)

Liquidity is measured by the turnover rate of a CEF's shares. It is defined as the ratio of trading volume of a fund's shares to its number of shares outstanding. I take natural logarithm of TO for regression analysis.

Beta

Bloomberg calculated Adjusted Beta for given CEF is used to measure the market risk of the fund.

NAV Returns (LNAVRETURNS)

Studying the US and UK funds, Bleaney and Smith (2010) find NAV returns affects discounts on CEFs, with the motivation from the significant relation between the demand for open-end funds and past performance. NAV Returns is calculated as the lagged percentage return on the NAV of the fund.

1/Price (TRANS_COST)

1/Price is used as a proxy for transaction costs (Ma, 2021). The reason to include this variable is that bid-ask spreads tend to be relatively smaller at low prices making arbitrage risk lower (Bradley et al, 2010).

Dividend Yield (DIV)

Pontiff (1996, 2006) argues that higher dividend yield would make it easier to execute a pure-trading arbitrage on a fund since the higher payout reduces the expected holding

cost. Hence, dividend yield is included in the model to examine whether it significantly reduces discounts on CEFs, similar to Bradley et al (2010) findings. Dividend yield is calculated as the dividend paid by a CEF in the prior 12-month period divided by its NAV at the end of the prior month.

Age

Literature findings indicate that management fees are significantly lower on older funds (Bleaney and Smith, 2010) and the age effect to be slightly negative, though overall insignificant (Bradley et al, 2010). Age of CEFs are calculated as years, from the fund inception date to the end of 2021.

Size

Since investors might feel that larger fund size means higher quality and flight to quality during times of crisis, size is employed as a control variable. It is defined as the multiplication of a CEF's price and its number of shares outstanding at week t. I take natural logarithm of Size for regression analysis.

Asset Class Focus

In the sample there are 162 CEFs with asset class focus are identified as Equity, and 29 as Real Estate, 17 as Mixed Allocation and 19 "others". The "others" include funds which have the asset class focus of fixed income, specialty, commodity, money market, derivatives. The asset class focus is included as fund characteristics in order to control for differences between CEFs that invest in different assets.

Market Characteristics

Country

Since the funds are going to be affected by the investor sentiment of the market they are traded, country of a fund, as country fixed effects, is included in the model.

Market Indices and Returns (LMARKET)

Market returns can count for the optimism and pessimism of individual investors. The value LMARKET is one week lagged market return of an exchange where the fund traded is included in the model. For each fund's exchange market, market indices are obtained from Bloomberg, in the same currency of Euro. Market indices are listed as:

The United Kingdom: FTSE UKX 100

Switzerland: SMI

Italy: FTSE MIB

Greece: ASE

Netherlands: AEX

Poland: WIG

Spain: IBEX35.

Housing Price Index (MARKET HPI)

Housing Price Index is used for real estate funds in parts of the analysis in order to observe the effect of housing prices changes rather than market returns. Housing Price Index for Switzerland is obtained from Swiss National bank data. I have calculated HPI

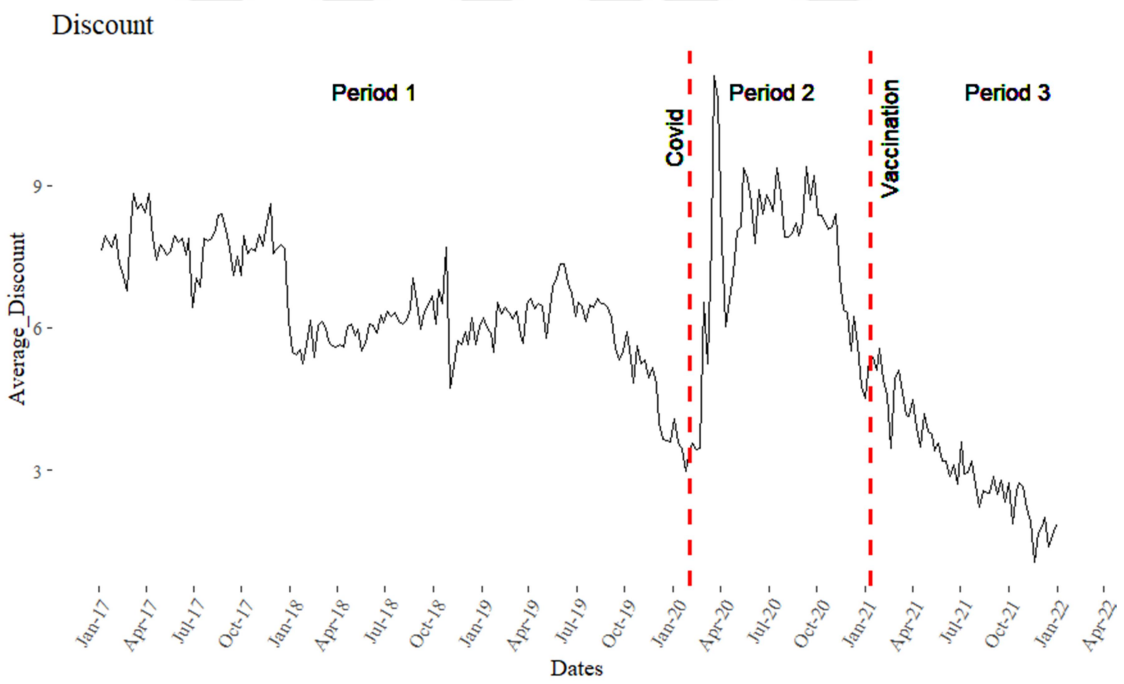
index return and applied it for Swiss real estate funds combined with market returns for Equity funds.

3.3 Descriptive Statistics

Discount

One of the main motivations of this thesis is represented on Figure 4, that displays how the weekly averaged discounts of the sample CEFs change over time. It is visible that average discounts increase after the outbreak of Covid-19, early February 2020. After a high discount period, discounts start to decrease after January 2021, with the advance of vaccination.

Figure 4: Weekly Average CEF Discounts



The descriptive statistics and t-test results for discounts are displayed on Table 1. The results indicate that discount mean for the whole sample period is significantly different

than 0, and with 95 percent confidence is between the interval of [5.811, 6.129]. Then, mean discounts are compared for sub-period samples. As expected, with the first Covid-19 cases, mean discount increased significantly from 6,40 to 7,53 from Period 1 to Period 2. Similarly, there is a significant decrease in mean from Period 2 to Period 3, from 7.53 to 3.16, following vaccination.

Figure 5 represents weekly average discount according to the specific fund characteristic, funds` asset class focus. The figure displays the differences between the average discounts on equity funds and real estate funds.

Figure 5: Weekly Average CEF Discounts According to Asset Class Focus

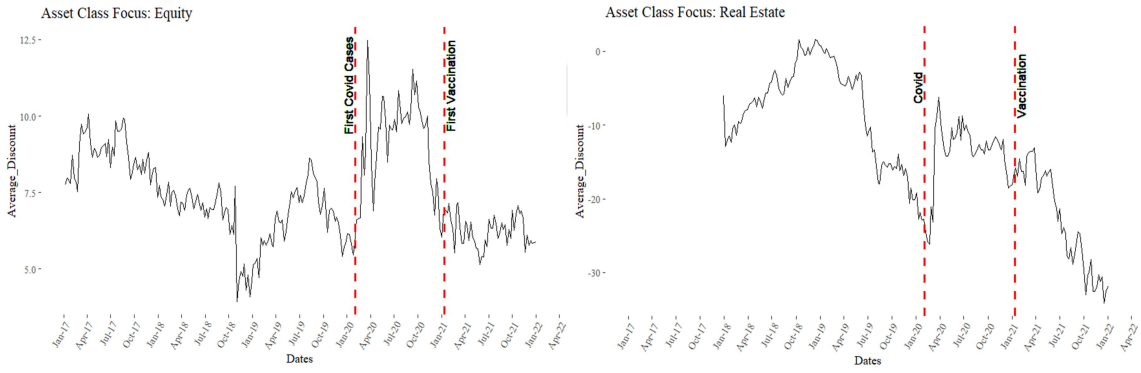


Table 1: Summary Statistics of CEF Discounts through Covid Periods

Period	Period 1	Period 2	Period 3	Whole Period
Time Interval	6 Jan 2017 -2 Feb 2020	2 Feb 2020– 11 Jan 2021	11 Jan 2021- 31 Dec 2022	6 Jan 2017 – 31 Dec 2022
Mean	6.40 %	7.53%	3.165%	5.97%
Standard Deviation	17.80%	19.68%	22.11%	19.17%
Min	-467.6%	-81.57 %	-123.8%	-467.6%
Max	100%	83.12%	88.31%	100%
First Quartile	-0.29%	0.08%	-1.01%	-0.38%
Median	6.72%	7.75%	5.52%	6.62%
Third Quartile	13.14%	15.49%	11.46%	13.20 %
Number of Observations	36547	11123	11577	59247 %
Hypothesis Tested		H0: $\mu_{P2} = \mu_{P3}$	H0: $\mu_{P2} = \mu_{P3}$	H0: $\mu = 0$
T-Statistic		-5,33***	15,54***	73,625***

Significance Codes '***' < 0.001, '**'< 0.01, '*' <0.05, '.' <0.1

Table 2 displays the mean discounts during different time periods of these funds respectively. It appears that real estate funds mainly trade at a negative discount (premium) while equity funds trade at a discount on average. The statistics presented in Table 2 also reveals that equity funds' discounts increased from 7.30% to 9.14% after the Covid outbreak and decreased to 6.25% with vaccination. However, real estate funds that were already trading at a premium, seem not to be negatively affected from Covid-19. The premiums increased from 7.85% to 13.81% with Covid, and increased even more after vaccination, to the mean of 23.07%. According to the statistics so far, Covid-19 only interrupted the decrease in discounts for real estate funds, for a while.

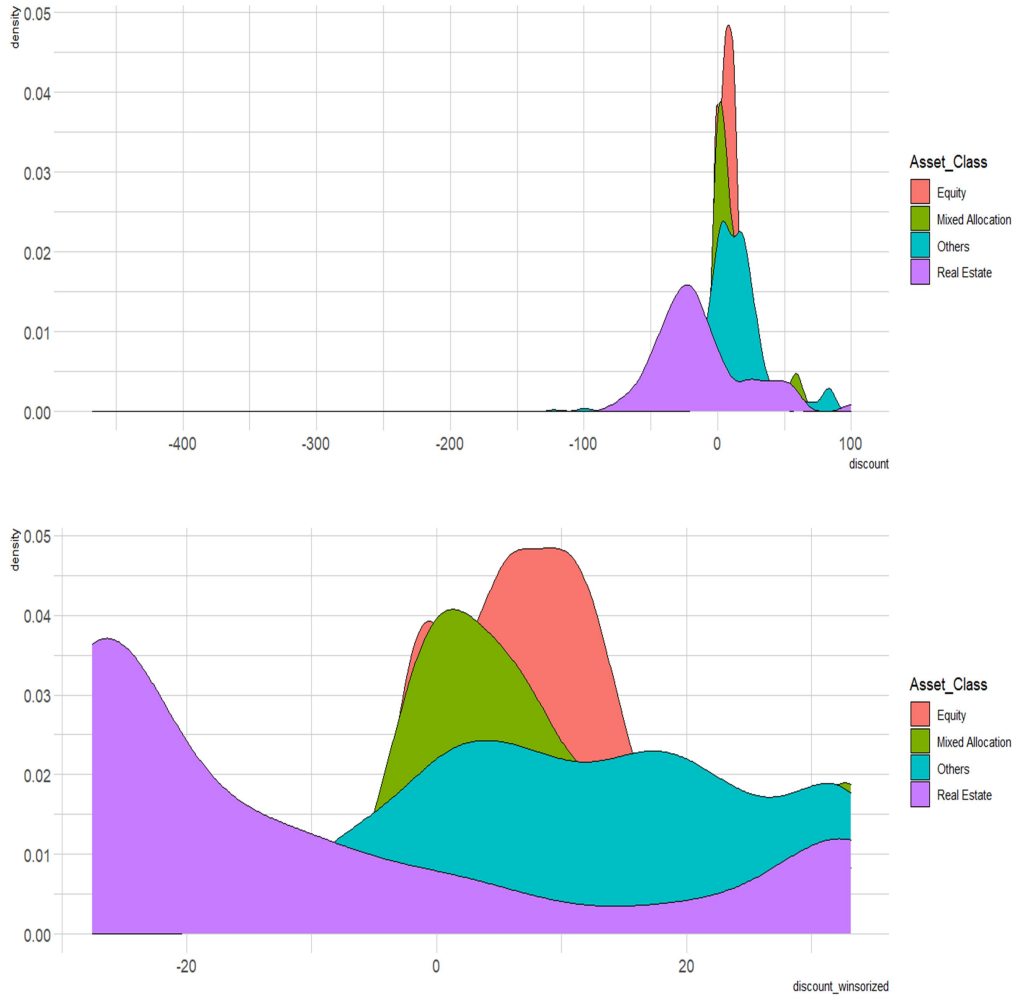
Table 2: Summary Statistics of CEF Dicounts on Equity and Real Estate Funds

	Mean	Standard Deviation	Min	Max	Hypothesis Tested	T-Statistics
Equity						
Period 1	7.3%	13.18%	-467.68%	60.66%	H0: μ P1 = μ P2	-12.11 ***
Period 2	9.14%	11.23%	-81.58%	68.82%	H0: μ P2 = μ P3	16.441 ***
Period 3	6.25%	10.97%	-77.64%	64.14%		
Real Estate						
Period 1	-7.85%	30.64%	-62.07%	100%	H0: μ P1 = μ P2	5.8064***
Period 2	-13.81%	34.03%	-73.53%	60.83%	H0: μ P2 = μ P3	7.0008***
Period 3	-23.07%	37.17%	-86.36%	65.01%		

Significance Codes '***' < 0.001, '**'< 0.01, '*' <0.05, '.' <0.1

The standard deviation of equity funds in period 1 is 13.18 while it is 30.64 for real estate funds in the same period, although equity funds range is much higher. The reason for this situation is the distribution of discounts. Figure 6 displays the distribution of CEF discounts according to Asset Class Focus. The figure also includes winsorized discount values, in order to observe the distribution better, because although range on Equity funds is higher, it is mostly due to outliers while most of the data points concentrate around the mean.

Figure 6: Distribution of Discounts According to Asset Class Focus



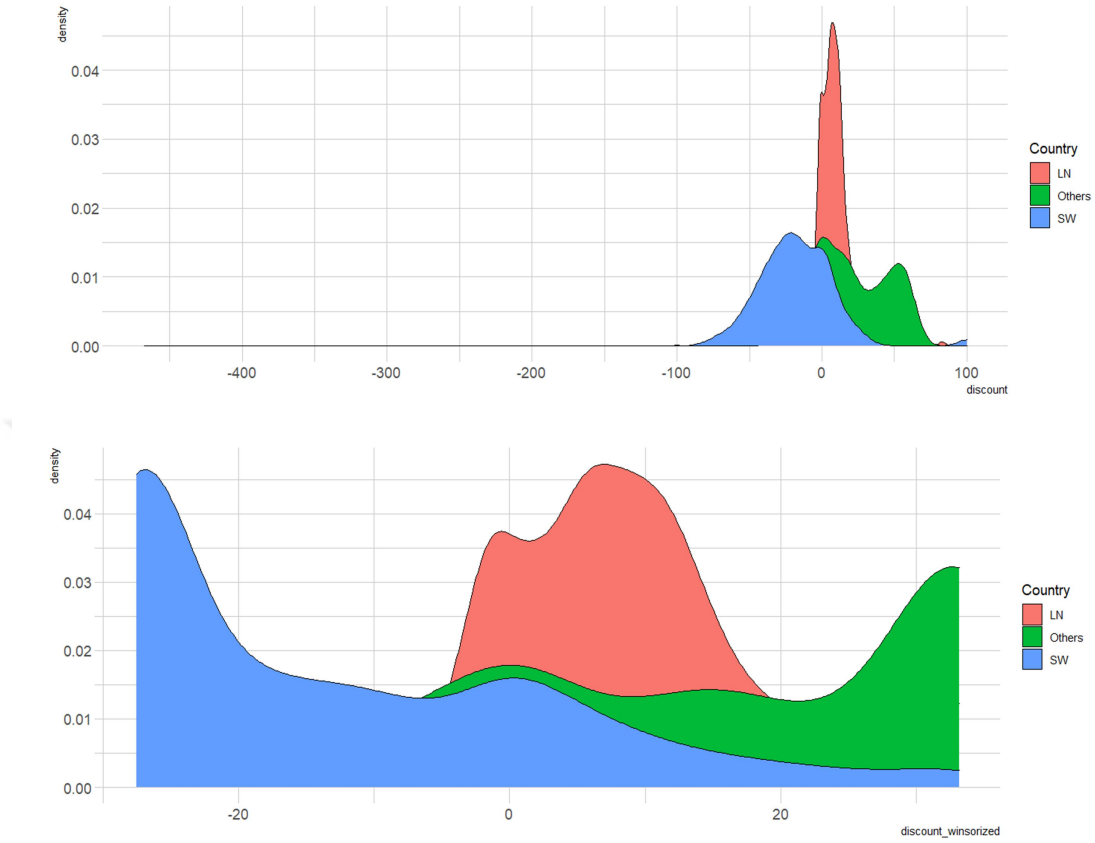
Similar to the differences between equity and real estate funds, the UK funds and Swiss funds reflect contrary discount-premium situation. This parallel situation is expected because out of 29 Swiss funds 21 of them are real estate funds, while all of the UK funds classified as equity. Table 3 represents the UK and Swiss funds' discounts summary statistics and t-test results.

Table 3: Summary Statistics of Discounts on the UK and Swiss Funds

	Mean	Standard Deviation	Min	Max	Hypothesis Tested	T-statistics
The UK						
Period 1	8.32	14.02	-467.68	84.7	H0: μ P1 = μ P2	-15.90***
Period 2	10.98	13.59	-81.58	83.12	H0: μ P2 = μ P3	16.72 ***
Period 3	7.47	14.62	-123.82	85.45		
Switzerland						
Period 1	-12.23	24.23	-62.07	100	H0: μ P1 = μ P2	11.63***
Period 2	-20.77	23.75	-73.53	32.64	H0: μ P2 = μ P3	9.10 ***
Period 3	-29.55	28.04	-86.36	88.32		
Significance Codes '***' < 0.001, '**'< 0.01, '*' <0.05, '.' <0.1						

Similar to asset class focus, the UK funds have much lower standard deviations than Swiss funds, due to outliers. Figure 7represents the distribution of CEF discounts and winsorized discounts according to the country where the funds are traded.

Figure 7: Distribution of CEF Discounts According to Country of Availability



While the statistics suggest that average discounts on the UK widen with Covid and decreased after vaccination, as the literature suggests and hypotheses propose, the decrease in discounts on Swiss funds seems unaffected from Covid-effect. Figure 8 presents the average discounts on the UK and Swiss CEFs and the market indices in order to demonstrate the effect of Covid on market conditions.

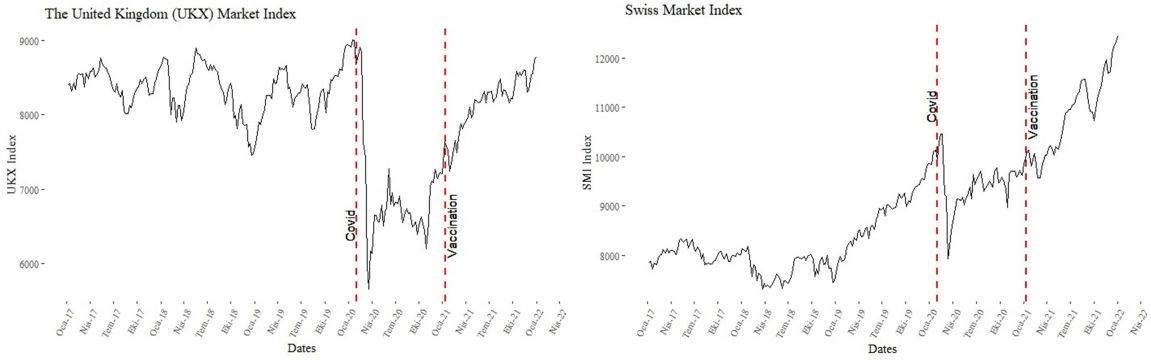
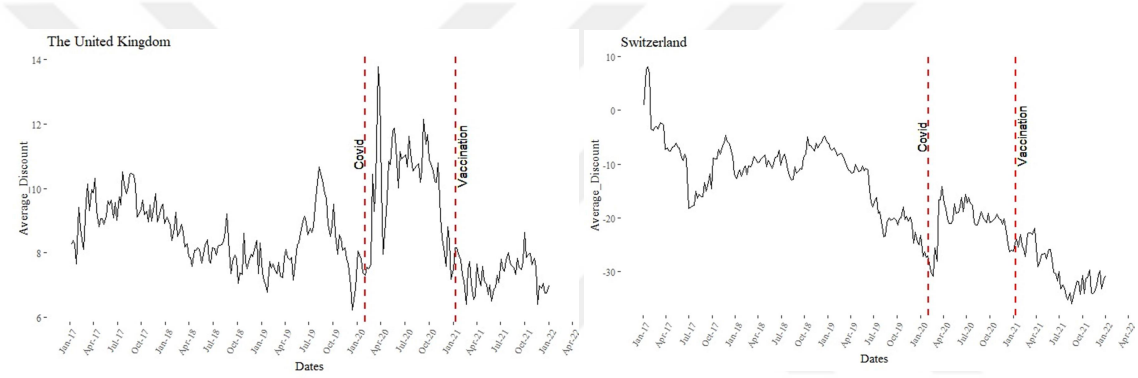
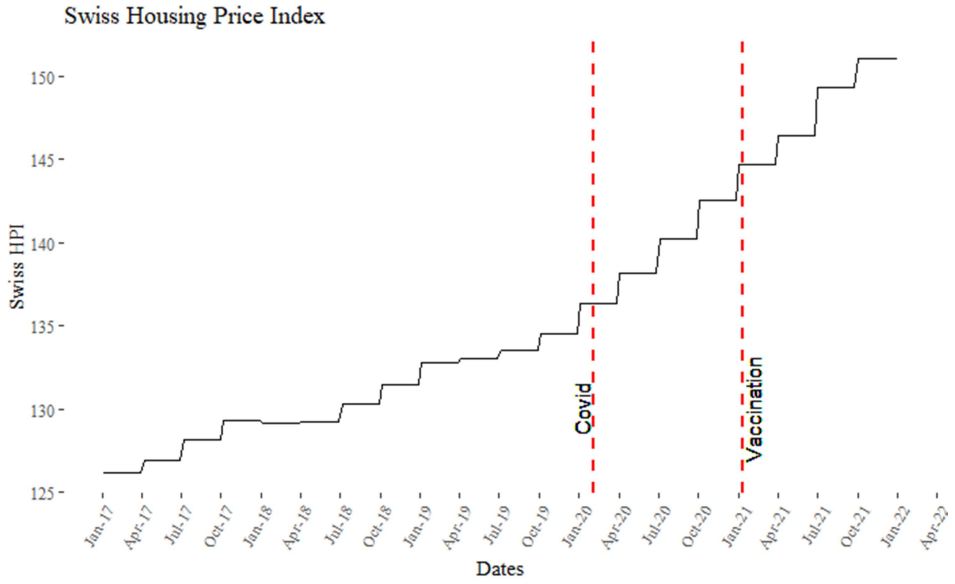


Figure 8: The UK and Swiss CEFs and Market



Although Figure 2 presented investor sentiment decline due to Covid and increase due to vaccination, Swiss Market Index and CEF discounts do not seem to be affected from sentiment as much as the UK market and CEFs. Another reason for the `less` increase in CEF discounts on Swiss funds may be due to the fact that most of the Swiss funds in my sample consist of Real Estate funds. Hence it might be more reasonable to observe the changes in Housing Price Index for Swiss Funds. As it can be observed from Figure 9, Swiss HPI steadily increased throughout Covid periods.

Figure 9: Swiss Housing Price Index



3.4 Empirical Models

The following model is used to examine the determinants of CEF discounts as argued in literature.

$$DISC_{itc} = \alpha + \emptyset \text{CONTROL}_{itc} + CFE + ACFE + \varepsilon_{itc}$$

where $DISC_{itc}$ indicates the discount of CEF *i* in week t for country v. CONTROL_{itc} denotes fund and market characteristics. *Fund characteristics* indicate fund related information that might affect the size of the discount based on the evidence in the literature: transaction costs proxy (TRANS_*COST*), lag NAV returns (*LNAVRETURNS*), beta (*BETA*), dividend yield (*DIV*), natural logarithm of age (*AGE*), natural logarithm of turnover proxy (*TO*), and natural logarithm of size proxy (*SIZE*). *Market characteristics* indicate the market conditions prior week calculated as lagged market returns (*LMARKET*). CFE denotes Country fixed Effects, and ACFE denotes Asset Class Focus

fixed effects. The other models are estimated with and without either CFE and/or ACFE, called Fixed Effects.

There exists both auto-correlation and heteroscedasticity problems, so I applied Newey-West adjustment in order to obtain robust standard errors.

The following table, Table 4, represents the expected signs of coefficients for the control variables, according to literature reviewed and initial data statistical interpretation.

Table 4: Expected Signs of Coefficients

Control Variables	Expected Sign of Coefficients
LMARKET	-
LNAVRETURNS	-
BETA	+
DIV	-
TRANS_COST	+
AGE	-
TO	-
SIZE	-
EQUITY FUNDS	+
REAL ESTATE FUNDS	-

The variations of the following model are used in order to test the first hypothesis:

$$DISC_{itc} = \alpha + \beta_1 P2 + \beta_2 P3 + \emptyset CONTROL_{itc} + Fixed\ Effects + \varepsilon_{itc}$$

P2 is a dummy variable, that equals one if week t is between the interval of dates from February 2, 2020 to January 11, 2021 and zero otherwise, indicating the Covid-effect period. The coefficient of *P2,* β_1, is expected to be positive if fund discounts increased

after the Covid-19 outbreak. *P3* is the other dummy variable, that equals one if week t is after January 11, 2021 and zero otherwise, indicating the after-vaccination period. The coefficient of *P3,* β_2, is expected to be negative if fund discounts decreased after the administration of the first dose of Coronavirus vaccine.

The variations of the following models are employed in order to test the second hypothesis:

$$DISC_{itc} = \alpha + \gamma_1 CASE_{tc} \text{ or } \gamma_2\ DEATH_{tc} + \emptyset CONTROL_{itc} + Fixed\ Effects + \varepsilon_{itc}$$

$$DISC_{itc} = \alpha + \beta_1 P2 + \beta_2 P3 + CASE_{tc} \text{ or } DEATH_{tc} + \emptyset CONTROL_{itc} + Fixed\ Effects + \varepsilon_{itc}$$

$$DISC_{itc} = \alpha + \beta_1 P2 + \beta_2 P3 + \gamma_1 CASE_{tc} \text{ or } \gamma_2\ DEATH_{tc} * P3 + \emptyset CONTROL_{itc} + Fixed\ Effects + \varepsilon_{itc}$$

CASE reflects natural logarithm of laboratory-confirmed cases, and DEATH is natural logarithm of laboratory-confirmed deaths due to Covid-19, in the country of CEF's availability. Before either the first case and the first death confirmation, both CASE and DEATH is zero. The interaction variables are included to investigate whether the effect of Covid cases or deaths on CEF discounts change during Covid-effect period and after vaccination.

CHAPTER 4

EMPIRICAL RESULTS

T-test results that were presented in Chapter 3 provide an insight about how the CEF discounts behave through Covid periods. However, multivariate results allow us to interpret the effect of each variable on CEF discounts by controlling for the effect of other variables. In this regard, as the first part of multivariate analysis, I investigate the effect of the control variables, in other words rational explanations, on CEF discounts, without Covid effect, in order to observe each variable's ability to explain the variations in discounts. The first set of regressions are represented on Table 6, regressing discount (DISCOUNT) on lag market returns (LMARKET), transaction costs proxy (TRANS_COST), lag NAV returns (LNAVRETURNS), BETA (BETA), dividend yield (DIV), natural logarithm of age (AGE), natural logarithm of turnover proxy (TO), and natural logarithm of size proxy (SIZE), with and without controlling for country and asset class effects. Four variations of the first model discussed in Chapter 3 are displayed in Table 5, with Newey-West adjusted standard errors.

The first results yield significant relationship between CEF discount and TRANS_COST, BETA, and SIZE at 0% and dividend at 0.1% and LMARKET at 10% confidence level.

The significant effects are consistent with the literature. While transaction cost and BETA are positively related to discounts, size and dividend yield are negatively related. Transaction cost relationship matches Bradley et al (2010) and Ma (2021), as it makes arbitrage costlier. As expected, as risk of the fund increases fund discount increases as well. The significant and negative coefficient of size indicates that larger funds experience lower discounts. Additionally, higher dividend yield is consistent with Pontiff (1996, 2006), reduces the discount by reducing the expected holding cost. Market returns are negatively related to discounts only at 10% confidence level. The results yield insignificant relationship between discounts and turnover, age, and lagged NAV returns.

The second series of regressions, presented in Table 6, investigates the behavior of CEF discounts during Covid-19 periods. As mentioned before P2 and P3 dummy variables indicate post-Covid pre-vaccination and post-vaccination periods, respectively. With regard to my first hypothesis, I expect and deduct results indicating that discounts widened after the outbreak of Covid-19 and shrunk after administration of the first dose vaccination. The relationship is significant. When the Covid subperiods are included in the model, market returns are insignificant and dividend yield is barely significant, either control of country and/ or asset class focus. The coefficients and significance of other independent variables remain robust.

Table 5: Discount with Fund and Market Characteristics

	Model 1	Model 2	Model 3	Model 4
INTERCEPT	11.897**	22.655***	13.595 ***	22.452 ***
	(4.243)	(4.334)	(3.840)	(3.867)
LMARKET	-0.044 .	-0.039	-0.041	-0.041 .
	(0.026)	(0.024)	(0.024)	(0.023)
LNAVRETURNS	0.129	0.110	0.110	0.107
	(0.101)	(0.102)	(0.101)	(0.101)
BETA	12.140 ***	5.426 ***	4.909 ***	4.895***
	(0.852)	(0.779)	(0.749)	(0.726)
DIV	-0.248 **	0.010	-0.189 **	-0.061
	(0.077)	(0.074)	(0.079)	(0.076)
TRANS_COST	3.770 ***	1.425 ***	2.852 ***	1.748 ***
	(0.327)	(0.367)	(0.332)	(0.348)
AGE	-0.160	-0.225	-0.142	-0.176
	(0.203)	(0.186)	(0.183)	(0.179)
TO	0.120	-0.621 .	-0.099	-0.761 **
	(0.313)	(0.318)	(0.282)	(0.284)
SIZE	-3.123 ***	-2.117 ***	-1.813 ***	-1.790 ***
	(0.156)	(0.138)	(0.137)	(0.132)
Other Countries		-7.129 ***		-6.922 ***
		(1.338)		(1.381)
Switzerland		-22.537***		-14.60***
		(0.736)		(0.854)
Mixed Allocation Funds			5.274 ***	4.772 ***
			(0.598)	(0.595)
Other Asset Class			1.836	3.977 ***
			(1.125)	(1.118)
Real Estate Funds			-22.455 ***	-12.007 ***
			(0.846)	(0.950)
Degrees of Freedom	36663	36661	36660	36658
F-statistic	796.8	1367	1259	1225
Adjusted R-squared	0.1479	0.2714	0.2739	0.3025

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 6: Discount with Covid Periods

	Model 5	Model 6	Model 7	Model 8
Intercept	12.198**	23.546 ***	14.364 ***	23.446 ***
	(4.239)	(4.350)	(3.850)	(3.883)
P2	0.517	1.753 ***	1.669 ***	1.917 ***
	(0.381)	(0.345)	(0.339)	(0.330)
P3	-2.101***	-1.076 **	-1.231****	-1.012 **
	(0.412)	(0.361)	(0.356)	(0.346)
LMARKET	-0.025	-0.021	-0.021	-0.021
	(0.026)	(0.024)	(0.023)	(0.023)
LNAVRETURNS	0.141	0.1220514	0.122061	0.118796
	(0.101)	(0.102)	(0.101)	(0.101)
BETA	12.183***	5.133 ***	4.629 ***	4.522 ***
	(0.847)	(0.767)	(0.726)	(0.706)
DIV	-0.253 **	0.005	-0.195 *	-0.067
	(0.077)	(0.075)	(0.081)	(0.077)
TRANS_COST	3.781 ***	1.317 ***	2.760 ***	1.622 ***
	(0.326)	(0.369)	(0.331)	(0.348)
AGE	-0.164	-0.227	-0.144	-0.178
	(0.202)	(0.185)	(0.183)	(0.179)
TO	0.114	-0.689 *	-0.156	-0.838 **
	(0.314)	(0.319)	(0.284)	(0.286)
SIZE	-3.096 ***	-2.090 ***	-1.785 ***	-1.759 ***
	(0.155)	(0.138)	(0.137)	(0.132)
Other Countries		-7.374 ***		-7.215 ***
		(1.306)		(1.348)
Switzerland		-22.651 ***		-14.641 ***
		(0.728)		(0.850)
Mixed Allocation Funds			5.240 ***	4.723 ***
			(0.592)	(0.588)
Other Asset Class			1.858 ****	3.976 ***
			(1.107)	(1.102)
Real Estate Funds			-22.586	-12.184 ***
			(0.841)	(0.954)
Degrees of Freedom	36661	36659	36658	36656
F-statistic	659.8	1164	1089	1085
Adjusted R-squared	0.152	0.275	0.278	0.307

Significance Codes '***' < 0.001, '**'< 0.01, '*' <0.05, '.' <0.1

The results are consistent with the first hypothesis tested in this paper: CEF discounts follow the pattern of investor sentiment (in reverse relation due to definition of discount variable), increasing and decreasing significantly after Covid and after vaccination respectively, while controlling for fund and market characteristics. The results are robust when country and fund characteristic (asset class focus) effects are taken into account, separately and together.

The third set of regressions introduce new Covid-19 cases ($CASE_t$) and new deaths due to Covid-19 ($DEATH_t$) at week t, as a predictor of CEF discounts and test the second hypothesis presented in this paper, and results displayed on Table 7. New cases and new deaths variables are expected to predict higher discounts, controlling for the same independent variables as before, given the investor attention for coronavirus studied in the literature (Goel and Dash, 2021, Smales, 2021). Regression results yield that discounts significantly increase with confirmed new deaths due to Coronavirus. However, there is no significant relationship between natural logarithm of new cases and CEF discounts, while the coefficients of control variables are consistent with the previous models. The significance of these variables remains robust when country and fund characteristics are controlled. However, further research indicates, this does not necessarily mean that new cases does not have significant relationship with CEF discounts. Because when P2, Covid period, and P3, vaccination period, dummy variables are included in the model, the coefficient of new cases turn out to be significant.

Table 7: Discounts with Covid Cases and Deaths

	Model 9	Model 10	Model 11	Model 12	Model 13
INTERCEPT	12.288 ** (4.265)	22.909*** (4.351)	13.928 *** (3.862)	22.693*** (3.862)	22.534 *** (3.874)
DEATH	0.171 ** (0.059)	0.102 . (0.057)	0.158 ** (0.056249)	0.112* (0.055)	
CASE					0.024 (0.029)
LMARKET	-0.063* (0.026)	-0.051* (0.024)	-0.058 * (0.023)	-0.053* (0.023)	-0.044 . (0.023)
LNAVRETURNS	0.120 (0.101)	0.105 (0.102)	0.102 (0.101)	0.101 (0.101)	0.105 (0.101)
BETA	11.87*** (0.848)	5.280 *** (0.775)	4.646 *** (0.733)	4.709 *** (0.711)	4.813*** (0.709)
DIV	-0.247 ** (0.077)	0.011 (0.074)	-0.187* (0.079)	-0.061 (0.076)	0.061 (0.07)
TRANS_COST	3.678 *** (0.325)	1.372 *** (0.366)	2.766 *** (0.330)	1.690*** (0.345)	1.724*** (0.343)
AGE	-0.163 (0.203)	-0.226 (0.186)	-0.144 (0.183)	-0.178 (0.179)	-0.176 (0.179)
TO	0.082 (0.315)	-0.646 * (0.319)	-0.132 (0.284)	-0.785** (0.286)	-0.770** (0.285)
SIZE	-3.118*** (0.157)	-2.116*** (0.138)	-1.808*** (0.137)	-1.787 *** (0.132)	-1.789*** (0.132)
Country Fixed Effects	No	Yes	No	Yes	Yes
Asset Focus Fixed Effects	No	No	Yes	Yes	Yes
Degrees of Freedom	36662	36660	36659	36655	36657
F-statistic	712.5	1244	1157	1021	1137
Adjusted R-squared	0.1487	0.2716	0.2745	0.3079	0.3026
Significance Codes '***' < 0.001, '**'< 0.01, '*' <0.05, '.' <0.1					

The results can be interpreted as new cases by itself, may not be able to capture the vaccination effect on the market. When controlled for country, P2 dummy seems to be insignificant while new cases have significant and positive relationship with discount. One of the inferences of the results can be people may be more perceptive to new deaths than new cases, regardless of vaccination. Since without the control of subperiods, new deaths have a significant relationship with discounts. As an alternative, vaccination effect on new cases and new deaths may be different. However, the interaction variables of P3*CASE and P3*DEATH yield similar results. The robust regression results regarding the interaction between Covid variables and time dummies are provided on Table 8. Regardless the use of new deaths or new cases as a proxy for investor sentiment, when we control for vaccination period, the results are significant and positive. Moreover, the effect of new cases and new deaths do not decrease during vaccination period. Even with the optimism on the market after vaccination, the results indicate that individuals still pay attention to new deaths and new cases.

Table 8: Discounts with P3-Covid Interactions

	Model 14	Model 15
INTERCEPT	23.363*** (3.884)	23.429 *** (3.883)
P3	-4.362*** (0.966)	-7.731*** (2.396)
DEATH	0.317*** (0.069)	
CASE		0.229 *** (0.040)
LMARKET	-0.053* (0.023)	-0.044 . (0.023)
LNAVRETURNS	0.102 (0.101)	0.11 (0.101)
BETA	4.718 *** (0.707)	4.575 *** (0.706)
DIV	-0.066 (0.077)	-0.066 (0.078)
TRANS_COST	1.655 *** (0.348)	1.623*** (0.349)
AGE	-0.189 (0.179)	-0.184 (0.179)
TO	-0.824926** (0.286)	-0.832** (0.286)
SIZE	-1.775*** (0.132)	-1.772 *** (0.132)
P3* DEATH	0.443* (0.214)	
P3*CASE		0.461 . (0.248)
Country Fixed Effects	Yes	Yes
Asset Class Fixed Effects	Yes	Yes
Degrees of Freedom	36655	36655
F-statistic	1018	1021
Adjusted R-squared	0.3074	0.3079
Significance Codes '***' < 0.001, '**'< 0.01, '*' <0.05, '.' <0.1		

Similar regressions are practiced for the United Kingdom and Switzerland sub-samples that are displayed on Table 9 and Table 10. These two countries represent different cases, since, as demonstrated before, while the UK CEFs trade at a discount, CEFs in Switzerland trade at a premium. The results of subsample regressions display that the UK funds' discounts trade at discount and are more affected by start of Covid rather than vaccination, because while P2 is significantly and positively related to discounts, P3 is insignificant. The effect of vaccination is significant only when controlled alongside new cases and new deaths variables.

The regression results of Switzerland funds, on the other hand, reveals negative and significant coefficients for P2, P3 and new deaths. The background of the Swiss funds, as mentioned in Chapter 3, is that they are traded at a discount only for a short period at the end of 2017 and a short period at the end of 2018. Moreover, the discounts decreased from 0.74% to -20.08% from the first to last week of 2019. Hence, when Covid-19 outbreak started, the premiums have already been increasing for a year. The increase halted and premiums even decreased to a level of 6.26%, however, especially after vaccination they reached to 34.15%. I believe the reason for the regression not to capture the Covid effect (P2) is this high variation and high negative discounts. The Swiss subsample regression results are provided on Table 10.

Table 9: Discounts on the UK Subsample

	Model 16	Model 17	Model 18
INTERCEPT	19.359 *** (4.1650)	20.648*** (4.198)	20.179*** (4.188)
P2		2.359*** (0.380)	
P3		-0.316 (0.383)	-2.182*** (0.455)
DEATHS			0.380*** (0.074)
LMARKET	-0.041 . (0.024)	-0.024 (0.024)	-0.067** (0.024)
LNAVRETURNS	0.101 (0.105)	0.111 (0.105)	0.093 (0.105)
BETA	4.370*** (0.801)	3.809*** (0.780)	3.953*** (0.783)
DIV	-0.136 (0.093)	-0.143 (0.095)	-0.141 (0.095)
TRANS_COST	2.514*** (0.392)	2.334*** (0.392)	2.389*** (0.392)
AGE	-0.225 (0.188)	-0.227 (0.188)	-0.229 (0.188)
TO	-0.737* (0.305)	-0.842** (0.307)	-0.798** (0.306)
SIZE	-1.244*** (0.149)	-1.215*** (0.149)	-1.216 (0.149)
Asset Focus Fixed Effects	Yes	Yes	Yes
Degrees of Freedom	33776	33777	33779
F-statistic	233.7	216.9	212.3
Adjusted R-squared	0.070	0.076	0.075
Significance Codes '***' < 0.001, '**'< 0.01, '*' <0.05, '.' <0.1			

Table 10: Discounts on Swiss Subsample

	Model 19	Model 20	Model 21
INTERCEPT	-22.887 (23.061)	82.340*** (20.064)	61.899** (21.304)
P2		-6.470*** (1.059)	
P3		-13.350*** (1.220)	-9.391*** (1.175)
DEATHS			-1.091** (0.348)
LMARKET	-0.083 (0.059)	-0.031 (0.054)	0.068 (0.053)
LNAVRETURNS	0.239 * (0.103)	0.230* (0.106)	0.251* (0.105)
BETA	17.312*** (4.170)	40.436*** (3.661)	34.922*** (3.695)
DIV	0.971*** (0.178)	0.975*** (0.195)	1.032*** (0.191)
TRANS_COST	60.039 . (32.920)	52.691* (26.474)	46.710 . (27.818)
AGE	0.699 (0.680)	0.326 (0.631)	0.475 (0.630)
TO	2.135 (2.227)	-6.635*** (1.740)	-4.858** (1.882)
SIZE	-5.594 *** (0.872)	-7.143*** (0.734)	-6.941*** (0.764)
Asset Focus Fixed Effects	Yes	Yes	Yes
Degrees of Freedom	2494	2942	2492
F-statistic	387.5	463.7	437.3
Adjusted R-squared	0.606	0.689	0.676

Significance Codes '***' < 0.001, '**'< 0.01, '*' <0.05, '.' <0.1

While coefficient of LMARKET, market returns, are mostly significant at 5% or 10% levels, for the Switzerland sub-sample, it is insignificant. The reason for this may be due to the fact that most of the Swiss funds are real estate funds so that market returns cannot capture the real estate valuation that affect those funds. Hence, I applied HPI returns instead of stock market returns for real estate funds and defined a new variable MARKET (HPI). The results indicate that the coefficient of MARKET (HPI) is significant with and without Covid periods, cases and deaths controlling for country and asset class fixed effects. Table 11 displays the regression results that employ this new variable for the whole sample.

As a robustness check I applied all the regressions with winsorized and trimmed discounts eliminate the effect of outliers on the findings and Market (HPI) to capture the real estate values during Covid-19. Table 12 displays the regressions that employ winsorized discount and HPI included market returns. The significance of coefficients on control variables are parallel to previous models.

Table 11: Market with House Pricing Index

	Model 22	Model 23	Model 24
INTERCEPT	22.999*** (3.872)	23.974*** (3.892)	23.985*** (3.892)
P2		1.987*** (0.330)	
P3		-0.672. (0.345)	-5.384* (2.382)
DEATHS			0.255*** (0.040)
MARKET (HPI)	-0.300*** (0.034)	-0.279*** (0.034)	-0.283*** (0.033)
LNAVRETURNS	0.109 (0.102)	0.119 (0.102)	0.110 (0.101)
BETA	5.220*** (0.730)	4.765*** (0.711)	4.760*** (0.711)
DIV	-0.065 (0.077)	-0.070 (0.078)	-0.069 (0.078)
TRANS_COST	1.777*** (0.348)	1.634 (0.349)	1.621*** (0.349)
AGE	-0.181 (0.179)	-0.177 (0.179)	-0.182 (0.178)
TO	-0.815** (0.285)	-0.893 ** (0.287)	-0.890** (0.287)
SIZE	-1.810*** (0.132)	-1.778*** (0.132)	-1.786*** (0.132)
Country Fixed Effects	Yes	Yes	Yes
Asset Class Fixed Effects	Yes	Yes	Yes
Degrees of Freedom	36672	36667	36667
F-statistic	1539	1107	1096
Adjusted R-squared	0.295	0.311	0.309
Significance Codes '***' < 0.001, '**'< 0.01, '*' <0.05, '.' <0.1			

Table 12: Winsorized Discount

	Model 25	Model 26	Model 27
INTERCEPT	19.701 *** (2.472)	20.474 *** (2.484)	19.821 *** (2.471)
P2		1.566 *** (0.251)	
P3		-0.341 (0.254)	-0.889 *** (0.252)
DEATHS			0.001 . (0.000)
MARKET (HPI)	-0.141 *** (0.022)	-0.129 *** (0.023)	-0.127 *** (0.022)
LNAVRETURNS	0.043 (0.032)	0.050 (0.032)	0.042 (0.033)
BETA	3.339 *** (0.585)	2.961 *** (0.579)	3.367 *** (0.577)
DIV	-0.008 (0.052)	-0.011 (0.053)	-0.011 (0.052)
TRANS_COST	1.222 *** (0.222)	1.103 *** (0.226)	1.224 *** (0.222)
AGE	0.008 (0.136)	0.007 (0.136)	0.005 (0.136)
TO	-0.526 ** (0.194)	-0.589 ** (0.195)	-0.528 ** (0.194)
SIZE	-1.689 *** (0.106)	-1.665 *** (0.106)	-1.684 *** (0.107)
Country Fixed Effects	Yes	Yes	Yes
Asset Focus Fixed Effects	Yes	Yes	Yes
Degrees of Freedom	36662	36660	36659
F-statistic	712.5	1244	1157
Adjusted R-squared	0.1487	0.2716	0.2745

CHAPTER 5

CONCLUSION

This thesis aimed to analyze CEF discounts' behavior under the novel effect of the global pandemic that crushed the financial markets in 2020. It is found that CEF discounts widened after the first cases confirmed in the country and shrunk after vaccination started. Moreover, I found that new cases and new deaths are significant predictor for CEF discounts.

This paper analyses the time period when the whole world entered an era of panic and fear as Covid-19 spread rapidly through countries. Although the vaccination was developed and comforted people that the pandemic was going to be under control, the devastating effect of pandemic lingered. In two and a half years of the pandemic around 600 million cases confirmed and almost 7 million people lost their lives due to the Coronavirus. Early studies of Covid-19 on investor sentiment revealed effect the overwhelming power of pandemic on investor sentiment and stock markets.

The scope of this paper is bounded by the five years period of 2017-2021 for the seven stock exchanges in the European market.

First, I analyzed the CEF discounts, without pandemic effect, with the most applied control variables in the literature including transaction costs proxy, dividend yield, beta, size, fund age, turnover, lagged market returns and lagged NAV returns (Cherkes, 2012). The results are consistent with the literature, as discounts increase with risk factor (beta), and transaction costs proxy while decreasing with dividend yield, turnover and size of the fund. My sample mainly did not yield significant results for the effect of fund age, lagged market returns and lagged NAV returns on CEF discounts. However, when I included HPI for real estate funds instead of market returns, the relationship between market and discounts is significantly negative.

Then, I investigated the first hypothesis that CEF discounts were affected by Covid-19 and vaccination. I found that discounts on average increased (decreased) after Covid outbreak (vaccination administration) started. The results remained consistent with the control for either country fixed effect and fund asset class fixed effect. Since, Google Search Volume for "coronavirus" revealed to be a significant proxy for investor sentiment (Smales, 2021), as a next step, I included new cases and new deaths to the analysis. The results were consistent with the second hypothesis that publicly available data on main Coronavirus statistics affected investor sentiment and CEF discounts accordingly. The discounts increased significantly with new deaths even after vaccination.

One of the limitations of this paper is due to the lack of data on institutional ownership on the funds. One of the reasons for CEF discounts to reflect the investor sentiment is the interpretation that CEFs are mainly held by individual investors (Lee et al, 1991). However, the data I gathered from Bloomberg had double-counting, producing

miscalculation, hence I could not use this part of data in my analysis. The results would be more robust with this control.

I found that Switzerland CEFs trade at premiums while the UK funds trade at a discount. Moreover, the relationship between discounts on Swiss funds, unlike the UK funds, and Covid-period is negative. Considering that most of the Swiss funds in the sample are classified as real estate funds, parallel situation is observed according to asset class focus. real estate funds trade at a lower discount (even premium) than equity funds. According to Bloomberg classification of asset class focus, REITs are not included. However, funds' portfolios are not listed, hence I do not know whether they invest in commercial or residential real estate. This lack of data creates another limitation for this thesis.

Further research may focus on the main reasons for the differences between the UK-Swiss funds and equity-real estate funds.

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