ERASMUS UNIVERSITY ROTTERDAM
Erasmus School of Economics

Master Thesis [Financial Economics]

Investment Behavior in stress times: Evidence from Dutch Institutional Investors

Name student: Juan Simon Escobar
Student ID: 444302

Supervisor: Sebastian Gryglewicz

Date Final version: 10-08-2021

Abstract

Investor behavior of large institutional investors such as pension funds and insurance corporations can either amplify or stabilize swings in financial markets. This paper analyzes how Dutch institutional investors behave over different market upturns and downturns. The analysis uses a large panel of individual institutions and aggregated data, over the periods 2007 to early 2021 and implements time and fixed effects methodologies. This study shows that life insurers present a strong countercyclical investment behavior independent of the market situation. Contrastively, pension funds and non-life insurers show evidence of procyclicality at normal times, but only insurance corporations seem the ones able to act as a supporting party at times of stress. Moreover, it is found that the industry of Dutch institutional investors put more weight on acting as stabilizing parties, than solving liquidity issues at the times of COVID-19. Findings suggest useful information for policy makers and COVID-19 effects on the industry as a whole.

Key words: Investment behavior; insurance companies; pension funds; procyclicality; COVID-19

Table of content

1. Introduction

Over the years, there has been interest on whether institutional investors have an impact on financial market sentiment. Institutional investors hold rapidly growing assets under management that cover a major part of global financial assets. Thus, they have the potential to either amplify or stabilize swings in financial markets and global economies.

The year 2020 was an unusual year for the world as it experienced the whiplashes of the global outbreak of COVID-19. This event has been causing social and economic disruption all around the globe. A paper written by Baker et al. (2020) found that despite the lower level of mortality that COVID-19 had at the beginning of the year compared to other past pandemics, there is no other infectious disease outbreak that experienced such market swings as COVID-19. The financial crisis caused by the coronavirus presented liquidity issues for firms and institutions of both small and medium capitalization, as investors considered them as riskier investments therefore avoidable.

Institutional Investors such as pension funds and life insurers companies are expected to act as shock absorbers at times of financial stress, as they are characterized by investments that trade in a longer time horizon, enabling them to sustain short-term price movements. In comparison with banks and mutual funds, these types of institutions do not face direct selling pressure as their liabilities cannot be easily withdrawn. Moreover, they tend to use rebalancing strategies, whether "buying low, selling high" or the other way around. This type of behavior enables the asset allocation to remain relatively stable. For example, when equities are undervalued compared to fixed income, investors will buy more equities, keeping the exposure of total equity at the level determined by the long-term strategic asset allocation strategy.

These rebalancing strategies have an impact at a macro level, either creating upward or downward price movements, being directly linked to financial stability. However, in practice, institutional investors do not tend to apply rebalancing strategies at times of stress. A clear example is the global financial crisis, where many investors decided to close their positions in bull markets, causing further acceleration in the fall of the prices.

In turbulent periods, institutional investors may pursue positive or negative feedback strategies. Positive being momentum trading strategies (Buying past winners and selling past losers) and negative being contrarian investment strategies (Buying past losers and selling past winners). It is well documented that these positive and negative feedback strategies are closely related to what is referred to as procyclical and countercyclical investing. Respectively, the first one tends to aggravate the fluctuations in assets prices while the other one moderates excessive price movements.

By looking at the assets under management with respect to Dutch GDP, insurers and pension funds cover 68.13% and 238.23% respectively, for the year 2020 (OECD,2021). Inclining in the idea that moves in a large number of assets under management, can either amplify or stabilize swings in financial markets and global economies. The following research question is developed:

Does the investment behavior of Dutch pension funds and insurance companies stabilize financial markets during market downturns and upturns?

This paper analyzes Dutch pension funds and insures over different time periods, between 2007 to 2021. It studies if companies behave countercyclically by buying and selling in contrast to market movements, for example, “Buy low, sell high”. Moreover, is going to be tested whether these institutional investors reflect asymmetric investment behavior by testing them in market downturns and upturns.

The Investment behavior by these types of institutions has vast consequences for the real economy and financial stability, especially the issues arising from procyclical investing (Borio, Furfine, and Lowe, 2001; Papaioannou, et al. 2013; and Fache and Giuzo 2019). There is evidence that their investing actions are not the only channel to have an impact on the real economy. For instance, insurers could invest countercyclically hoping for future returns or avoid future failure. Furthermore, pension funds could increase contributions or diminishing benefits at times of financial stress. Both actions independently of each other could have some positive or negative impact on the economy. Notwithstanding, this research aims the attention on assessing whether Dutch institutional investors (Pension funds, life and non-life insurers) have a destabilizing or stabilizing role in financial markets.

The research of this topic contributes to the existing literature of Dutch institutional investors, with a wide influence on insurer enterprises as this one is lacking in the world of finance. The following is a considerable omission, as statistically one-third of total institutional investments in the Netherlands are covered by insures. On the other hand, this paper adds to the literature by focusing on actual transactions and by taking into account both fixed income and equities, thus covering almost entirely the balance sheet. Lastly, the idea behind the research will be to give valuable information on how the Dutch institutional investors react to a complicated period such as the COVID-19. Providing useful information for policymakers and retail investors.

Proceeding the Introduction, the remainder of the paper is organized as follows. Section 2 will present the theoretical framework. In this section, the previous academic literature underlying the subject matter and characteristics of the institutions studied will be discussed in order to formulate hypotheses. Thereafter, the data implemented in the analysis will be introduced in Section 3; the data sources, sample creation method and descriptive statistics will be discussed. Subsequently, the methodology selected for the analysis will be explained and justified in Section 4. The empirical analysis and discussion of pertinent results will then be developed in Section 5. In this section, the relevant findings for the regression analysis, as well as their respective robustness check will be presented. Finally, the conclusion will be displayed in Section 6, in which a concise summary will be formulated, leading to a clear answer to the research question. This will be followed by an examination of the study's limitations, policy implications and suggestions for future research.

2. Theoretical framework

This section will explore relevant academic literature regarding the topic of investment behavior of institutional investors and put more context in order to create the hypotheses raised for this research. In the previous decades, there has been a growing body of literature concerning institutional investors and their role in providing stabilization in financial markets.

2.1 Institutional investors investment behavior

Plenty of research has documented investors' past-return behavior and under what circumstances particular investment strategies are successful. Grinblatt and Kelohojaru (2000) develop a study that focuses on investment behavior of many investors categories, which includes insurance companies. They concluded that domestic investors, particularly households, tend to be contrarian investors, while foreign investors tend to be momentum. Odean (1998) while analyzing trading records for 10,000 accounts from a large discount brokerage house in the US. He found that the investors have the tendency to realize losses, as they hold losing investments for too long and sell winning investments too soon. Thus, present evidence consistent with contrarian investment strategies.

A strand of literature investigates herding behavior on investors (Scharfstein and Stein,1990; Chang, Cheng, and Khorana, 2000; Hirshleifer, and Hong Teoh 2003) there is a variety of research depending on assets classes and financial industry classification. For instance, Beber Brandt and Kavajecz (2009) suggest while studying the bond market that during periods of large inflows and outflows in this market, liquidity explains a large proportion of sovereign yield spreads. Chiang and Zheng (2010) by applying an investigation in advanced stock markets, observe that a crisis triggers herd activity in the country of crisis origin and produces contagion effect to the neighboring countries. Broders et al. (2016) used unique and detailed data to analyze herding behavior on pension funds. This "herding behavior" is what is referred to in this paper as procyclical investment behavior.

Procyclical investing is closely related to momentum investing. The aforementioned attribute is that investors buy and sell the same assets at the same time. While momentum investing refers to buy past winners' assets and sell past losers. Clearly, there is a significant overlap between both concepts. Procyclicality refers to "the dynamic interactions (positive feedback mechanisms) between the financial and the real sectors of the economy. Where these mutually reinforcing interactions tend to amplify business cycle fluctuations and cause or exacerbate financial instability" (FSF, 2009).

It is well documented that the financial system is naturally procyclical, this procyclicality can be economically and financially harmful, especially in downturns (Borio, Furfine, and Lowe, 2001; BIS 2008; Claessen and Kose, 2013). The global financial crisis has been a reaffirmation of such instability. Sectors such as banking are prone to this procyclical behavior, as their high leverage and combination of risk management and capital requirements, trigger a tightening of credit standards in market downfalls (Gerlach and Gruenwald, 2006; Brunnenermeier, 2009).

Numerous empirical evidences suggests that many institutional long-term investors engaged in procyclical investment actions during times of crisis, though the extent of such behavior varied depending on investment styles and market conditions. Even though, the financial market theory presumes rational behavior of both short term and long term investor while allocating capital, is important to clarify both concepts for a clearer explanation. We define short-term investors as frequently trading related to contribution to market liquidity and exploitation of mispricing. Whereas long-term investors are defined as those who have the intention of holding assets for multiple years and are not expected to liquidate their positions in the short term.

The OECD (2013) argues that institutional investors benefit from this long-term behavior as it provides a stable net income flow and tends to follow a less cyclical investment pattern. However, it is known that even in the long term investors may need to dispose of part of their assets due to certain conditions such as portfolio rebalancing; tactical positioning for assets; unexpected events (eg. natural disasters, accounting frauds); and legally mandate liquidations (Papaioannou, et al (2013).

2.2 Institutional investors as a stabilizing party.

The procyclical investment behavior is reflected in a wide variety of classes of institutional investors during a crisis. Several studies analyze pension funds and insurance corporations in major market events. Results tend to vary depending on the geographical scope and time periods. A research made by the IMF (Papaioannou, et al. 2013) shows that Portuguese, Spanish, and U.S pension funds engaged in equity sell-offs in a period close to the global financial crisis, more specifically 2007-2008, causing destabilization given the market circumstances at that time. Nonetheless, pension funds in Italy, Norway, Poland, and Turkey had an opposite behavior by

reacting countercyclical as they purchase equity during the crisis and lowering their intensity at the time of purchase as markets tend to recover. Another study conducted by the Bank of England (2013) while studying pension funds on the global financial crisis got to the same conclusion that pension funds invested countercyclical in the short run and procyclical in the medium run. However, they stated that the decision to sell equities was also influenced by the desire of pursuing safer investment strategies.

On the other hand, studies such as the one performing by Blake, Sarno and Zinna (2017) reflect the contrary. While analyzing UK pension funds over a longer time frame of 25 years. They conclude that these institutional investors did not have a stabilizing effect on markets, as they tend to apply only rebalancing in the short run. Something similar is found by Voronkov and Bohl (2005), were they found that Polish pension funds presented values of herding and positive feedback trading, due to a strict regulatory framework of the country

Evidence of life insurance companies' procyclical behavior seems to be mixed during the recent financial crisis. Rudolph (2011) while studying US life insurers found that their asset allocation stayed remarkably stable through 2001 to 2010. The Bank of England and Procyclicality Working group (2013) found a positive correlation for French, UK and US life insurers between equity investments and stock market performance for a period of 16 years. Still, the authors fail to provide strong conclusions due to limitations in their data and the fact that there was a structural change towards a more conservative asset allocation.

On the contrary, according to Impavido and Tower (2009), they conclude that US life insurance companies contributed to the downward spiral in the equity market fall in 2001-2003, known as the dot-com bubble. Life insures attributed to the crash by selling equities in an attempt to bolster their balance sheets. A similar behavior was observed during the global financial crisis. The International Monetary fund (2016) found that insurers with a low level of capital were more prone to sell securities in the global financial crisis, nevertheless that in overall, US insurers tend to act countercyclical.

As our main focus in the research is reflected in Dutch institutional investors is important to provide the numerous empirical research that is available. De Haan and Kakes (2011) studied the

investment behavior of three types of Dutch institutional investors (pension funds, life insurers, Non-life insurers) before the global financial crisis. The results of this paper show that the three types of investors turn to act as contrarian traders. However, through their results, pension fund appear to be the only ones to have systematic results. A paper conducted by Dujim and Steins (2018) investigates whether Dutch insures and pension funds institutional investors behave countercyclically at the period of 10 years (2006-2015). They found evidence that pension funds present a countercyclical behavior during market upturns. While insurance companies (non-life and life insurers) present a procyclical behavior. A study performed by Kakes (2008) examines the financial behavior of Dutch pension funds during the timeframe of 2002 to 2005, as is characterized for being a turbulent period due to strong market corrections and historically low interest rates. He found that Dutch pension funds continued to have a stabilizing influence on financial markets during stressful times.

In general, it is expected that institutional investors have a stabilizing role in financial markets by making a rebalance in their portfolio at the time of price movements. From that statement, the first hypothesis is formed:

H1*: Pension funds and Insurance companies tend to buy assets after a drop in market prices (Buy low, sell high). Therefore, having a countercyclical investment behavior.*

2.3 Dutch Institutional Investors composition

2.3.1 Pension Funds

For years the Dutch pension system has been recognized as one of the best in the world. This could be argued due to their robust retirement income system (Mercer,2016) and credibility backed up by rating agencies of pension systems all over the world. Facts speak for themselves, in not any country in the world the level of poverty among older people is that low and the difference between disposable income before and after retirement is relatively small (Pension Federatie, 2021). The success behind this achievement comes from the organization of retirement provision in the Netherlands. The Dutch pension system consists of there pillars, each with their own features.
The first pillar also known as the General Old-Age Pensions Act (in Dutch AOW) is a general-old age insurance and provides pensions for all people living in the Netherlands, once they have

reached the qualifying age. Nowadays, the age required to be entitled to this pension is 67, but under current plans, the required age wants to be linked to the development of life expectancy. The AOW functions as a Pay-as-you-go system (PAYG) meaning that the contributions, funded from tax revenues, are paid by individual participants and immediately passed on as benefits to the retirees. After reaching the certain age, the government will pay out a flat-rate pension benefit. In less favorable economic times, this type of system provides a stable pension benefit base. On the other hand, the PAYG system is sensitive to demographics and aging of the population. The AOW should be seen as the basic provision at minimum level, and in most cases, this benefit is supplemented with income from the other pillars.

The second pillar is made up of the occupational pensions accrued by the majority of employees accumulate over the course of their careers. All employees and employers are affiliated to a pension fund, where contributions are being paid based on a collective employment agreement. This type of system may provide a pension fund for all businesses in a particular industry, a fund for a group of people working in a certain profession, or a fund for a group that works for one specific company.

The second pillar is an employment benefit raised on the basis of capital funding. This works in the following manner: an employer, together with the employee, accrues pension entitlements from the contributions paid in and the returns generated by the pension fund investments over time, with the capital raised by these contributions. The value of assets gathered in the second pillar accounted for €850bn in 2013, which was equal to 135% of the Dutch GDP by that time (Goudswaard, 2013).

This second pillar also known as the employment-related pension can be divide into three categories: company-linked, industry-wide and profession-linked funds. The company-linked pension funds are organized by one single company. In this category is where lies more of the pension funds from this pillar. The industry-wide pension funds are organized by sectors, like the construction industry or government. Participation in an industry pension fund may be mandatory for the entire sector following the guidelines of the Minister of Social Affairs and Employment (Pension Federatie, 2021). Lastly, the profession-linked pension funds are pension funds designed for specific proficiencies (often medical), such as doctors, obstetricians and physiotherapists.

The third pillar known as the individual supplementary pension consists of insurance products or individual banking for which contributions can be paid in for the accrual of a pension, with tax allowances up to a certain level. This type of pension is completely voluntary and can be added to the benefits received in the first and second pillars if it aligns with fiscal ceiling set by the government (Kuiper, 2016). This pillar is meant for people who do not build pension rights in the second pillar, for example, self-employed or if the employer is not affiliated to a pension fund.

Types of Pension schemes

There are various types of pension schemes. The most common and traditionally used in the Netherlands is the defined benefit (DB) scheme. In this scheme, the amount of benefits depends on the number of years worked and the total contributions paid. All these schemes are based on average pay, with the level of pension accrued related to the income in a particular year. These average paid schemes usually present conditional indexation. Meaning that the benefits of the contributors will be adjusted each year in line with inflation or the wages increase in the sector; only if the fund has sufficient funds to cover. Since the Financial crisis in 2008-2009, many pension funds haven't been able to allocate indexation (Pension Federatie, 2020).

In addition to defined benefit schemes exist defined contributions (DC) schemes. The amount of pension in this scheme depends on the contributions paid in during the accrual phase and the return on these contributions. The capital raised has to be converted into periodic benefits on retirement. In principle, the employee bears both the interest rate risk and the investment risk. In the Netherlands is relatively rare the use of individual DC schemes, for that reason, a combination of DB and DC comes into place. For instance, the collective defined contribution scheme (CDC) known as a hybrid scheme, has increased popularity in the country (Goudswaard, 2013). This type of scheme is characterized for receiving the benefits based on salary and service years, just like the DB scheme, but the contribution is fixed for several years. It turns out that if the contributions are not sufficient, the pension benefit will be lower than originally intended

Current situation of Dutch Pension funds

The vast majority of Dutch Pension schemes are defined benefit schemes. In times where things go well, all the stakeholders will benefit. If is the other way around, all stakeholders will contribute to the recovery, hence sharing the risk. The stakeholders include the employer, employees and

pensioners. Recent financial and economic circumstances have put under pressure the DB pensions schemes. As it becomes harder for Dutch pension funds to manage various financial shocks, such as investment risk, longevity risk and interest rate risk.

For instance, even though the Dutch pension system has shown its ability to deal with shocks in linear times, due to the unique combinations of a system such as Pay-as-you-go and capital funding. The increase on the drastic increase in the aging of the Dutch population has become a problem, as it requires a larger pension than was assumed. Moreover, with interest rates been this low for many years, in accordance with accounting rules and buffer requirements, pension funds must hold high levels of capital in order to meet their future and current obligations. These type of situations have put pressure on the system shaping the reason why pension funds have not been able to achieve their ambition of indexation, and even some had to reduce their pensions (Pension Federatie, 2021).

For Pension schemes to be able to pay the full amount of benefits in the future, they need to value these commitments to assess whether they have enough capital available. In order to check if pension funds comply with the standards they are mandated, the institution in charge of monitoring the capital requirements is the Dutch National Bank (DNB). The DNB characterizes for monitoring closely: operational management, the financial position and the board members of pension funds. To check for the financial position, a pension fund funding ratio reflects the situation. This ratio indicates whether a fund holds enough reserves to pay out benefits, now and in the future. This ratio is directly linked to the level of actuarial interest rate, so the higher this rate the less reserve they need. The current level of financial position is expressed by the ratio between available assets and liabilities. (DNB, 2021).

Talking about funding ratio is directly linked with statutory rules. For example, Pension funds are only allowed to apply full indexation or partial indexation if their funding ratio exceeds 110%. In the case where Pension fund's funding ratio is too low, they must take measures to improve their financial situation.
The rules implied by the DNB are shown in Table A. The main purpose of these rules is to ensure that pension funds allocate their assets in a balanced way between current and future pensioners.

The current situation with many pension funds is that they presented insufficient funding ratios for several years. This is partly due to the lower level of interest rates and choices made relative to investments and contribution levels. The funding ratio may vary depending on the institution's amount of contributions asked and their investment strategy.

Table A Founding ratio rules implied by De Nederlandsche Bank (2021).

Funding Ratio Rules			
Funding ratio	<104%	<104-110%	≥110%
Actions to be done	Take measures	No indexation	Apply partial or full indexation

Currently, a pension accord approved by the Minister is underway to grant pension funds more time to improve their financial position. By January 2026 at the latest, pension funds have time to adapt to the new pension system. This new system characterizes in the way that pension funds no longer need to make promises about the number of benefits they intend to pay out in the future. Instead, it is a contribution-based system where everyone will build up their share of pension assets. Thus, pension funds liabilities, which were define based on the promises made by the future pension funds benefits, are no longer known which means that the funding ratio goes out of the spotlight. However, the Minister has yet to decide on the funding ratio rules for the period up to January 2026. Since in the new system the people's pensions are directly linked to market development. As the returns on invested pension assets are what determines the eventual amount of benefits paid out, and the government still wants to have some level of control over capital and risk requirements.

2.3.2 Insurance companies

The Dutch Civil Code entitles any company as an insurance company if it provides insurance on a commercial basis and for its own account. An insurance policy is an agreement under which an insurer guarantees one or several benefits in exchange for one or more premium payments by the policyholder (Breedveld-de Voogd et al., 2016). Insurance companies need the authorization to undertake insurance activities. The insurers are distinguished by categories depending on the type of insurance they provide: non-life insurance, life insurance, funeral expenses in-kind insurance, or reinsurance.

Non-life insurances are characterized for providing benefits that are related to the damage sustained by the insured. Examples could be accident insurance, legal assistance insurance and health insurance. A Non-life insurer is obliged to provide a benefit due to an uncertain event or circumstance that affects the insured's interest. The Netherlands has a quite sizable non-life insurance industry, it is rank fourth worldwide due to its levels in per-capita-non-life premiums and premium income to GDP (Bikker and Gorter,2008).

Life insurance supplies a payment of a capital sum upon the insured person's death. These type of insurers only provide monetary benefits. Moreover, the amount of this benefit is predefined, which means that the amount does not change depending on the actual damage sustained. Therefore, life insurance covers deviations in the timing and size of predetermined cashflows due to accidental death or disability. Some life insurance only pays out the benefits in the incident of death, however, others do at the end of term, which is known as endowment insurance. In the Netherlands, the life insurance sector is important as it covers a volume of business in terms of financial assets of €420 millions which cover more than 85% of all the insurance industry (DNB, 2021)

Moving on to the last two types of insurance, the funeral expenses and benefits kind of insurance is a type of insurance that provides a benefit related to the arranging of the funeral of the deceased. This one is a service rather than a cash payment. Lastly, reinsurance is the insurance for insurance companies where they transfer the risk to other insurers. Reinsurance is performed only between professional market operators, private individuals cannot take out reinsurance.

Insurance benefits and solvency

The core business of the insurance industry is the sale of protection against risk. As stated before an insurance is created based on an agreement between at least two parties, where some benefits are expected at the time of any loss. These benefits can be guaranteed beforehand so insurance firms have the chance to bear the risk that invested premiums may not cover the promised payments. Such guaranteed benefits could be followed by some kind of profit sharing, of course depending on the type of investment whether it is shares or bonds. In addition, the benefits of the insurance could be linked to capital market investments, for example, an investment in a basket of shares, so that the insurance firm bears no investment risk at all, an example of this are unit-linked funds (Bikker & van Luvensteijn, 2008).

One of the main characteristics of life insurance policies is the long life span of the policies. For that reason, life insurers need to remain in a financially stable condition over the decades in order to provide the promised benefits to the policyholders. Insurers need large reserves to cover their expected insurance liabilities. The reserves are financed by the insurance premiums which are invested mainly in capital markets. Even though, insurers face various amounts of risks, investment risk may be their major risk (Bikker & van Luvensteijn, 2008). Thus, without sufficient profitability and level of solvency, it is questionable whether insurers can face unfavorable developments such as a long lasting decline in interest rates.

In that sense, a relatively strong regulatory framework has contributed to maintain insurers under a strategy of conservative asset allocation (Rudolph, 2011). In the Netherlands, the supervision of insurers is governed by the Financial Supervision Act (in Dutch WFT). The WFT is the entity that authorizes the company to operate. The authorization requirement and the supervision of insurers are based on the European Solvency II. The main aim of this framework is to protect the interest of the policyholders through qualitative requirements and quantitative capital requirements implemented by operational managements and transparency shown towards supervisory authorities and the public.

2.4 Differences in the investment behavior of pension funds and insurance companies (Non and life insurers)

Even though all are institutional investors and have similarities, differences seem to exist between these three parties. For instance, when comparing pension funds and insurance companies the regulatory framework is an important factor to consider. The two sectors have to value their assets and liabilities based on market value, which increases their tendency on following a procyclical behavior. However, their liabilities are less sensitive to market circumstances due to the introduction of the ultimate forward rate. In addition, both sectors can choose the composition of their portfolio as their asset allocation is not subject to hard limits. This is known as the "prudent person" principle, which enjoins portfolio diversification and broad asset-liability matching.

In line with regulation, one important difference is that for pension is extremely hard to go bankrupt. As pension funds, have more recovery options, for example, they can increase premiums or cut policyholder's benefits. Therefore, insurance companies may face higher pressure in market

downturns due to their business models. Insurance companies are compelled to lower their risk profile on their portfolio or to attract additional capital in recovery periods, an example of this scenario is when their solvency position is below the regulatory minimum. On the other hand, pension funds are not compelled to lower their risk profile, yet there are not allowed to increase their risk appetite during recovery.

Another important difference between institutional investors is the maturity of their assets and liabilities. Pension funds and life insurers have a long maturity in their liabilities, thus aiming for a longer investment horizon, while non-life insurers have a shorter investment horizon as they are concerned more about the liquidity of their assets. In terms of investment risk profile, a study conducted by Gorter and Biker (2013) found that pension funds hold significantly more investment risk than insurers. In addition, they also found that pension funds are more risk tolerant as they are able to rebalance their equity allocation in their portfolio to a larger extent, in both bear and bull markets. While insurance companies rebalance mostly in bull markets, and they do not tend to restore their equity allocation by buying cheap equities in bear markets (Dujim and Steins, 2018).

Taking into account this difference and previous research, it is expected to find a piece of stronger evidence in terms of countercyclical behavior for pension funds compared to insurance companies. Therefore, creating the following hypothesis:

H2: *Insurance companies show a weaker countercyclical behavior than pension funds.*

Additionally, this type of behavior is expected on a bigger scale in life insurers than non-life insurers, because of their shorter investment horizon. Leading to the following hypothesis:

H3*: Life insurers show stronger countercyclical behavior than non-life insurers.*

2.5 Response to market shocks by Insurers and Pension funds

As stated previously institutional investors tend to behave differently in downturn times compared to tranquil periods. A diverse set of literature found differences in the investment behavior of our investors at research during turbulent circumstances (Kakes,2008; Impavido and Tower, 2009). Research such as the one performed by Houben and van Voorden (2014) adds to this topic. While

they were studying Dutch insurance companies during the financial crisis, found that the insurers institutions actively decreased their exposure to equity markets which they found clear causation of the stock prices to drop. Moreover, something similar happens in the fixed income assets for Dutch insurers. Bijlsma and Vermeulen (2016) while researching the sovereign bond portfolio of these insurers, found that during the European sovereign debt crisis insurance companies engaged in a procyclical investment behavior by selling southern European assets.

According to Bikker, Broeders and De Dreu (2010), they conclude that pension funds reacted asymmetrically to market shocks, one of the reasons is their way of rebalancing. They particularly highlight that the rebalancing was much stronger after negative equity returns. The idea of the study is to test if there are stronger reactions after market downturns than market upturns. So, according to the Dutch authors, it is expected that the buying of equities and selling behavior of insurance companies and pension funds to differ during periods of stress. For that reason, is formalized the following hypothesis:

H4: *Insurance companies and pension funds react differently to market shocks by reacting stronger to market downturns.*

2.6. COVID-19 as an exogenous shock

In this paper, the novel coronavirus (COVID-19) pandemic is used as an exogenous shock determined as a downturn period and study how institutional investors react to this risk event. A global pandemic has not been considered as a relevant risk till very recently. The focus has been primarily on volatility caused by socioeconomic issues, climate changes and other investment risks. Even though some empirical evidence such as Almond (2006); Yamey et.al (2017); Fogli and Veldkamp (2013) present relevant information on health cost and social impact of viral infections in economic activities in the long term. Nevertheless, this paper wants to focus more on the stabilizing role of institutional investors at such unique times.

The powerful thing about the COVID-19 pandemic as an exogenous shock is that is a natural disaster that did not originate from changes in underlying economic conditions. Therefore, institutional investors were not able to reposition themselves in avoiding investments that would be hit hardest by an upcoming pandemic. In contrast to the global financial crisis, which exploded from frictions in financial markets that developed over time, giving some institutional investors some time to restructure their portfolios.

From what is seen from the start of the pandemic to nowadays is that noninvestors whether it is retail or institutional have emerged unscathed from the pandemic. As stated, earlier in the paper we expect that institutional investors provide some financial stability at the time of market downturns by rebalancing their portfolios. However, each and one of the institutions have their top priorities at the time of such events. Most of the institutional investors set their priorities as the health and safety of their employees; business continuity, by facilitating the activity of work-from-home models; maintaining investment performance; and lastly financial liquidity.

A paper conducted by Glossner et al. (2020) found that institutions using the Covid-19 as exogenous shock provided clear evidence of "fire sales" in US institutional investors as they needed to de-risking their portfolios to limit the COVID-19 stock market crash and move towards becoming a more financially resilient firm.

There are possible interpretations that the big reaction to the stock price drop in the "Fever Period" (Ramelli and Wagner, 2020) was driven by institutional investors in what is known as "fire sales", where asset sales at a discount in reaction to fundamental shock that triggers these sales. This event is generated as a cascade of subsequent sales by other institutions that have similar asset exposures, which forced them to lower their risk in their portfolio by selling the assets. Thus, the event potentially further capital withdrawals (Coval and Stafford, 2007; Shleifer and Vishy, 2011)

There seem to be two main factors that trigger institutional fire sales: 1) An attempt of institutional investors to lower their risk in their portfolios by rebalancing toward firms better prepared to deal with the pandemic, and 2) the sudden increase in redemption risk, driving institutional investors to decrease the total size of their equity exposure. For that reason, is generated the following hypothesis:

H5*: Dutch institutional investors lower their equity exposure during the exogenous shock of Covid-19*

3. Data

The research is aimed to analyze the investor behavior of Dutch institutional investors such as pension funds and insurance companies. Therefore, it uses data from surveys carried out by Statistics Netherlands and De Nederlandsche Bank (DNB). All the calculations were made by the former institution. The timespan of the data is from the period 2007 to early 2021, the frequency of the data varies depending on the investors analyzed, due to availability in the database. The

idea behind the selection of this timeframe is to see differences in times of financial stress and "normal times". We define these times of financial stress in our paper as the Global Financial Crisis and the most recent negative catalyst such as the hit of the Covid-19 pandemic.

The data consist of detailed balance sheets of the institutional investor's assets and liabilities. Both assets and liabilities are valued at market value. Assets include deposits and other liquid assets, financial derivatives, fixed income (bonds), real estate, shares and other equity. From the DNB database the availability of the balance sheets differs depending on the institution, there is aggregated data for all institutions, but for individual institutions, there is only yearly data of insurers companies.

In order to get information on individual pension funds, data is obtained from the amount of invested capital in pension fund's risk of individual institutions. By comparing and making a percentage distribution with the aggregated data available. It was able to obtain the necessary variables to perform the required regressions from this percentage distribution, the percentage investment on equity is available, thus a category known as "Other investments" is created, from the rest of the percentage sum.

The data also contained detailed cash flow statements. It reconciles all inward and outward cash flows, regardless of whether they relate to operations or to purchases and sales of assets and liabilities. The cash flow statements are available as aggregated data, therefore the distribution of the net amount of the asset studied is assigned to each asset class depending on what percentage of the asset class represents to the total amount of the asset. This allocation is performed to the sample of individual institutions.

In addition, is needed supervisory data to control for institution specifics, for example solvency position. For the pension funds, levels of funding ratio and required funding ratio are obtained. For insurance companies, the levels of available solvency and required solvency are obtained where a ratio is determined in order to control for the solvency position. Lastly, the study also recollects data from asset classes indices in order to show an estimation on how much return they make on that asset class, as institution-specific information for most of the data is confidential and unavailable in the DNB database. For equity, the Amsterdam Stock Exchange Index (AEX) was

used; for fixed income, the Bloomberg Barclays Euro Aggregate Bond Index (LBEATREU) was the index used.

The database for this study collects information for 23 pension funds, 24 non-life insurers and 13 life insurers companies, each covering respectively 81%, 49% and 67% of the Dutch sectors in terms of investments or total assets. The paper only includes institutions for which the data was available for at least 10 consecutive periods. By looking at the statistics drawn by the OECD (2021), insurance corporations' total financial assets, which represents the sum of the sub-sectors non-life, life, reinsured and health care insurers represent 68.13% of Dutch GDP (in Q4-2020). While the Pension funds represent 238.23% of the Dutch GDP (in Q4-2020), this big difference is due to the high financial activity of Industry-wide pension funds.

In Table 1 and 2 are presented the descriptive statistics of the dataset, being 1 for the aggregated data of institutional investors and 2 for the sample of individual institutions. The allocation in asset classes varies across the different sets of investors. In this study, equity is represented by the sum of non-quote shares, quoted shares, other equity and shares in investment funds. While fixed income is represented by all types of bonds in all levels of maturity. For the asset class named "Other Investment", strictly used for individual pension funds (Table 2), represents all other assets invested differently than equity, such as real estate, bonds, loans, financial derivatives, other non-financial assets, and other assets. It is necessary to state again that the frequency in insurers and pension funds differ, but this is not a problem for the analysis as it is not tested a specific event in the timeline, more a behavior of the investors.

Table 1. Descriptive Statistics of Aggregated data

Variables	Mean	Median	Min	Max	Std. Dev.	Skew.	Kurt.
Total pension funds							
Total assets (in € millions)	1510575	1452811	1235565	1924380	198170	.598	2.21
Equity allocation (%)	60.857%	61.292%	53.455%	66.453%	3.835%	-.421	2.174
Fixed income allocation (%)	26.357%	26.260%	23.342%	29.548%	2.004%	.193	1.579
Relative equity transactions (%)	-0.083%	-0.202%	-2.900%	2.681%	1.508%	.087	2.383
Relative fixed income transactions (%)	-2.505%	-1.942%	-9.108%	0.239%	2.307%	-1.317	4.311
Founding ratio (%)	102.3%	102.9%	89.6%	110.3%	549.4%	-.530	2.468
Life Insurers							
Total assets (in € millions)	425848	414079	390753	476103	29868	.419	1.72
Equity allocation (%)	25.307%	25.253%	23.257%	27.332%	1.166%	-.148	2.114
Fixed income allocation (%)	39.371%	39.591%	37.181%	41.545%	1.397%	.005	1.808
Relative equity transactions (%)	0.498%	0.441%	-2.680%	4.828%	1.708%	.704	3.446
Relative fixed income transactions (%)	0.246%	0.385%	-3.087%	2.010%	1.129%	-1.013	4.297
Solvency ratio (%)	189.5%	190.%	170%	230%	13.6%	1.067	5.144
Non-life insurers							
Total assets (in € millions)	42232	41726	39749	46607	1902	.569	2.402
Equity allocation (%)	17.706%	17.789%	13.866%	23.152%	2.639%	.368	2.376
Fixed income allocation (%)	52.805%	52.489%	45.585%	59.491%	3.989%	.019	2.093
Relative equity transactions (%)	0.518%	0.442%	-2.768%	5.038%	1.760%	.745	3.587
Relative fixed income transactions (%)	0.248%	0.381%	-3.055%	2.056%	1.116%	-.998	4.345
Solvency ratio (%)	171.4%	170%	160%	180%	5.7%	.033	2.974
Total Institutional Investors							
Total assets (in € millions)	659200	412730	39749	1924380	636651	0.619	1.785
Equity allocation (%)	34.50%	25.20%	13.90%	66.50%	19.20%	0.638	1.612
Fixed income allocation (%)	39.60%	39.60%	23.30%	59.50%	11.30%	0.121	1.762
Relative equity transactions (%)	0.3%	0.1%	-2.9%	6.1%	1.7%	0.751	4.182
Relative fixed income transactions (%)	-0.7%	-0.1%	-9.1%	2.0%	2.0%	-1.746	6.903
Ratio of Solvency for INS (%)	151%	170%	89.60%	230%	39.80%	-0.273	1.539
Founding Ratio	102.15%	102.55%	89.60%	110.30%	5.54%	-0.462	2.41

This table shows the descriptive statistics of the aggregated dataset over the period 2015Q1 -2021Q1. It includes the mean, median, minimum and maximum (10% and 90% percentiles, respectively) the standard deviation, skewness and kurtosis of the key variables used in the regression analysis

Table 1 shows clear statistics on the biggest participants of the institutional investor's industry. For total pension funds, represents the sum of all types of pension (company, industry-wide and other pension funds). On the other hand, for Insurance corporations, the research only takes into account life and non -life insurers as they cover the vast majority of the insurance industry. The

data shows that pension funds invest more in equity across all their sub-divisions. While Insurance companies are the other way around. This distribution is in line with Gorter and Bikker (2013) findings that pension funds take more investment risk than insurers. Important facts to highlight are that the non-life insurers invest more than half of their assets in the more safe asset class and by looking at the institutional investors as a whole the distribution in asset classes between equity and fixed income is not that substantial.

Table 2 displays statistics for the sample of individual institutions. The sample shows that the size of the institutions measured by total assets varies strongly for the insurers companies, as the right-skewed distribution displays a higher number in total assets assuming the presence of big companies. Even though, the selection of the companies was based on the consistent availability of data for at least 10 consecutive periods. Companies with the biggest market share were included. For the life Insurers, four of the biggest players were included representing almost 90% of the whole market; and for non-life insurers, three of the major players representing over 50% of the market (KPMG,2020). For Pension funds, the difference in size is not that representative, as the selection of the pension funds was done based on the companies with the biggest amount of invested capital.

In terms of allocation in asset classes, the numbers in the sample vary in comparison with the aggregated data. Even though, for insurers the level of fixed income is still higher than equity, the sample shows that these companies don't invest much in equity. This is in line with the findings of Fache and Giuzo (2019), where they stated that regarding investment preferences, the portfolio of European insurers is dominated by fixed income assets. As for pension funds, the sample present expected results as equity presented almost 50% of the invested capital. Moving on to the supervisory statistics insurers companies report high levels of average solvency ratios 290% and 360% for life and non-life insurers, respectively. This shows that the sample has a high level of capital buffer as the solvency ratios are above the minimum requirement of 100%. For Pension funds, the average funding ratio equals 110%.

Table 2. Descriptive Statistics for Individual Institutions

	Mean	Median	Min	Max	Std. Dev.	Skew.	Kurt.
Life Insurers							
Total assets (in € units)	1.93E+10	2044614000	50924000	9.94E+10	3.00E+10	1.619	5.127
Equity allocation (%)	4.668%	1.492%	0.000%	35.897%	8.466%	2.493	8.579
Fixed income allocation (%)	38.296%	38.043%	2.251%	99.497%	23.941%	0.669	3.14
Relative equity transactions (%)	1.517%	0.740%	-9.362%	10.901%	4.111%	-0.124	6.141
Relative fixed income transactions (%)	-0.771%	-0.196%	-11.136%	7.186%	6.730%	5.277	51.531
Solvency ratio (%)	290.118%	247.350%	118.812%	823.032%	150.729%	1.792	6.024
Non-Life Insurers							
Total assets (in € units)	815132468.8	159161500	7816000	7528553000	1600639547	2.922	11.393
Equity allocation (%)	6.340%	1.569%	0.000%	30.309%	8.531%	1.266	3.492
Fixed income allocation (%)	47.538%	50.889%	0.000%	96.119%	29.612%	-0.322	1.919
Relative equity transactions (%)	4.296%	1.002%	-7.634%	141.456%	19.332%	8.541	83.212
Relative fixed income transactions (%)	-0.927%	-0.184%	-9.625%	9.738%	5.027%	-0.396	9.946
Solvency ratio (%)	360.271%	258.682%	110.628%	2118.566%	351.365%	3.546	16.923
Pension funds							
Investments for the Pension Fund risk	5.13E+10	2.39E+10	8271702000	4.63E+11	9.21E+10	3.367	13.823
Equity investment allocation (%)	49.747%	50.300%	18.500%	65.500%	10.007%	-1.018	4.244
Other Investment allocation (%)	50.253%	49.700%	34.500%	81.500%	10.007%	1.018	4.244
Relative equity transactions (%)	-0.053%	-0.113%	-2.450%	2.051%	1.098%	-0.05	2.423
Relative other transactions (%)	0.600%	0.615%	-3.077%	3.581%	1.355%	-0.402	3.893
Founding Ratio (%)	110.9734	109.7	88.3	142.8	12.32161	0.539	2.828
Required Founding ratio (%)	120.133%	120%	110.1%	128.2%	393.459%	-0.219	2.741

This table shows the descriptive statistics of the aggregated dataset over the period 2007 to 2019 for the insurance companies and period 2017 -2021 for pension funds. It includes the mean, median, minimum and maximum (10% and 90% percentiles, respectively) the standard deviation, skewness and kurtosis of the key variables used in the regression analysis

Even though, is possible to provide more information in aggregate information in the allocation of the asset classes, this data is not useful to test for procyclicality without further analysis, as it does not correct for valuation effects. This controls the fact that a rise in equity allocation could be driven by a positive market tendency and/or an actual stock split. For such reason, the research focuses on the net amount of equities and fixed income investments, calculated from the actual sales and purchases of each asset class.

For that reason, a new variable for each asset class studied is created. The variable is computed based on the net amount of the asset sold or bought expressed as a fraction of the total amount of the asset in the portfolio in the previous time t-1. For equity, this variable has the name of "Relative equity transaction". For the fixed income, it has the name of "Relative fixed income transaction'. In the case of Pension funds, a variable with the name of "Relative other investment transaction" was created. This variable represents the net amount of investment of the pension funds in other asset classes different than equity.

By looking at Table 1, it is seen that the pension funds were net equity sellers and net fixed income sellers on average as their relative transaction variables presented a negative and left-skewed number during the sample period. For Insurance companies, the opposite was viewed as both asset classes studied are presented by positive means, indicating that the insurers on average focus on the buying of equity and fixed income. Lastly, by checking the industry as a whole, it seems that they are net buyers of equity and net sellers of fixed income over the years 2015-2021.

For Table 2, the sample of individual institutions shows some difference with the aggregated data (Table 1). The life and non-life insurers selected still are net equity buyers, but they differ in how they treat fixed income, as they become net sellers during the period studied for the sample. For Pension funds, the relative equity transaction variable stays the same indicating that on average pension funds sell equity during our timeframe. While they are net buyers of other investments.

4. Methodology

In order to test our hypotheses, we replicate the methodology used at Dujim and Steins (2018) paper but making some adjustments due to their underlying data available.

For testing our hypotheses, the analysis starts by creating a baseline regression for each type of institution studied. As stated in the data section, the frequency and availability of the data differ from each type of institutional investor, so the equation is interpreted differently depending on each investor. The analysis starts by running panel data regression separately for each institution (Pension funds, life insurers and non-life insurers) recollected in our sample of individual institutions. Thereafter, it proceeds to run a panel data regression for all institutional investors implicated, in order to analyze how the industry acts as a whole.

The baseline regression which is used is the following:

Baseline regression

$$\frac{T_{i,t}^{E}}{A_{i,t-1}^{E}} - \frac{T_{i,t}^{(*)}}{A_{i,t-1}^{(*)}} = \alpha + \beta_1 * \left(r_{i,t-1}^{E} - r_{i,t-1}^{(*)}\right) + \beta_2 * \left(\frac{T_{i,t-1}^{E}}{A_{i,t-2}^{E}} - \frac{T_{i,t-1}^{(*)}}{A_{i,t-2}^{(*)}}\right) + \sum_{k=3}^{K} \beta_k X_{I,t-1} + \varepsilon_{i,t} \qquad (1)$$

The dependent variable $\frac{T_{i,t}^{E}}{A_{i,t-1}^{E}} - \frac{T_{i,t}^{(*)}}{A_{i,t-1}^{(*)}}$ for this equation estimates the relative difference transaction, which is the difference between relative equity transaction and relative fixed income or other investments transaction. The factor (*) represents fixed income while studying the industry as whole and individual insurers (non-life and life); Other investments while studying individual pension funds. Equity is always going to be compared to other asset classes no matter the institutional investor analyzed. Both assets tested are defined as the net buying/selling in time t divided by the total holdings at t-1. This dependent variable indicates whether an institution *i* actively increase or decrease its equity holdings relative to its fixed income holdings or for the pension funds to other investments assets.

In this equation, we need to control for outliers, by excluding observations of relative asset transaction that fall above 100% and below -100% (this result to be an average of 1% of all observations), the reason behind it is that these transactions are often related to transfer of assets from or to investment funds. Moreover, it is controlled for serial correlation, by adding into the equation the lagged dependent variable, $\left(\frac{T_{i,t-1}^{E}}{A_{i,t-2}^{E}} - \frac{T_{i,t-1}^{(*)}}{A_{i,t-2}^{(*)}}\right)$. Even though, adding this lagged variable in the panel regression may create some bias, if the time dimension of the cross-section dimension is relatively bigger when compared to the panel dimension. This is controlled as the time dimension of the dataset is larger than the cross-section dimension for all institutions analyzed. The individual fixed effects accounting for institution-specific characteristics will be represented by the variable α_i.

The variable $\left(r_{i,t-1}^{E} - r_{i,t-1}^{(*)}\right)$ known as return difference, represents our main independent variable. This variable is defined as the difference on the return made on equities by institution *i* in period t divided by the total equities in period t-1 minus the return made on fixed income or

other investments by institution *i* in period t divided by the total fixed income investment or other investments in period t-1. In order to get the amount of return made by the asset class, we multiply the total amount of the asset class to their national main index of that asset class. For equity we use, the AEX and for fixed income we use the Bloomberg Barclays Euro Aggregate Bond Index. From this return difference is tested weather pension funds and insurance companies buy more equities relative to other asset class when equity seems to be overperformed by the other asset class. This variable will be key in answering our first hypothesis, as it is expected a negative coefficient for this variable. This means that institutions buy more equities compared to other assets when equity underperforms, as it is cheap to buy, therefore reflecting a countercyclical behavior.

The variable $X_{I,t-1}$ is used to controlling for institution-specific variables. For instance, the solvency position is included to control for the financial stability of an institution. Institutions with higher capital buffers have more means to resists market shocks. In addition, pension funds with solvency positions that are close to regulatory minimums tend not to increase their risk profile while insurance companies are even obliged to lower their risk profile. Base on this assumption is expected a positive coefficient for this variable, as the more solvent the institution is, it has more chances to withstand shocks and to increase its risk by buying equities.

In the case of pension funds, it is made a minor adjustment compared to Dujim and Steins (2018) as we included a dummy variable into the equation which is equal to one if the actual funding ratio is below its required funding ratio. Every quarter, pension funds need to report their actual and required financial ratios in order to see if they have enough capital buffer to fulfill all the retirement plans. Therefore, if the actual allocation lies above its required allocation, the pension funds tend to buy more equities relative to fixed income as they are able to assume more risk in their investments plans, based on this is expected a positive coefficient for this variable. In certain extent, this control variable may also indicate pro- or countercyclical behavior, as a deviation from the strategic equity allocation due to financial stability may be concede by price developments. Nonetheless, this situation is true to a certain extent as pension funds control their strategic levels based on stock market performance (Bikker, Broeders & Debreu, 2010). In this equation, size is not included as a control variable, as the dependent variable does not depend on the size of an institution.

Moreover, the baseline regression is run with and without time fixed effects. The inclusion of time fixed effects allows to test whether institution's buying/selling decisions are influenced by small differences in their returns due to different fixed income and equity allocations; while the exclusion of time fixed effects allows verifying if pension funds and insurance companies react to common shocks in the market.

One of the drawbacks of this baseline regression (1) reflected by Dujim and Steins (2018) is that regression is symmetric, so it does not distinguish between equity outperformance and underperformance. Therefore, to test whether institutions rebalance more after market downturns compared to upturns, which in this case is an asymmetric behavior, it's run the following regression:

Asymmetric Regression:

$$\frac{T_{i,t}^{E}}{A_{i,t-1}^{E}} - \frac{T_{i,t}^{(*)}}{A_{i,t-1}^{(*)}} = \alpha + \beta_1 * \left(r_{i,t-1}^{E} - r_{i,t-1}^{(*)}\right) * D_t^D + \beta_2 * \left(r_{i,t-1}^{E} - r_{i,t-1}^{(*)}\right) * D_t^U + \beta_3 * \left(\frac{T_{i,t-1}^{E}}{A_{i,t-2}^{E}} - \frac{T_{i,t-1}^{(*)}}{A_{i,t-2}^{(*)}}\right) + \sum_{k=4}^{K} \beta_k X_{I,t-1} + \varepsilon_{i,t} \quad (2)$$

The idea behind the dummy variables ($D_t^D and\ D_t^U$), is to denote the downturns and upturns of the market. So, this helps verify how strong is the relationship between investment behavior and their performance at the time of financial stress. It distinguishes between two definitions, the market situation. The first one is based on whether equities underperform (downturn) or overperform (upturns) relative to fixed income or other investments. The second situation is based on whether there is a crisis period. Two periods will be used in this study to see a clear difference in time of stress (downturn) and normal times (upturn). The Global financial crisis will be reflected as a time of downturn from 2008-2009 for the insurer's companies; the same will be for the period 2020Q2-2020Q3 define as the COVID-19 period but in this case for the pension funds.

Again, this equation, in particular, is run first in the sample of individual institutions to give interpretations of each investor separately. Afterward, is run over the sum of all institutional investors. The results obtained from this panel regression made on the whole industry help us

clarify even more our research question and make a substantial emphasis on the hypothesis raised about the COVID-19 impact.

5. Results

At first, a set of Hausman tests were conducted on the baseline regressions of each institution in order to determine if fixed effects or random effects models should be used. The test's statistically significant p-value signaled that an FE regression has a better fit for the models in question. The results from this test can be checked in Appendix 1. The first three hypotheses raised in the Theoretical framework were initially tested with both the sample of individual institutions and the aggregated data. The results were obtained from the use of the baseline regression model which are illustrated from Table 3 to Table 5. Subsequently, the last two hypotheses raised were tested in the sample of individual institutions and the aggregate data respectively. The results for this process were obtained from the use of regression 2, and the results are depicted from Table 6 to Table 8.

Table 3 shows the results of the baseline regression implemented in the sample for individual institutions. From Table 3, the first two columns represent the outcome for life insurers. Column 1 presents the model excluding the time fixed effects, where the significant and negative coefficient for the return difference variable indicates that life insurers react countercyclical to common market movements. Meaning that if the return on equities is lower than fixed income, life insurers increase their equity investments by buying more equities than other assets, in this case, fixed income. However, column 2 which shows the model including the time fixed effects, exhibits no significant impact of equity under or outperformance on the investment behavior of the institution. Moreover, at the time of testing this specification, the coefficients for solvency position show a not expected outcome as it shows negative coefficients, yet unable to reach a conclusion as the variables were insignificant.

Table 3. Baseline regression (1) model for individual institution sample (Unweighted).

	(1)	(2)	(3)	(4)	(5)	(6)
	Life Insurers		Non-Life Insurers		Pension Funds	
Return difference (-1)	-.092*	.200	.173***	.205***	-.105	-.008
	(.043)	(.176)	(.047)	(.037)	(.07)	(.015)
Relative Transaction difference (-1)	-.114***	-.022	-.118	-.06	-.177***	-.395***
	(.032)	(.057)	(.09)	(.073)	(.01)	(.032)
Solvency control (INS)(-1)	-.010	-.006	-.005***	-.003***		
	(.008)	(.004)	(.001)	(.001)		
Solvency control (PF) (-1)					.002***	0
					(.000)	(.000)
Strategic Solvency (-1)					0	0
					(.000)	(.000)
Constant	.05**	.209**	.066***	.265***	-.213***	-.04***
	(.023)	(.077)	(.007)	(.025)	(.014)	(.009)
Observations	104	104	144	144	345	345
R-squared	.095	.579	.565	.823	.114	.981
Time FE	No	Yes	No	Yes	No	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes

*This table exhibit the results from the equation (1) for life insurance corporations and pension funds separately. For life and non-life insurers the equation was tested over the period 2007-2019; while for the pension funds over the period 2017-2021. The difference in time period, was due to availability of the data in the DNB database. The dependent variable is an institution relative transaction difference defined in the methodology section. Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1 denote significance at the 1%, 5% and 10% levels, respectively*

Columns 3 and 4 exhibit the regression results for non-life insurers companies. The results are completely different from the results of the life insurers. As in this case, the sample for non-life insurers shows significant positive coefficients for the return difference variables, in both specifications, with and without time fixed effects, indicating that non-life insurers act in a procyclical way at the time of making investing decisions. Making emphasis on solvency control variable, the negative and significant coefficients, show a not expected outcome.

Moving on to the results for pension funds, displayed in columns 5 and 6. By looking at coefficient from the solvency position is positive and significant as expected, at the time institutions reacting to common market movements. However, the two variables which allow making interpretations about the investment behavior of the pension funds, such as the return difference and the strategic solvency were insignificant for the two models. Therefore, the paper performed regressions that are more in line with economic reality. As stated previously in the data section, there seems to be variance in size among institutions in our sample, and these unweighted regressions assume equal information to each and one of the observations, irrespective of the size of the institution. For that

reason, the paper run regressions where each institution is weighted according to their size directly measured by its total assets for insurers companies and total investments for pension funds.

The results from the weighted regression are shown in Table 4. Starting again from life insurers, the results were similar to the unweighted regressions reassuring that life insurers act in a procyclical way independent of the size of the company at the time of excluding the time fixed effect. In column 2 the main independent variables to give assumptions about investment behavior remain insignificant.

Table 4. Baseline regression (1) model for individual institution sample (Weighted).

	(1)	(2)	(3)	(4)	(5)	(6)
	Life Insurers		Non-Life Insurers		Pension Funds	
Return difference (-1)	-.077**	-.059	.17**	.188***	.163*	.153**
	(.035)	(.042)	(.069)	(.055)	(.081)	(.067)
Relative Transaction difference (-1)	-.204***	-.219***	-.074	-.041	-.24***	-.249***
	(.053)	(.051)	(.064)	(.046)	(.055)	(.049)
Solvency control (INS)(-1)	-.007	-.004	.011**	.011**		
	(.011)	(.009)	(.004)	(.005)		
Solvency control (PF) (-1)					.002***	.002***
					(0)	(0)
Strategic Solvency (-1)					-.000	-.000**
					(0)	(0)
Constant	.005	.009**	.001***	.014***	-.008***	-.009***
	(.003)	(.003)	(0)	(.004)	(.001)	(.001)
Observations	104	104	144	144	345	345
R-squared	.122	.452	.48	.654	.165	.369
Time FE	No	Yes	No	Yes	No	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes

*This table exhibit the results from the equation (1) for insurance corporations (life and non-life insurers) and pension funds separately. In order to show regressions more in line economic reality, the paper decide to apply weights to the institutions based on the size of their total assets or investments. The regression was tested over the period 2007-2019 for life and non-life insurers; while for the pension funds over the period 2017-2021. The difference in time period, was due to availability of the data in the DNB database. The dependent variable is an institution relative transaction difference defined in the methodology section. Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1 denote significance at the 1%, 5% and 10% levels, respectively*

For non-life insurers, results shown in columns 3 and 4 were similar to the unweighted regressions. Reaffirming the evidence of procyclical behavior by this type of institution. As both specifications with and without time fixed effects show a positive and significant value for the return difference variable. However, in terms of the solvency position, there is a change in the sign of the variable, indicating that probably bigger non-life insurance companies give more importance to the financial health of the company at the time of making investing decisions.

For pension funds, columns 5 and 6 show again that the coefficients for the solvency position are positive and significant as expected. On the other hand, the coefficients for the return difference are positive and significant thus assuming a procyclical behavior for pension funds. Moreover, the strategic solvency variable backed up this behavior to some extent as the coefficient is negative and significant for the specification controlling the time fixed effects. Implying that pension funds with funding ratios below their required levels will decrease their equity position relative to other asset classes as they do not have the financial health to opt for the riskier asset class. It is mentioned to some extent as pension funds set their asset allocation depending on the stock market performance (Bikker, Broeders & Debreu, 2010).

Throughout empirical evidence, it was expected that pension funds act in a countercyclical way (Dujim and Steins (2018); Bikker,Broeders and De Dreu (2010)). However, these coefficients show the contrary, meaning that bigger pension funds at the time of investing tend to do it in a procyclical way. The reason behind this could be directly associated with a specific issue from the equation. Since the paper measures investment behavior from return difference between equities and "other investments". The variable of "other investments" covers not only fixed income but also all other investments different than equity. This return difference could be inclined to opt for the buying of the rest of asset classes rather than equity, as this represents the desire to acquire a safer and diverse set of investments

Subsequently, the baseline regression was run in the sample of aggregated data showing the outcome of the industry of institutional investors in Table 5. Column 2 shows that the industry as whole acts in a countercyclical way at the time of investing. Since the coefficient of the main independent variable, such as the return difference is negative and significant while controlling for time fixed effects. Meaning that institutional investors sell more equities compared to fixed income when equity outperforms the other asset class, by a small difference in their returns.

Table 5. Baseline regression (1) model for institutional investors industry as whole.

	(1)	(2)
	Institutional Investors	
Return difference (-1)	0	-.054**
	(.002)	(.008)
Relative Transaction difference (-1)	.976***	.974***
	(.007)	(.005)
Solvency control	-.002	-.003
	(.001)	(.002)
Constant	.002	.001
	(.001)	(.003)
Observations	62	62
R-squared	.998	.999
Time FE	No	Yes
Institution FE	Yes	Yes

*This table exhibit the results from the equation (1) for the whole industry of institutional investors over the period 2015-2020. The dependent variable is an institution relative transaction difference defined in the methodology section. Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1 denote significance at the 1%, 5% and 10% levels, respectively.*

In order to sum up what was shown from the outcome of the baseline regression (1) presented from Table 3 to Table 5. It is found that investment behavior around institutional investors differ around sectors. For life insurance companies, it is found evidence that they act in a countercyclical way at the time of investing, while non-life insurers and pension funds act in a procyclical way. All the responses are determined by their investment behavior stemming from the return difference between equity and the other asset class (Fixed income or "Other investments"). The sign of the coefficients supports the hypothesis that life insurers react relatively more countercyclical to market circumstances than non-life insurers. Similarly, by checking the return difference the paper rejects the hypothesis that insurance companies show a weaker countercyclical behavior as life insurers tend to react more countercyclical than pension funds in our sample.

Even though, it is inconclusive to test the first hypothesis raised in the theoretical framework as results differ around investors. If we consider, the industry as whole the results show that these institutional investors react countercyclically in the time fixed effect specifications. Supporting the first hypothesis that pension funds and insurance companies tend to have a countercyclical investment behavior.

The next section of the results shows the aftermath of the regressions run from the regression equation (2). Table 6, again starting from life insurers, shows a negative and significant coefficient from the difference in return at the time of equity underperformance (in column 1) revealing that life insures show a strong countercyclical investment behavior when equity underperformed fixed income investments. In addition, the coefficients of the return difference shown in columns 3 and 4 reveal that this type of institution appears to provide some type of stabilization in the financial markets at the time of the Global financial crisis. Since the negative coefficient indicates that life insurers invest contrary to price movements during a period of stress. In line with the baseline regression (1) results, the solvency variable does not show any significant results around the specifications.

Regarding non-life insurers, the results in Table 6, suggest that non-life insurers show a strong countercyclical investment behavior during market downturns and a strong procyclical investment behavior during market upturns. Since, they present a negative and significant coefficient for their return difference, when equity underperformed fixed income and during the period of market stress such as the global financial crisis. As well as, they present a positive and significant coefficient during the "normal times", reaffirming the procyclical behavior. The solvency variable shows the expected positive and significant coefficient controlling for time fixed effect in all specifications.

For pension funds, the results are presented in columns 9 to 12. The results from the solvency variable are in line with the baseline regression (1) showing the significant and positive coefficients at the time of excluding time fixed effects. However, pension funds only show significant results corresponding to their return difference, while testing the market situation according to the performance of equities. Moreover, the results shown by the coefficients of the return difference in equity underperformance reflect ambiguity. Considering that they tend to react procyclical to common market movements, but countercyclical at the time of controlling for time fixed effects. Is important to highlight from this table, that the downturn event for pension funds is different than for insurance corporations, due to the unavailability of data. The crisis period is denoted by the Covid-19 hit in the financial markets. Nevertheless, none of the coefficients seems to provide clear evidence to test the investment behavior at the time of stress.

Table 6. Regression 2 model for individual institution sample (Unweighted).

	Life Insurers				Non-Life Insurers				Pension Funds			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Performance		Crisis		Performance		Crisis		Performance		Crisis	
Return difference*Equity Downturn Performance (-1)	-.195**	.157			-.213***	-.154***			.174*	-.054**		
	(.081)	(.214)			(.033)	(.018)			(.089)	(.025)		
Return difference*Equity Upturn Performance (-1)	.065	.279			.252***	.249***			-.49**	.05		
	(.057)	(.173)			(.004)	(.001)			(.186)	(.039)		
Relative Transaction difference (-1)	-.186**	-.019	-.171***	.061	-.023	.008	-.128	-.066	-.207***	-.381***	-.177***	-.404***
	(.077)	(.055)	(.031)	(.089)	(.031)	(.007)	(.096)	(.071)	(.017)	(.025)	(.011)	(.03)
Solvency control (INS)	-.007	-.006	-.006	-.001	.001*	.001***	.003**	.003***				
	(.008)	(.004)	(.006)	(.004)	(.001)	(0)	(.001)	(.001)				
Solvency control (PF)									.002***	0	.002***	0
									(0)	(0)	(0)	(0)
Strategic Solvency				-					0	0	0	0
									(0)	(0)	(0)	(0)
Return difference * Crisis (-1)			-.199***	-.109***			-.181***	-.152***			-.073	.017
			(.012)	(.035)			(.013)	(.024)			(.086)	(.014)
Return difference * No Crisis (-1)			-.003	.495			.191***	.206***			-.116	-.02
			(.073)	(.282)			(.043)	(.036)			(.103)	(.023)
Constant	.02	.189*	.03*	.052*	-.015***	.031**	.039***	.055***	-.238***	-.045***	-.213***	-.04***
	(.031)	(.096)	(.015)	(.025)	(.005)	(.014)	(.01)	(.014)	(.016)	(.009)	(.014)	(.009)
Observations	104	104	104	104	141	141	144	144	342	342	345	345
R-squared	.136	.582	.149	.695	.914	.988	.665	.84	.144	.981	.115	.981
Time FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*This table exhibit the results from the equation (2) for life insurance corporations and pension funds separately. For life and non-life insurers the equation was tested over the period 2007-2019; while for the pension funds over the period 2017-2021. The difference in time period, was due to availability of the data in the DNB database. The dependent variable is an institution relative transaction difference defined in the methodology section. Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1 denote significance at the 1%, 5% and 10% levels, respectively*

Subsequently, the paper does the same as in the baseline regression whereby weighted regressions are also performed to give a precise comparison with economic reality. The results for these regressions are exhibit in Table 7. By checking Life insurers, there seem to be some similarities and minor differences with the unweighted regressions. The evidence for countercyclical behavior at the time of equity underperformance is even more confirmed. Since both specifications, with and without time fixed effects, show a significant negative coefficient for the independent variable. In contrast to the unweighted regression, the coefficients for the return difference in equity overperformance become statistically significant. Pointing out that at times of equity overperformance life insurers companies tend to buy more of the asset class.

For Non-life insurers, the weighted regressions results in Table 7 are in line with the unweighted results for non-life insurers. The only minor difference is that coefficients are somewhat bigger, showing that the bigger the non-life insurance company the stronger is emulated their investment behavior.

Table 7. Regression 2 model for individual institution sample (Weighted).

	Life Insurers				Non-Life Insurers				Pension Funds			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Performance		Crisis		Performance		Crisis		Performance		Crisis	
Return difference*Equity Downturn Performance (-1)	-.396***	-.356***			-.254***	-.225***			-.414***	-.47***		
	(.026)	(.024)			(.049)	(.043)			(.1)	(.084)		
Return difference*Equity Upturn Performance (-1)	.193***	.196***			.242***	.239***			.887***	.89***		
	(.02)	(.015)			(.015)	(.013)			(.159)	(.118)		
Relative Transaction difference (-1)	-.437***	-.427***	-.278***	-.304***	-.062	-.045	-.091	-.053	-.21***	-.211***	-.229***	-.237***
	(.033)	(.043)	(.031)	(.032)	(.074)	(.048)	(.08)	(.053)	(.03)	(.025)	(.056)	(.051)
Solvency control (INS)	.004	.002	-.002	0	.004	.003	.02**	.019**				
	(.011)	(.009)	(.011)	(.008)	(.004)	(.003)	(.008)	(.009)				
Solvency control (PF)									.002***	.002***	.002***	.002***
									(0)	(0)	(0)	(0)
Strategic Solvency									0	0	0	0**
									(0)	(0)	(0)	(0)
Return difference * Crisis (-1)			-.21***	-.201***			-.186***	-.166***			-.155	-.123
			(.01)	(.009)			(.018)	(.012)			(.109)	(.089)
Return difference * No Crisis (-1)			-.02	.007			.198***	.21***			.271***	.248***
			(.03)	(.035)			(.05)	(.039)			(.084)	(.07)
Constant	-.002	-.001	.003	.004	-.002***	0	-.002	0	-.009***	-.009***	-.008***	-.008***
	(.003)	(.003)	(.003)	(.003)	(0)	(.001)	(.001)	(.002)	(.001)	(.001)	(.001)	(.001)
Observations	104	104	104	104	141	141	144	144	342	342	345	345
R-squared	.443	.663	.184	.503	.812	.874	.626	.751	.264	.46	.182	.381
Time FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*This table exhibit the results from the equation (2) for insurance corporations (life and non-life insurers) and pension funds separately. In order to show regressions more in line economic reality, the paper decide to apply weights to the institutions based on the size of their total assets or investments. The regression was tested over the period 2007-2019 for life and non-life insurers; while for the pension funds over the period 2017-2021. The difference in time period, was due to availability of the data in the DNB database. The dependent variable is an institution relative transaction difference defined in the methodology section. Robust standard errors are in parentheses. ***p<.01, **p<.05, * p<.1 denote significance at the 1%, 5% and 10% levels, respectively*

The weighted regression results for pension funds presented from column 9 to 12 help solving the ambiguity presented by the unweighted regression in Table 6 in various ways. Firstly, the negative and significant coefficients presented from the return difference variable in equity underperformance, show that pension funds invest contrary to price movements during equity underperformance to the other investments. Secondly, the positive and significant coefficients displayed by the return difference at the time of market upturn in terms of equity performance leaves a clear interpretation that procyclical investment behavior is opted by this type of institution, in such circumstance. Finally, the weighted regression confirms that the pension funds used in this

sample, act procyclical at times outside our denoted Covid-19 crisis, due to the sign and significance of the coefficients shown in columns 11 and 12.

Furthermore, regression 2 was run in the aggregated data in order to test for the asymmetric investment behavior. To analyze whether the industry as a whole tends to rebalance more after market downturns compared to upturns. Table 8 shows the results from equation (2), and gives a clear emphasis on the market downturn denoted by the Covid-19 shock. A revealing fact about these results is that none of the specifications excluding the time fixed effect show significant coefficients, besides the variable controlling for serial correlation. Nonetheless, specifications with time fixed effects exhibit a valuable outcome. First, the results display in column 2 show that institutional investors show a strong countercyclical investment behavior at the time of equity underperformance since the coefficient for this variable is negative and significant. In addition to that, the solvency variable shows the expected and positive significant coefficient. Lastly, the results in column 4 show that institutional investors act as stabilizing party at the time of the Covid-19. As the significantly negative coefficient for the return difference at time of crisis indicate that institutional investors tend to invest contrary to price movements, at least in the short run.

Table 8. Regression 2 model for institutional investors industry as whole.

	Institutional Investors			
	(1) Performance	(2)	(3) Crisis (COVID)	(4)
Return difference*Equity Downturn Performance (-1)	-.008	-.127**		
	(.006)	(.013)		
Return difference*Equity Upturn Performance (-1)	.004*	.094		
	(.001)	(.102)		
Relative Transaction difference (-1)	.977***	.975***	.974***	.975***
	(.006)	(.006)	(.007)	(.006)
Solvency control (INS)	-.002	.004*	-.002	-.004
	(.002)	(.001)	(.001)	(.001)
Return difference * Crisis (-1)			-.004	-.139***
			(.002)	(.012)
Return difference * No Crisis (-1)			.004	.073
			(.002)	(.071)
Constant	.003	-.002	.002	.009
	(.002)	(.002)	(.001)	(.004)
Observations	62	62	62	62
R-squared	.998	.999	.998	.999
Time FE	No	Yes	No	Yes
Institution FE	Yes	Yes	Yes	Yes

*This table exhibit the results from the equation (2) for the whole industry of institutional investors over the period 2015-2020. This table provides an outcome appropriate to make analysis about the Covid-19 impact in financial markets. The dependent variable is an institution relative transaction difference defined in the methodology section. Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1 denote significance at the 1%, 5% and 10% levels, respectively.*

5.2 Robustness Checks

This research only shows the results of the regression model including a one-time lag (t-1) of the return difference. Nonetheless, this paper checks the robustness of the models implemented, by using different specifications of the return variable. Therefore, it is estimated the regressions using two-time lags, three and up to four-time lags. Using longer time differences is beneficial because, even though sample sizes are reduced, relatively more weight is given to persistent changes in the variables of interest, therefore reducing the influence of noise (Javorcik, 2004)

The robustness checks are directly performed on the baseline regression (1), as with this equation is possible to reach the premise of the investment behavior of the institution. The results are shown in the Appendix B, where each institution have their own table. Results confirm the procyclical behavior by non-life insurers and pension funds, as all significant coefficients from the return difference variable have a positive sign. For life insurers, the paper is unable to make confirmation for the countercyclical behavior, as even though around the distinctive tested lags the coefficient of return difference is negative none coefficient denotes significance at any level. Subsequently, the industry of institutional investors confirms the countercyclical behavior, as all significant coefficients from the return difference variable have a negative sign. Giving more proof that the industry acts as stabilizing party as they invest contrary to price movements.

In addition, to using longer time differences, the paper also tested if the investment behavior of all institutions changed if different indices for fixed income were used. Therefore, the regression in equation (1) was performed with the Netherlands benchmark of 10-year government bond index and the German benchmark of 10-year government bond index, both obtained from the Thomson Reuters database. The results are presented on the Appendix B. The findings show an outcome almost identical for both indices, like the ones obtained in the main analysis, thus confirming the countercyclical investment behavior.

6. Conclusion

Institutional investors show to have the potential to make an impact on the financial market sentiment. As their moves in a large number of assets under management, can either amplify or stabilize swings in financial markets and global economies. In this paper, five hypotheses were

tested around a sample of life insurers, non-life insurers and pension funds with different frequencies, in order to answer the initial research question.

The first hypothesis predicted that pension funds and insurance companies tend to buy assets after a drop in market prices. Therefore, having a countercyclical investment behavior. By the means of the baseline regression (1) controlling for the size of the institution and for time fixed effects. These results displayed that investment behavior around institutional investors differs around sectors. As evidence shows that life insurance act in a countercyclical way while non-life insurers and pension funds act in a procyclical way. Nevertheless, by performing the same baseline regression on the industry as a whole, the results for this effect shown that the countercyclical behavior seems to be statistically significant. This significant finding is consistent with the existing literature that proves such behavior, especially regarding Dutch institutional investors. In this sense, the institutional investors confirm their stabilizing role in the financial markets since they control for market swings by rebalancing their portfolios in contrast to price movements.

The second hypothesis assumed that insurance companies show a weaker countercyclical behavior. By using the same regressions as the first hypothesis, this assumption is rejected. Results show that the signs of the coefficients for the variable of return difference are negative for the life insurers and positive for pension funds. Implying that life insurers sell more equities compared to other assets when equity outperforms, while pension funds buy more equity when this one outperforms. In the results section, the paper makes emphasis that the outcome from countercyclical behavior on pension funds, may be influenced as the comparison with relative equity transaction is performed among a variable different than fixed income. Although, most of the literature backed up the contrarian strategies by pension funds the results aligned with evidence obtained from Blake, Sarno and Zinna (2017) and Vorklahvo and (2005) where pensions funds display strong herding behavior

Subsequently, the third hypothesis tested with the same baseline regression is confirmed. Since the results confirmed that life insurers show a stronger countercyclical investment behavior compared to non-life insurers. The outcome for this premise leaves no room for ambiguity as the main independent variable such as the return difference between equity and fixed income shows significant opposite signs for both insurers. The expected procyclical investment behavior shown by non-life insurers is attributed due to investment strategies and the shorter investment horizon of their assets, presented by these types of institutions.

Furthermore, the last two hypotheses were tested by the means of regressions from the asymmetric equation (2). The fourth hypothesis assumed that insurance companies and pension funds react differently to market shocks by reacting stronger to market downturns. The results obtained from such regression confirm such a hypothesis. The analysis shows that life insurers show a strong countercyclical behavior during market downturns, leaving the room that these types of insurance corporations act contrary to price movements hence controlling for bigger swings in financial markets. Differently, non-life insurers exhibit a countercyclical behavior during market downturns and procyclical during upturns. Meaning that non-life insurers attempt to alleviate financial markets by investing contrary to price movements during times of stress. But in "normal times" the institutions follow a herding behavior, as they invest based on the momentum of prices. Lastly, regarding pension funds, results presented in unweighted regressions leave some ambiguity to determine how the investment behavior of this institution is reflected depending on the market situation. Nonetheless, results obtained from weighted regressions presented similar behavior to non-life insurers, by the smallest difference that at time of crisis, in this case, presented by the COVID-19, the coefficients for return difference were insignificant. It could be argued, that pension funds did not invest contrary to price movements, therefore accelerating the market crash of that period, but as coefficients are insignificant, that assumption is avoided. It is important to highlight that the absolute values of the return difference coefficients are bigger than the ones in the baseline regression, thus confirming that the reaction is stronger in market downturns.

Last but not least, the fifth hypothesis predicted that Dutch institutional investors lower their equity exposure during the exogenous shock of Covid-19. By using the asymmetric regression on the aggregated data this premise was proven to be rejected. Even though, Glossner et al (2020) found that US institutional investors decrease the total size of equity as they were clear evidence of fire sales. Dutch institutional investors seem to put more weight in the stabilizing role of the economy, as the significant negative coefficient for the return difference variable at the time of crisis, shows that the industry as a whole bought more equity during such period. These findings are in line with the research of Kakes (2005) as the investors continued to have stabilizing influence on financial markets during stressful times.

To conclude, the above-mentioned findings are combined to develop the following answer to the research question: institutional investors confirm their stabilizing role on the financial markets since they control for market swings by rebalancing their portfolio in contrast to price movements.

However, depending on the market situation each institution tends to perform different investment strategies. Life Insurers seem to be the biggest moderator, as independent of the market situation a countercyclical investment behavior is observed. However, for the other two institutions, the way of investing changes depends on market sentiment. Conversely, the industry as whole shows to provide stability for the financial system at the times of the Covid-19 shock.

There are a set of limitations that arise from this study, one of the main ones being the unavailability of data by individual institutions. The fact that the financial statements of individual institutions are not fully available, as not all institutions are public, commits the research to make an assumption based on the percentage distribution made out of the aggregated data recollected from the DNB statistics. This leads the research to the use indices of asset classes, in order to make an estimation on how much return was made by the companies in each asset class tested. Even though these proportions might be representative it would be preferable to have all available input.

Moreover, due to lack of data, the analysis made on pension funds limits the robustness of the model used, as the equation differs with insurance companies. The fact that equity investment is not compared to fixed-income investments, but to a variable that covers all the other investments different than equity. Creates a grey area at the time of analyzing this institution. Thus, it is unknown how much proportion of each asset class covers the "other investments" variable. For that reason, investment behavior for pension funds may be biased to opt for the more diverse asset class. In order to correct for these limitations raised from the unavailability of data, the best solution would be to have complete access to the full database of the DNB and not the one show to the public. This would avoid making interpretations made on percentage distribution, as such institutions are obliged to present their financial numbers to the DND and the WFT each year.

Another limitation, for this paper, would be the difference in frequency for each institution. Insurance companies only present yearly data for their individual institutions, while pension funds provide different frequencies. A solution for it would be the interpolation of the data, to set them all at the same frequency. However, this would lead to flawless assumption as it would be substituting a guess for an actual value.

Even though limitations exist, findings concerning the subject studied may still be relevant for policymakers. This is because they help establish how Dutch institutional investors carry out as stabilizing parties for financial markets. Policymakers may use such findings to develop policies

that are more focused on improving the resilience of the financial system. Nowadays, these types of improvement has been implemented in the banking sector on macroprudential measures; however, expanding this framework beyond the banking sector could be a valuable topic for the literature and international policymakers. After the global financial crisis, entity regulators are focused on improving the resilience of the overall financial system. This is why, regulation systems are working to put into practice a new system, for institutional investors that will come into place by January 2026 at the latest.

Some insights put forward by this paper can be used at the time of testing investment behavior, outside of the institutions already tested.

Regarding future research, adding variables directly linked with COVID-19 event, such as: number of cases, increase on number of insurances, reduction in premium and benefits, would be intriguing to make further analysis on it. In addition, studies made on a different type of countries where regulatory frameworks are more strict would be interesting.

7. Bibliography

Almond, D. (2006).*Is the 1918 influenza pandemic over? Long-term effects of in utero influenza exposure in the post-1940 U.S. popu- lation*. Journal of Political Economy 114 (4): 672–712. https:// doi.org/10.1086/507154.

Baker, S. R., Bloom, N., Davis, S. J., Kost, K. J., Sammon, M. C., & Viratyosin, T. (2020). *The unprecedented stock market impact of COVID-19* (No. w26945). National Bureau of Economic Research.

Bank for International Settlements (2008). *Addressing Financial System Procyclicality: a Possible Framework, Note for the FSF Working Group on Market and Institutional Resilience,* September (Basel)

Bank of England and Procyclicality Working Group. (2013). *Procyclicality and Structural Trends in Investment Allocation by Insurance Companies and Pension Funds*. London: Bank of England.

Beber, Alessandro, Michael W. Brandt, and Kenneth A. Kavajecz. (2009). *"Flight-to-Quality or Flight-to-Liquidity? Evidence from the Euro-Area Bond Market,"* Review of Financial Studies, Vol. 22 (March), No. 3, pp. 925–57.

Bijlsma, M., and R. Vermeulen. (2016). "*Insurance Companies' Trading Behaviour during the European Sovereign Debt Crisis: Flight Home or Flight to Quality?"* Journal of Financial Stability 27: 137–154.

Bikker, J. A., D. W. G. A. Broeders, and J. De Dreu. (2010). *Stock Market Performance and Pension Fund Investment Policy: Rebalancing, Free Float, or Market Timing.* International Journal of Central Banking 6 (2): 53–79.

Bikker J.A & Gorter J. (2008). *Performance of the Dutch non-life insurance industry: competition, efficiency and focus.* Utrecht School of Economics.

Bikker J.A, and Gorter, J. (2013). *"Investment Risk Taking by Institutional Investors."* Applied Economics 45 (33): 4629–4640.

Bikker J. A &. van Leuvensteijn. M (2008). *Competition and efficiency in the Dutch life insurance industry*, Applied Economics, 40:16, 2063-2084, DOI: 10.1080/00036840600949298

Blake, D., L. Sarno, and G. Zinna. (2017). *The Market for Lemmings: The Herding Behavior of Pension Funds.* Journal of Financial Markets 36: 17–39.

Bohl M and Voronkova S. (2005) . *Institutional Traders' Behavior in an Emerging Stock Market: Empirical Evidence on Polish Pension Fund Investors.* Journal of Business Finance & Accounting, 32(7) & (8).

Borio, C., C. Furfine, and P. Lowe. (2001). *"Procyclicality of the Financial System and Financial Stability: Issues and Policy Options."* BIS Working Papers 1: 1–57.

Breedveld-de Voogd, C., Castermans, A., Knigge, M., Linden, T., Oever, H., & Beumers, M. (2016). *Core concepts in the Dutch civil code*. Deventer.

Broeders, D. G. W. A., D. H. J. Chen, P. A. Minderhoud, and C. J. W. Schudel. (2016). *"Pension Funds Herding."* DNB Working Paper, No. 503. Amsterdam: De Nederlandsche Bank.

Broner, Fernando A., Tatian Didier, Aitor Erce, and Sergio L. Schumukler, (2013), *"Gross Capital Flows: Dynamics and Crises," Journal of Monetary Economics, Volume 60 (January), Issue 1, pp 113–133.*

Brunnermeier, Markus K. (2009). *"Deciphering the Liquidity and Credit Crunch 2007–08,"* Journal of Economic Perspectives, Vol. 23 (Winter), No. 1, pp. 77–100.

Chang, E. C., Cheng, J. W. and Khorana, A. (2000). *An examination of herd behavior in equity markets: an international perspective.* Journal of Banking and Finance, 24, 1651–1679.

Chiang, Thomas C., and Dazhi Zheng. (2010). *"An Empirical Analysis of Herd Behavior in Global Stock Markets,"* Journal of Banking & Finance, Vol. 34 (August), No. 8, pp. 1911–21.

Christie, W. G. and Huang, R. D. (1995). *Following the pied piper: do individual returns herd around the market?,* Financial Analysts Journal, 51, 31–37.

Claessens, S., and M. M. A. Kose. (2013). *"Financial Crises Explanations, Types, and Implications."* IMF Working Paper, No. 13-28. Washington, DC: International Monetary Fund.

Coval, J and Stafford, E. (2007) *Asset fire sales (and purchases) in equity markets.* Journal of Financial Economics 86, 479--512.

De Haan, L., and J. Kakes. (2011). *"Momentum or Contrarian Investment Strategies: Evidence from Dutch Institutional Investors."* Journal of Banking & Finance 35 (9): 2245–2251.

DNB.(2021).*General Insurers Information from DNB*. Retrieved on july 9, 2021 from https://www.dnb.nl/en/sector-information/supervision-sectors/insurers/general/

De Nederlandsche Bank. (2021). *Pensions: funding ratio.* Retrieved on june 7, 2021 from https://www.dnb.nl/en/current-economic-issues/pensions/our-present-pension-system/pensions-funding-ratio/

Duijm, P., & Steins Bisschop, S. (2018) *Short-termism of long-term investors? The investment behaviour of Dutch insurance companies and pension funds*, Applied Economics, 50:31, 3376-3387, DOI: 10.1080/00036846.2017.1420898

Financial Stability Forum. (2009). *"Report of the Financial Stability Forum on Addressing Procyclicality in the Financial System,"* April 2 (Basel).

Fogli, A., and Veldkamp,L. (2013).*Germs*. Social Networks, and Growth. https://doi.org/10.21034/sr.572.

Gerlach, Stefan, and Paul F. Gruenwald. (2006) *Procyclicality of Financial Systems in Asia (Washington: International Monetary Fund).*

Giuzio, M. and Rousová, L. (2019). *Insurers' investment strategies: pro- or countercyclical?*. European Central Bank. https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2299~1d060f6979.en.pdf

Glossner, S and Matos, P and Ramelli, S and Wagner, A. (2020). *Do Institutional Investors Stabilize Equity Markets in Crisis Periods? Evidence from Covid-19*. CEPR Discussion Paper No. DP15070, Available at SSRN: https://ssrn.com/abstract=3661413

Goudswaard, K.P., (2013). *'Blijft het Nederlandse pensioenstelsel bijzonder?' in: R. Bijl et al (red.), Opvallend gewoon*. Het bijzondere van Nederland, Sociaal en Cultureel Planbureau, Den Haag, 2013, pp. 18-24.

Grinblatt, M., Keloharju, M. (2000). *The investment behaviour and performance of various investor types: a study of Finlands's unique data set*. Journal of Financial Economics 55, 43–67.

Hirshleifer, D. and Hong Teoh, S. (2003), *Herd Behaviour and Cascading in Capital Markets: a Review and Synthesis.* European Financial Management, 9: 25-66. https://doi.org/10.1111/1468-036X.00207

Houben, A. C. F. J., and J. P. van Voorden. (2014). *"Insuring the Financial System Against Insurers: A Macroprudential Framework."* In Macroprudential Supervision in Insurance – Theoretical and Practical Aspects, edited by J. Monkiewicz and M. Malecki, 66–84. London: Palgrave Macmillan.

Impávido, G., and I. Tower. (2009). *"How the Financial Crisis Affects Pensions and Insurances and Why the Impacts Matter."* IMF Working Paper, No. 09-151. Washington, DC: International Monetary Fund.

International Monetary Fund. (2016). *Global Financial Stability Report: Potent Policies for a Successful Normalization, April 2016.* Washington, DC: International Monetary Fund.

Javorcik, S. B. (2004). *Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages.* American Economic Review, 605-627.

Kakes, J. (2008). *Pensions in a perfect storm: financial behaviour of Dutch pension funds (2002–2005)*. Applied Financial Economics Letters 4, 29–33.

KPMG Financial Services. (2020). *Analysis of the insurance market in the Netherlands 2019.* KPMG.

Kuiper, S and van der Zwan, N. (2016). *Nederland pensioenland: wat je wilt weten over pensioen.* Amsterdam University Press

Mercer. (2016). *Melbourne Mercer Global Pension Index*.Australian Centre for Financial Studies, Melbourne.

Odean, T. (1998). *Are investors reluctant to realize their losses?*. Journal of Finance 53, 1775–1797.

OECD (2021). *Institutional Investors' Assets and Liabilities.* Retrieved on july 12, 2021 from https://stats.oecd.org/Index.aspx?DataSetCode=QASA_7II#

Organisation for Economic Co-operation and Development (OECD). (2013). *Draft High-Level Principles of Long-Term Investment Financing by Institutional Investors*, May (Paris).

Papaioannou, M.G., Park, J., Pihlman, J., and van der Hoorn, H. (2013). *Procyclical Behavior of Institutional Investors During the Recent Financial Crisis: Causes, Impacts, and Challenges*. IMF Working Paper 193-2013.

Pensioen Federatie. (2021). *The Dutch pension system: highlights and characteristics.* Retrieved on july 6, 2021 from https://www.pensioenfederatie.nl/website/the-dutch-pension-system-highlights-and-characteristics

Ramelli,S and Wagner, A. (2020) *"Feverish Stock Price Reactions to COVID- 19"*, Review of Corporate Finance Studies 9, 622--655.

Rudolph, Max J. (2011). *"U.S. Insurance Company Investment Strategies in an Economic Downturn,"* White Paper sponsored by Committee on Financial Research, Society of Actuaries (Schaumburg, IL).

Scharfstein, D. S., and J. C. Stein. (1990). *"Herd Behaviour and Investment."* The American Economic Review 80(3): 465– 479.

Shleifer, A, and Vishny,R.(2011). *Fire sales in finance and macroeconomics.* Journal of Economic Perspectives 25, 29--48.

Sibylle J.M. (2018). *The Dutch Pension System an overview of the key aspects.* Dutch Association of Industry-wide Pension Funds (VB) https://mhpf.nl/wp-content/uploads/2018/03/TheDutchPensionSystem.pdf2018

Yamey, G., M. Schäferhoff, O. Aars, B. Bloom, D. Carroll, M. Chawla, V. Dzau, R. Echalar, I.S. Gill, T. Godal, S. Gupta, D. Jamison, P. Kelley, F. Kristensen, C. Mundaca-Shah, B. Oppenheim, J. Pav- lin, R. Salvado, P. Sands, E. Whiting, et al. (2017). *Financing of international collective action for epidemic and pandemic prepar- edness.* The Lancet Global Health 5 (8): e742–e744. https://doi. org/10.1016/S2214-109X(17)30203-6.

8. Appendices

8.1 Appendix A

Table for Life Insurers

Hausman Test

	Random coefficient (b)	Fixed coefficient (B)	Difference (b-B)	Sqrt (diag(V_b – V_B)) S.E.
Return difference (-1)	-0.087289	-0.092347	0.005058	.
Relative Transaction difference (-1)	-0.0471432	-0.1138396	0.0666965	.
Solvency control (INS)(-1)	-0.0019307	-0.0099781	0.0080474	.

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B) = -5.84 Prob>chi2 = 0.000

(V_b-V_B is not positive definite)

Table for Non- Life Insurers

Hausman Test

	Random coefficient (b)	Fixed coefficient (B)	Difference (b-B)	Sqrt (diag(V_b – V_B)) S.E.
Return difference (-1)	0.1804416	0.1730418	0.0073998	.
Relative Transaction difference (-1)	-0.0470307	-0.1176044	0.0705736	.
Solvency control (INS)(-1)	-0.0015455	-0.0048168	0.0032713	.

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B) = -19.26 Prob>chi2 = 0.000

(V_b-V_B is not positive definite)

Table for Pension funds
Hausman Test

	Random coefficient (b)	Fixed coefficient (B)	Difference (b-B)	Sqrt (diag(V_b – V_B)) S.E.
Return difference (-1)	-0.1583274	-0.1048266	-0.0535007	.
Relative Transaction difference (-1)	-0.0551688	-0.1774078	0.122239	.
Solvency control (PF) (-1)	0.0004272	0.0018532	-0.001426	.
Strategic Solvency	-0.0000582	-0.0000377	-0.0000205	.

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B) = -29.53 Prob>chi2 = 0.000

(V_b-V_B is not positive definite)

Table for Institutional investors industry
Hausman Test

	Random coefficient (b)	Fixed coefficient (B)	Difference (b-B)	Sqrt (diag(V_b – V_B)) S.E.
Return difference (-1)	0.0001559	-0.0002094	0.0003653	.
Relative Transaction difference (-1)	0.9761068	0.9760518	0.000055	.
Solvency control (INS)(-1)	0.0000258	-0.0016135	0.0016393	.

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B) = -1.10 Prob>chi2 = 0.000

(V_b-V_B is not positive definite)

8.2 Appendix B

Robustness check for Life Insurers

Unweighted Regressions

	(1) 2nd Differences	(2)	(3) 3rd Differences	(4)	(5) 4th Differences	(6)	(7) NL10	(8)	(9) Ger10	(10)
Return difference (-1)	-.054	.103	.029	.172	.029	.172	-.005	.258**	.008	.238***
	(.041)	(.099)	(.042)	(.136)	(.042)	(.136)	(.109)	(.088)	(.113)	(.061)
Observations	104	104	88	88	88	88	104	104	104	104
R-squared	.063	.548	.064	.54	.064	.54	.032	.794	.012	.825
Time FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Weighted Regressions

	(1) 2nd Differences	(2)	(3) 3rd Differences	(4)	(5) 4th Differences	(6)	(7) NL10	(8)	(9) Ger10	(10)
Return difference (-1)	-.055	-.03	-.028	-.004	-.028	-.004	-.092**	-.074*	-.077**	-.059
	(.039)	(.047)	(.057)	(.064)	(.057)	(.064)	(.032)	(.041)	(.035)	(.042)
Observations	104	104	88	88	88	88	104	104	104	104
R-squared	.076	.43	.103	.46	.103	.46	.159	.47	.122	.452
Time FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robustness check for Non-Life Insurers

Unweighted Regressions

	(1) 2nd Differences	(2)	(3) 3rd Differences	(4)	(5) 4th Differences	(6)	(7) NL10	(8)	(9) Ger10	(10)
Return difference (-1)	.106	.124*	.111**	.119**	.093***	.087***	.169***	.203***	.167***	.203***
	(.062)	(.07)	(.043)	(.045)	(.023)	(.011)	(.048)	(.037)	(.049)	(.037)
Observations	144	144	126	126	109	109	144	144	144	144
R-squared	.349	.544	.516	.659	.358	.467	.553	.819	.543	.818
Time FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Weighted Regressions

	(1) 2nd Differences	(2)	(3) 3rd Differences	(4)	(5) 4th Differences	(6)	(7) NL10	(8)	(9) Ger10	(10)
Return difference (-1)	.116*	.127*	.099	.105	.044	.025	.163**	.184***	.163*	.153**
	(.065)	(.064)	(.072)	(.072)	(.051)	(.043)	144	144	(.081)	(.067)
Observations	144	144	126	126	109	109	.459	.638	345	345
R-squared	.397	.538	.37	.487	.108	.233	No	Yes	.165	.369
Time FE	No	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robustness check for Pension Funds

Unweighted Regressions

	(1) 2nd Differences	(2)	(3) 3rd Differences	(4)	(5) 4th Differences	(6)	(7) NL10	(8)	(9) Ger10	(10)
Return difference (-1)	.147**	.024*	.363***	-.005	-.077	.004	-.105	-.008	-.105	-.008
	(.053)	(.012)	(.052)	(.01)	(.066)	(.01)	(.07)	(.015)	(.07)	(.015)
Observations	345	345	322	322	299	299	345	345	345	345
R-squared	.123	.981	.173	.981	.102	.974	.114	.981	.114	.981
Time FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Weighted Regressions

	(1) 2nd Differences	(2)	(3) 3rd Differences	(4)	(5) 4th Differences	(6)	(7) NL10	(8)	(9) Ger10	(10)
Return difference (-1)	.25***	.224***	.407***	.351***	.047	.059*	.163*	.153**	.163*	.153**
	(.07)	(.077)	(.075)	(.089)	(.049)	(.031)	345	345	(.081)	(.067)
Observations	345	345	322	322	299	299	.165	.369	345	345
R-squared	.214	.404	.332	.491	.133	.343	No	Yes	.165	.369
Time FE	No	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robustness check for Institutional Investors Industry

	(1) 2nd Differences	(2)	(3) 3rd Differences	(4)	(5) 4th Differences	(6)	(7) NL10	(8)	(9) Ger10	
Return difference (-1)	0	-.049***	0	-.025*	0	-.013**	0	-.054**	0	-.056**
	(.002)	(.003)	(.002)	(.007)	(.002)	(.002)	(.002)	(.011)	(.002)	(.012)
Observations	62	62	61	61	60	60	62	62	62	62
R-squared	.998	.999	.998	.999	.998	.999	.998	.999	.998	.999
Time FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Institution FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes