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**Are Pension Funds too Important to Fail?  
Or too Big to Save?**

Tilburg University

Netspar

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Master Thesis

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# Summary

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The Dutch pension sector was hit hard by the financial crises of 2008 and 2011. The effects of these crises combined with the structural problems of aging and longevity caused some pension funds to fail. This caused a public debate about the collective pension schemes in the Netherlands. It also raised the question whether pension funds are too important to fail and/or too big to save and what the consequences are.

To answer those questions the definitions of failing and saving should be clear. A pension fund fails because the balance between assets and liabilities is insufficient. Since there is already extensive literature on liabilities being higher than anticipated but not on assets being lower than expected, this paper focuses on the assets. The ultimate consequence of failing is that a pension fund has to reduce pension entitlements and rights. There are two types of failure. The first type is a single pension fund failing, this is called an idiosyncratic failure. The second type is multiple pension funds failing simultaneously and this can be considered as a systemic failure. Policies activated ex ante to a failure are to prevent failing of pension funds. However, when a pension fund is already failing, the employer or the government may intervene and save a pension fund. So these saving policies are activated ex post to a failure. The employer and the government together have four possible ways of saving a pension fund. The employer has only one option to rescue its pension fund, which is by means of an employer bailout. The government can bailout a pension fund as well but also has two other saving strategies in addition: temporary relaxing funding rules or establishing a pension guarantee fund.

This paper examines whether pension funds are too important to fail and, if so, what appropriate policy measures are. The pros and cons of the different policy strategies are analyzed. Alternatively, pension funds may also be too big to save. Literature on pension funds being too important to fail or too big to save is scarce. There is however extensive literature on these questions for banks. We analyze the available banking literature and evaluate to what extent it is applicable to pension funds. Furthermore we empirically analyze whether one of the moral hazards that characterizes a too important to fail environment, excessive risk taking, occurs in the Dutch pension fund sector. Finally policy recommendations will be given with respect to failing pension funds.

This paper concludes that pension funds may be too important to fail for society. This is however only the case with one type of failure, i.c. systemic failure. The reason is the significant risk a large systemic failure poses for social and economic unrest. In case of an idiosyncratic failure this risk is much lower. From the four mentioned saving vehicles, two are fit too important to fail policies; temporarily relaxing funding rules and a government bailout. These two are fit because they are useful in case of a systemic failure. The other two saving vehicles, employer bailout and pension guarantee fund, are only useful in case of an idiosyncratic failure. Since a pension fund is only too important to fail in case of systemic failure an employer bailout and a pension guarantee fund are not too important to fail policies. Both too important to fail policies, temporarily relaxing funding rules and a government bailout, increase the level of the intergenerational risk sharing characteristic of pension funds.

This may cause a new problem. Excessive intergenerational risk transfers may lead to a generational conflict. This conflict may in itself also be a source of economic and social unrest. Hence the two too important to fail policies may come with the same problems as those they intend to prevent; social and economic unrest. Limiting the transfer between generations is a solution that may prove to be welfare improving, also ex post, and therefore prevent the intergenerational conflict. Furthermore a government bailout has another specific problem. The government may be restricted by its public finances. The problems with these two too important to fail policies may become large and cause pension funds being too big to save.

Because of the problems that may come with the too important to fail policies we recommend that the focus of supplementary policies should be on preventing systemic failure. Policies that are activated ex ante should be used. The most important prevention measure is increasing transparency and supervision. First, transparency and supervision on financial institutions that trade on the global financial market should be increased. Dutch pension funds invest much of their assets in other financial institutions. A systemic failure of Dutch pension funds due to a decrease in assets is likely to be caused by systemic failure on the global financial market. Therefore it is important that the risks of a systemic failure on the financial market, causing a systemic failure of Dutch pension funds, decrease. This should be done by enhanced supervision. Of course supervision cannot prevent systemic failure on the financial market, but, it can decrease the risk of this failure. Furthermore it is important that the enhanced supervision also focuses on increasing transparency of products of financial institutions traded on the financial market. This to ensure that pension funds are better aware of the risks of the products they invest in. This will enable pension funds to better incorporate and internalize the risks they run. Second, disclosure to all the stakeholders of the pension funds about the risks they are exposed to should be increased. When it is clear to all the participants in a pension fund what the risks are, social unrest due to negative risks is less likely to occur. More transparency will cause a failure to be less of a shock and therefore will cause less social unrest reducing the necessity of (ex post) too important to fail policies.

# Preface

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This paper marks the end of my student life and of my Master of Science program Economics and Finance of Aging at Tilburg University. Moreover, it concludes my internship at De Nederlandsche Bank (DNB).

I would like to take the opportunity to thank several people. First I would like to thank my supervisors, Prof. dr. A.C. Meijdam, Dr D.W.G.A. Broeders and Drs. D.R. Rijsbergen for their valuable comments and feedback. Their advice and criticism helped me during the process of writing this paper. In addition I would like to express my gratitude towards Prof. dr. E.H.M. Ponds for his participation in the exam committee. Furthermore I would like to thank DNB and in particular the department “Strategie Toezicht Beleid” for their hospitality during my internship. Additionally I would like to thank my fellow students for sharing their knowledge and the good times in classes and during assignments. Finally, I would like to express my gratitude towards my family and friends for their support.

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# 1 Introduction

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The Dutch pension sector was hit hard by the financial crises<sup>1</sup>; the average funding ratios of Dutch pension funds dropped rapidly. The nominal funding ratio – which was 144 percent in 2007 - dropped to 95, 109 and 107 percent in the subsequent years (DNB, 2011). The financial crisis is typically seen as the immediate cause of this decrease in funding ratio, but the financial position of Dutch pension funds is also exposed to more structural problems<sup>2</sup>. These include the trends of increasing longevity and aging which put pressure on the system and its funding ratios, while the trend of declining interest rates make pension schemes more expensive.

The impact of the financial crisis and the structural problems resulted in a political and an economical debate about the occupational pension system. Due to a low funding ratio, pension funds curtailed their indexation and some of these funds had to file a recovery plan at DNB. In a recovery plan the pension fund specifies how it will restore its funding ratio to an adequate level. The recovery time a pension fund has is three years to reach the funding ratio of 105 percent and within fifteen years it should be up to 125 percent. In February 2009 the recovery time in case of funding deficits was expanded from three to five years, because of the extreme economic conditions and because many pension funds simultaneously reported funding deficits. A few pension funds had to reduce accrued benefits in 2010 as a measure of last resort to restore the funding ratio. This raises a lot of questions, such as what will happen if a large number of pension funds can no longer pay their liabilities in full and “fail” (defaulting on its commitments)? To address this issue proactively, the government installed the Goudswaard Committee<sup>3</sup> in 2009 to investigate the long term sustainability of the Dutch pension system. Furthermore an agreement was made between employers, employees and the government on restructuring of pension funds. This agreement caused much discussion between and within these three parties and within the Dutch society as the media attention and public debate about it showed. This demonstrates how important and relevant the topic is in the Netherlands. The ongoing public debate about pension reform and new pension contracts causes uncertainty in the Dutch society.

The ongoing public debate about possible failure also raises the question whether pension funds can indeed fail or whether they may be too important to fail? And what is too important to fail? The term has its origin in banks’ too big to fail and was introduced in 1984. In September of that year the Comptroller of the Currency testified before U.S. Congress that there were eleven banks that were too big to fail (O’Hara and Shaw, 1990). If this may also be the case for (some) pension funds, what then are the consequences? Does this require any

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<sup>1</sup> The global credit crisis that started with a mortgage crisis in the US.

<sup>2</sup> In Appendix A more information about the pension sector in the Netherlands may be found.

<sup>3</sup> In addition to this commission ‘Toekomstigbestendigheid Aanvullende Pensioenregelingen’ another committee ‘Beleggingsbeleid en Risicobeheer’ was asked to review the investment policy and risk management of pension funds.

regulatory or supervisory changes? And would it alter anything for employees and employers contributing to pension funds? These questions about the possibility of failing of pension funds and its consequences are of special interest to DNB which is the prudential supervisor of pension funds.

This thesis will examine whether pension funds can fail and the consequences of the result will be discussed. The central research question of this thesis will be formulated as:

**Are Dutch pension funds too important to fail and/or too big to save and what are the consequences?**

The following sub research questions enable a thorough examination of the problem:

1. *How is failing respectively saving of a pension fund defined?*
2. *Are there any theoretical arguments and is there any empirical evidence to support the hypothesis of pension funds being too important to fail or too big to save?*
3. *What are the consequences of the 'too important to fail' or 'too big to save' argument for supervision, government, society and financial markets?*

To enable us to answer these questions we will proceed as follows. As said the term too important to fail has its origin in banking. Furthermore literature on pension funds being too important to fail or too big to save is scarce. There is however extensive literature on these questions for banks. We analyze the available banking literature and evaluate to what extent it is applicable to pension fund. Chapter two will consist of the literature on banks. The third chapter will examine to what extent the literature on banks is applicable to pension funds. We will use chapter two as the foundation for chapter three upon which we will build further. In chapter four empirical research about the investments by Dutch pension funds will be presented. The final chapter will include a conclusion with policy recommendation and some final remarks.

## 2 Theoretical framework regarding banks

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In this chapter we will discuss the related literature on the topic of too important to fail (TITF) and too big to save (TBTS) banks. We will start by discussing failing for banks and thereafter how banks may be too important to fail and what the consequences of it may be. Then we will discuss, if banks are indeed TITF, what the saving options are which are applicable in the case of TITF banks. We will discuss the saving vehicles and determine whether they are TITF policies. The possible impact of TITF policies will be examined. Thereafter we will analyze whether the consequences of TITF policies may be so large that they may cause banks to be TBTS, as well as if these problems with TITF policies are unwanted and/or too large what can be done to prevent banks from becoming TITF.

### 2.1 Failing

When a bank cannot meet its liabilities to its creditors anymore it fails. Once the bank has failed, not all creditors will be able to recover their claim in full.

A failing bank gives an incentive for a bank run; depositors rush to withdraw their deposits before there are no assets left (Diamond and Dybvig, 1983). A bank run may also cause a perfectly healthy bank to fail. Banks have many illiquid assets, which makes it difficult to retrieve their assets quickly. When there is a run, for example due to rumors, the bank has to liquidate its assets suddenly and quickly and may be forced to do this at a loss, which will lead to a decrease in its assets.

There are two types of failures: systemic failure and idiosyncratic failure. Systemic failure refers to one bank failing and contaminating other banks or many banks failing together (Acharya, 2009). An idiosyncratic bank failure occurs when only one bank fails

#### 2.1.1 Too important to fail

In the banking literature the term too big to fail (TBTF) is widely used. TBTF does not necessarily refer to the size of a bank; it refers to banks that are of systemic importance. This is when the failure of a bank could threaten the stability of the entire financial system (Ennis and Malek 2005). However, size and systemic importance are often closely related. Since the too big to fail does not refer just to size but also to systemic importance, TITF is a better term for this phenomenon. Stern and Feldman (2004) also acknowledge that TBTF is not a correct term but their argumentation to keep using it is that TBTF is already a very common and widespread term. Since the International Monetary Fund (IMF) (2011) now refers to

institutions being TITF rather than TBTF in this paper we will use TITF since this term captures the issue much better<sup>4</sup>.

There are several definitions used to describe what TITF is. Stern and Feldman (2004) define a bank TITF<sup>5</sup> when it is so large that it poses significant risks for other financial institutions, to the entire financial system and possibly to the economic and social order. Other definitions are similar to this. However, all these definitions are open to discussion since they are ambiguous; when does something pose a significant risk? When is it plausible that failure is a risk for social order? Because of the confusion about what systemically important/large financial institutions are, the IMF (2011) developed characteristics to determine whether an institution is too important to fail. The three characteristics of systemically important financial institutions (SIFIs) are their large size, that they are highly interconnected and that their substitutability is limited. These characteristics make it more clear what TITF exactly is. However, it remains difficult to measure. To make the term TITF more understandable we will first explain in more detail the motivation for a bank being TITF.

The most important reason for policymakers to perceive a bank as TITF is fear of systemic failure caused by spillovers (Stern and Feldman, 2004). Stern and Feldman (2004) also mention two other motivations to save large banks. Policymakers may want to allocate credit or they may seek personal gain. Policymakers may gain from saving banks because of corruption or the chance of switching to a better paid job in the financial sector. These last two motivations for TITF policies differ more among countries than spillovers. As not all governments want to direct bank credits and also corruption and scandals about policymakers switching to better paid jobs differ between countries. Therefore we will focus on spillovers.

The first type of spillover is through interbank credit exposure such as overnight, intraday and long-term credits (Wall, 1993). If one bank fails there is the risk that another bank, which has credits at the failing bank, is no longer able to get its funds back. That would decrease their assets which may lead to its insolvency. This might set a domino effect into motion affecting the entire financial sector.

Another possible cause of contamination is through banks that have the same type of exposures; there is the risk of spillovers because of the reaction of their creditors. When a bank has an excessive exposure to a certain company and becomes insolvent, unsecured creditors might run on banks that also have exposure to that particular company. This may even happen if those other banks are not insolvent, causing runs on solvent banks (Stern and Feldman, 2004).

Furthermore, non-banking sectors may also be affected by a bank failure. For bank customers to be able to pay, they need (next to a solvent bank) a working payment system (Wall, 1993). Because of connected payment systems, the system of other banks may not

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<sup>4</sup> In this paper we use the term TITF instead of TBTF. However we should notice that most literature on banking uses the term TBTF. In essence it is the same since the terms mean the same only we believe TITF captures the underlying issue better, but when looking at the mentioned literature they will mostly use TBTF.

<sup>5</sup> Note that Stern and Feldman use the term too big to fail in their definition rather than too important to fail. However since we use the term TITF in this paper for clarity we will also use it here.

work anymore either, disrupting daily living. Furthermore, (non-financial) businesses rely on banks for liquidity (Saidenberg and Strahan, 1999). When the banking sector fails there is the risk of contamination of the real economy because consumers and businesses cannot make use of the services of banks anymore.

On the other hand there is also the view that contagion risk is small. Calomiris and Mason (1997) conclude that contagion during the Chicago panic on banks in 1932 was not high and that failures of banks were due to weaknesses in asset value; during the Depression bank failings were not due to spillovers. This research provides an example that risks on spillovers are overstated. However, this is probably not persuasive enough to convince policymakers that there is no significant risk for the economy. Therefore, as Stern and Feldman (2004) point out, fear of spillovers is still the most important motivation for too important to fail policies and creditors will anticipate on it. Table 1 summarizes the main motivations of TITF policy.

Table 1 Main motivation of TITF policies: Fear of systemic failure

<b>Type of Spillovers</b>	<b>Literature</b>
Interbank credit exposure	Wall, 1993
Reaction of creditors on similar exposure	Stern and Feldman, 2004
Affect non banking sectors	Wall, 1993 / Saidenberg and Strahan, 1999

## 2.2 Saving

Saving policies are activated in case a bank fails, therefore it is an ex post policy. To prevent a bank run the government provides a deposit insurance; an insurance that guarantees depositors their deposits up to a maximum amount. Many countries, including the Netherlands, have such an explicit guarantee to prevent bank runs. Since this insurance usually has a maximum insurable amount there are still unsecured creditors (Stern and Feldman, 2004). The government acting as lender of last resort and bailing out a bank is also a saving vehicle, it goes further than the deposit insurance and also saves the unsecured creditors.

### 2.2.1 Saving policies for too important to fail banks: TITF policies

Not all saving vehicles are also TITF policies. Saving policies in case of TITF banks are defined as TITF policies. These policies insure creditors that do not fall under deposit insurance; the implicit guarantees. Therefore a deposit insurance is a saving policy but not a TITF policy. The government acting as a lender of last resort and bailing out a failing bank is a saving vehicle that and is also the TITF policy. We will discuss the consequences of a possible bailout

*Economic consequences: incentives*

When a bank anticipates being saved in case of an idiosyncratic failure it might change its behavior, because of certain incentives they get from TITF policies. However, a bank is subject to the market and therefore the market also has to anticipate on the bank being TITF to enable a bank to change their behavior. If the market expects the government to bail out a bank there will be less market discipline (Demirgüç-Kunt and Huizinga, 2011). In that case the market's incentives to monitor and assess the riskiness of this type of bank declines, since the government will bear the costs of a failure instead of the market. This will lead to excessive risk taking, the market will allow the bank to take extra risks without disciplining it. That is a moral hazard common with insurance. This will lead to a reduction in the funding costs of a bank. The interest rate a bank pays includes a premium for the risk of bankruptcy. However, with an implicit guarantee there is implicitly no longer a risk of bankruptcy. Therefore there will be no risk premium in the interest rate and hence the funding costs will be lower (O'Hara and Shaw, 1990). According to O'Hara and Shaw (1990) the wealth effect will be captured by shareholders and that will increase the profits. They found evidence for this statement; the stock prices of the banks that were named in 1984 as TBTF<sup>6</sup> rose. Another moral hazard that Stern and Feldman (2004) point out is the incentives a bank has to take excessive risk. Since risk taking does not affect the funding ratio anymore the bank has an incentive to increase risk taking to increase the expected return; the government bears the downward risk. Furthermore TITF policies give a bank the incentive to grow beyond cost effectiveness and a socially optimal size. This growth will increase the chances of a bank becoming so large that it is TITF, since size is one of the determinants of TITF. It will therefore be able to make use of the advantages of the implicit subsidy (Mishkin, 2006).

When many banks fail together this is also systemic failure. Since the government wants to prevent this type of failure it may bail out all failing banks (Acharya and Yorulmazer, 2007). When banks increase the risk that they will fail all together they increase the systemic risk. That will also increase the chance of being bailed out. Acharya and Yorulmazer (2007) point out that this is a strong incentive for banks to herd and increase the risk that they will fail together and become TITF by becoming too many to fail (TMTF).

Table 2 provides an overview of all the above mentioned incentives

Table 2 Incentives TITF - Banks

Incentive	Literature
Less market discipline	<i>Demirgüç-Kunt and Huizinga, 2011</i>
Low funding costs	<i>O'Hara and Shaw, 1990</i>
Excessive risk taking	<i>Stern and Feldman, 2004</i>
Excessive growth	<i>Mishkin, 2006</i>
Herding	<i>Acharya and Yorulmazer, 2007</i>

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<sup>6</sup> Here we do use the term TBTF since it in the speech of 1984 that this exact term was used.

### *Financial consequences: costs*

Anticipation upon a bailout by the government gives banks incentives to change their behavior and creates moral hazard. This increases costs and waste resources, due to excessive risk taking and a lower efficiency. As bank are not stimulated to operate in the most cost-effective way or to innovate of due to the lack of market discipline (Stern and Feldman, 2004).

Furthermore, the money that governments use to bailout banks has to come from somewhere. In the short run it is raised by issuing government bonds (Acharya and Drechsler, 2011); this decreases the value of government bonds that already exist. They are being repaid by taxation, which means that in the long run the residents of the country bear the costs of the bail out. Increasing government borrowing by issuing these bonds may also increase the market interest rates. This crowding out makes it more expensive for companies and consumers to borrow money and will reduce investments. Another method to pay for the bailout is directly via tax income. The consequence is that the government will either cut back on other expenditures or increase taxes or a combination of those two. Both ways of paying for a bailout will have effects on the economy and possibly on society. When, for example, taxes on income will increase there is the risk of a decrease in labor supply since an hour work now is less rewarding. However, the government may in some cases also gain money on a bailout. When the bank is in a better position the government will sell the part of the bank that they sold for a higher price than they bailed it out for. So in some cases the costs of the bailout are recovered. Nonetheless the wasted resources and incentives that a rescue gives will lead to higher costs for society than the possible gain for the government on a specific bail out.

#### 2.2.2 Too big to save

The financial consequences of TITF policies make it clear that a bailout comes with high costs, which raises the question whether these costs may become too high. When a bank is large relative to its country's gross domestic product (GDP), the government may not be able to bail the bank out. The amount needed to save the bank is simply too large; it is TBTS<sup>7</sup>. Subsidies to the banking sector from the state may be limited by the state of public finances (Demirgüç-Kunt and Huizinga 2010). Moreover a country may not be willing to save the bank; it may harm their economy more by saving the bank than by letting it go bankrupt. An example of TBTS is Iceland; before the crisis of 2008 the banking sector in Iceland had foreign assets worth approximately 10 times their GDP (Danielson, 2008). Because this sector was so relatively large, the Icelandic government was not able to offer any guarantee to banks and at the end of 2008 during the credit crisis the Icelandic banks failed and triggered a national bankruptcy.

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<sup>7</sup> Here we do use the term big instead of important since we believe that TBTF gives the best insight in the meaning of this term, as the reason for why it may not be saved is in its size and the accompanying high costs.



As mentioned before a bank that is considered TITF by the market will have lower funding costs. Demirgüç-Kunt and Huizinga (2011) examine whether banks that may be TBTS have higher funding costs, because in the case of TBTS creditors do bear the risks of bankruptcy. They distinguish between absolute and relative size, they find evidence that systemic large banks, which may be too large to save, have higher funding costs. This result implies that the market considers systemic banks to be too big to save and therefore they are disciplined. However, there are the believe that large banks will take even more risks because the financial crisis of 2008 showed that there are few negative effects for a bank to take great risks. Even though Demirgüç-Kunt and Huizinga (2011) conclude that the market does discipline TBTS banks, they add that the market does not prevent them from becoming that big. Letting banks grow that large is not market efficient since their rate of return on assets declines with their systemic size. A reason that banks become TBTS, even if this is not market efficient, is because it may be in the personal interest of bank managers to increase size (Demirgüç-Kunt and Huizinga, 2011).

When a bank that is TBTS is large in relation to a country, letting that bank fail will have severe consequences. Furthermore as it is not market efficient to be so big we conclude that it is welfare improving to prevent banks from becoming so large that they are TBTS.

### **2.3 Preventing too important to fail**

Especially since the financial crisis of 2008 there are concerns about these costs of bank bailouts and about the threat that TITF banks form for the economy. It is believed that these banks do more harm than good and should disappear: “if a bank is too big to fail, it’s too big” (Meltzer, 2009). Hence policies to prevent TITF failure should be implemented. A regulator can focus on the size of a bank, on the risk of failure or focus on a combination of the two. Rules about the size of a bank can prevent a bank from becoming too big. Since not only size determines TITF but also interconnectedness and substitutability these are also factors that should be prevented. Preventing a bank from failing in a free market is not possible. However, policymakers are able to decrease the possibility by forcing the bank to hold a larger buffer to decrease the risk of failure. Acharya and Yorulmazer (2007) point out that in the light of the incentive to become too many to fail regulators should focus on policies at a systemic level rather than an individual one.

A measure to deal with the TITF problem is a Living Will (sometimes also referred to as a wind down plan). A Living Will is a plan that is activated when a systemically important bank gets into problems. This plan facilitates the preservation, the continuity of the payment services and if necessary the winding down of the bank (European Commission, 2009). A Living Will should be developed for the entire bank as a whole and therefore it should not be made on a national but on a global level. This proposal has ex ante advantages; it forces banks to think about failing and the accompanying actions. Furthermore, it may also convince banks to restructure their business and if they do not do this voluntarily, supervisors may be persuaded to oblige them (Avgouleas et al, 2010). Another ex ante advantage the European Commission (2009) points out is that it decreases the complexity of a bank structure. Living Wills should include scenarios for reorganization, this may simplify the legal structure to

reorganize. This simplification makes implementation of reorganization, if necessary, easier. Therefore a Living Will may also decrease the interconnectedness of banks. When a bank is simplified it is probably also easier to substitute their products since they are better understood. Further, the development of these plans may increase a dialogue between banks and their supervisors, which will increase the knowledge of supervisors about those banks. According to Avgouleas et al. (2010) the ex-post effect may be less strong. Because of time inconsistency, in times of crisis authorities may ignore the arrangements and behave as they see fit to save the financial sector.

Another measure to deal with TITF, the Volcker Rule, was presented on the 21st of January 2010 by the American President Barack Obama. This rule restricts the investments a bank can make and aims to reduce the risk taking by banks. Commercial banks would be restricted to engage in trading that is unrelated to the needs of its customers and in investments in hedge funds and private equity funds (Carpenter and Murphy, 2010). This reform to deal with TITF problems does this by reducing the probability of failure.

Furthermore the IMF (2011) discusses how to deal with systemic important financial institutions (so not only banks). They agree with others, for example Meltzer (2009), that an institution that is viewed as TITF is not optimal. They give three complementary approaches to reduce the systemic risk of these institutions and reinstate market discipline. The first is reducing the systemic risk, the second is reducing the probability and the third is constructing a framework that minimizes disruption when a failure occurs. Policies should be developed that aim to internalize risk. The IMF (2011) provides elements for policies to internalize risk taking by too important to fail institutions; 1) more stringent capital requirements, 2) intensive and proactive supervision, 3) enhanced transparency and disclosure requirements and 4) effective resolution regimes. These approaches are similar to the approaches mentioned above; the last three of those four may be found in the Living Wills.

## **2.4 Conclusion**

Banks are TITF when they pose significant risks for other financial institutions, to the entire financial system and possibly to the economic and social order (Stern and Feldmand, 2004). The main motivation for the government to step in and save a bank is because of the fear of spillovers. There are three ways in which spillovers may arise. The First way is via interbank credit exposure, second via the reaction of creditors in case of banks with similar exposure and thirdly by affecting other sectors. A government acting as lender of last resort and bailing the bank out is effectuating a TITF policy. This however comes with economic consequences in the form of unwanted incentives such as less market discipline causing low funding costs, excessive risk taking and excessive growth. Furthermore it creates the incentive for banks to become TITF by becoming TMTF via herding. Therefore the financial consequences are not only the costs of the bailout but also wasted resources because of these unwanted incentives. The costs of the effectuating TITF policy may limit the government because of the state of public finances (Demirgüç-Kunt and Huizinga 2010), hence a bank may become TBTS. The costs that come with banks being TITF have raised the issue that such large banks are not improving welfare. Hence arrangements to prevent funds from becoming so large should be installed.

## 3 Theoretical framework regarding pension funds

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The third chapter will discuss the literature on TITF and TBTS for pension funds. This will be performed by using the theoretical framework regarding banks as a foundation and expanding it. Therefore we will start with describing the fundamental differences between the two financial institutions; banks and pension funds. Thereafter the structure of this chapter will be similar to the previous. We will discuss what failing is and if pension funds are TITF. The saving vehicles will be analyzed and the motivations and problems of TITF policies will be discussed. We will finish with the arrangements that may prevent pension funds from being TITF.

### 3.1 Fundamental differences between banks and pension funds

Banks and pension funds are both financial institutions that are important for the Dutch society as well as its economy. However, there are differences between the two; which we will discuss in this paragraph. One difference to start with is that the banking sector is globally interconnected and is part of the global financial system. In contrast, pension funds are only users of the financial system. They do not bring products into the financial market that are traded there. They use the financial market to invest their assets and try to profit from these investments.

Furthermore pension funds are non-profit institutions in contrast to banks. Because of the structure of pension funds there are no funding costs as there are with banks. In case of pension funds, employer and employee pay (quasi-mandatory) premiums to pension funds. Moreover, customers can choose whether or not they deposit money at a specific bank, whilst this is more difficult in the case of pension funds since participation to an occupational pension fund is quasi-mandatory. In addition, money deposited in a bank may be retrieved at any moment in time. Since pension entitlements are deferred income, a pension fund is in that sense an insurance system. Hence they will only pay the entitlements monthly when the participant is retired. Therefore pension funds typically have longer time horizons when investing since they only have to start paying entitlements at the retirement age. As a consequence, the future cash outflows for a pension fund are typically known well in advance. The only possible capital transfer is to another pension fund which takes over the wealth and will pay the pension entitlements once the participant retires. This transfer is only allowed in case the pension fund transferring the capital to another pension fund is not underfunded (funding ratio below 105 percent). So a pension fund with a funding ratio lower than 105 percent is not allowed to transfer capital.

There are also differences between banks and pension funds in the governance domain. A board of trustee's governs the pension fund and consists of representatives of employers and employees. Because pension funds are non-profit organizations the board only has to act in the interest of participants, those that pay or paid premiums; beneficiaries and employers.

These premiums are in almost all cases the same percentage of wage for all employees; this is also an important characteristic of pension funds. There is no difference between the premiums based upon individual differences related to the risks participants run. Someone who has a high risk of growing very old does not have to pay more than the person who has a high risk of dying at a young age. This average premium redistributes within generations and also between generations (Bonenkamp, 2007). Redistributions are specific for pension funds, banks do not have similar systems. The money deposited on bank accounts is not redistributed either within or between generations.

Another important difference between banks and pension fund also arises from the relation between generations; the intergenerational risk sharing within the pension system. Via pension funds, implemented by the government, there is the ability to trade with unborn generations (Gordon and Varian, 1988), hence there is intergenerational trade. Intergenerational risk sharing may be welfare improving because of risk smoothing and risk diversification. The risk bearing capacity can be increased by a collective plan with multiple generations. In this case, the deficits or surpluses do not have to be solved at once, since capital of future generations' can also absorb parts of this risk (Ponds, 2010). Risk smoothing is also incorporated in Dutch rules on deficits in pension funds<sup>8</sup> which give them, dependent on the type of deficit, three or fifteen years to recover. The other aspect of intergenerational risk sharing is risk diversification. The income of workers depends on wages and that of the retired on capital market returns, they both may want to share their income risk with each other (Ponds, 2010). In case of pension funds in the Netherlands, these two types of risks are shared and hence participants are able to diversify risks.

There are two main reasons why this intergenerational trade does not occur without the government; time-inconsistency and non-tradability of human capital (Ponds, 2010). Human capital of a person is the present value of their future incomes. For individuals it is difficult to sell human capital against future income hence trade with them is not possible. The government has an indefinite time span and therefore can make trade possible for example, by means of mandatory participation in a pension fund. Time-inconsistency is another difficulty of intergenerational risk sharing without the government; it comes from the different perspectives ex ante and ex post. Once a shock occurs (ex-post) some generations will find it unattractive to participate anymore, as these are the generations that will have to transfer (E. Westerhout, 2011). Hence, this brings about continuity problems (Gordon and Varian, 1988); what is optimal ex-ante does not have to be ex-post. This may cause a conflict of interest between generations. Ex ante all generations may perceive participating in the fund as welfare improving, while ex post this may no longer be the case. The young generation would lose wealth and prefer the pension fund to fail while the old generation prefers saving. When participation is voluntary the transfer generations will leave the pension fund and therefore intergenerational risk sharing in this sense will not occur. Due to the quasi-mandatory participation in the Netherlands participants are not able to just leave the pension fund and hence this trade is possible.

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<sup>8</sup> Appendix A

## 3.2 Failing

Because of the described differences between banks and pension funds, they also differ in the context of failing. A pension fund is a long term investment fund which is characterized by redistribution, solidarity and long term liabilities. Therefore a pension fund is not directly bankrupt when the value of its liabilities exceed the value of its assets (Gorter and Bikker, 2011), in contrast with banks and ordinary companies. A pension fund that can no longer meet its liabilities and therefore has a deficit, still has time to recover by increasing its funding ratio through the process of a recovery plan<sup>9</sup>.

Therefore we use a different definition for failure concerning pension funds. The Financial Assessment Framework (FTK), part of the pension act, lays down financial requirements (DNB website). This includes the rule that if the recovery plan is not able to reduce the funding deficit and the pension fund is not able to increase the funding ratio without disproportionately harming beneficiaries (active, passive or retired) or the employer, then in that case pension entitlements and rights should be decreased. This supervision and these measures should prevent a pension fund from being underfunded for many years in a row until eventually the consequences are extreme. However, even though this emergency measure is to prevent an even worse scenario, we view it as failing in the context of a pension fund. Since pension entitlements may only be reduced when a pension fund can no longer meet its liabilities, thus when a pension fund fails. Furthermore, other companies, including banks, do not have the opportunity to “just” reduce their liabilities and go on, they would go bankrupt.

The reason for failure may be viewed from two sides; the liabilities are higher than expected or the assets are lower than expected. An increase in liabilities is typically related to improvements in the life expectancy and / or a climate of declining interest rates. As a result of improving mortality assumptions for instance, the pension fund is obliged to pay out more pension entitlement over a longer period of time. On the other hand, losses on the asset side typically relate to the investment strategy of a pension fund. Pension funds invest partly in risky assets but their liabilities are in nominal terms and generally considered risk-free in defined benefits (DB) schemes. This creates a duration mismatch between assets and liabilities, which results in a lower funding ratio in a climate of declining interest rates. However, some investing in risky investments is needed to have an expected return that fits the defined benefits. On top of these defined benefits pension funds have the ambition to index pensions. This causes also a need for a higher expected return on the investments of pension funds, leading to more risky assets. There is already extensive literature on the liabilities being higher than anticipated (aging and longevity) and less about assets declining. Furthermore, failure because of decreasing assets is comparable to failing in the context of banks. Therefore, we will mainly focus on the assets being lower than expected as the cause of failure in this paper.

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<sup>9</sup> Appendix A

As with banks it is important to distinguish between two types of failure of pension funds; idiosyncratic failure and systemic failure. In the case that only one pension fund is failing we speak of idiosyncratic failure. When multiple funds fail due to a shock or a trend it is systemic failure (Lemmen, 2003).

### 3.2.1 Too important to fail

Here we will discuss, as we did with banks, the motivations, incentives and costs that come with TITF. From the banking literature we find that a bank is TITF when it is so large that it poses significant risks for other financial institutions, to the entire financial system and possibly to the economic and social order (Stern and Feldman 2004). From this definition we deduce that a failure is TITF when it poses a significant risk to other financial institutions, to the financial system or to the economic order or social order. The IMF (2011) points out three characteristics of SIFIs: large size, highly interconnected and limited substitutable. Pension funds are substitutable by means of private saving for pension, however, in this case the intergenerational risk sharing will not be used. Hence there is some limitation in substituting products for pension funds. Pension funds are not interconnected with other financial institutions. They invest in other companies, including financial institution such as banks, but none invest in pension funds. So they are connected with other financial institutions but not interconnected. However, pension funds are connected with the national economy since they administer (deferred) income for participants. Last is size, the entire sector is large relative to GDP. But the size of pension funds differs a lot within in the sector. In sum there are some points on which the pension sector fits the TITF characteristics of SIFIs according to the IMF. But, like banks, even with these definitions and characteristics it is still difficult to measure this and therefore we will further explore whether pension funds are TITF by taking a better look at the motivations of TITF policies

When analyzing banks we found that fear of spillovers are the main reason why banks may be viewed as TITF. The first two spillovers mentioned for banks are spillovers to the banking sector; systemic failure starting with an idiosyncratic failure. There are fewer risks of contamination because of the lack of transfers between pension funds that are common with banks. Banks have unsecured exposures to others (Stern and Feldman, 2004), whereas pension funds do not have credit exposures to other pension funds (Lemmen, 2003). Furthermore, a run on a pension fund is very unlikely and will not cause failure. Capital in a pension fund cannot be withdrawn at once and a transfer to another pension fund is only possible if the fund is healthy. Hence pension funds do not pose a risk of a domino-effect as banks may do. Another spillover to other banks may be due to a reaction of creditors on banks with similar exposure. This may cause a run on a healthy bank causing a failure. Again this is not applicable to pension funds because a run causing failure is not possible. Therefore an idiosyncratic failure does not cause spillovers to other pension funds and will not cause systemic failure; thus an idiosyncratic failure of a pension fund is not a TITF failure.

Affecting other sectors is the last spillover motivation mentioned for banks is the risks of. A bank failure may cause the payment system to not work properly anymore. This is not applicable for pension funds, since a failing pension fund does not disrupt the payment

system. However, a pension fund failing may spill over to other sectors in other ways. To determine whether pension funds are of systemic importance and may threaten other financial institutions, the entire financial system and the economy we examine the effect of spillovers to other sectors in more detail.

A bank failure may pose a risk to the financial system; for pension funds this works in a different way. Banks are part of the financial system and pension funds are only users of the system. Banks bring products on the financial market, enabling other financial institutions to invest in them. Pension funds only trade products on the market they do not bring their own products on the financial market. When a bank fails, part of the system fails and it may even spillover to other parts of the financial system, as discussed before. A user of the financial system failing does not pose risks like that. This is reinforced by the fact that banks are highly interconnected on the global financial market and pension funds are not interconnected with other financial institutions. As the Netherlands is a small economy and the financial market a global market, it is unlikely that, even when all Dutch pension funds fail, this will directly pose a significant risk to the financial system. This because Dutch pension funds are only consumers of financial products and relatively small to this global financial market where these products are traded. Therefore Dutch pension funds failing will not pose a significant risk to other financial institutions and the financial system in the same way as banks. However, there is a direct relation between the financial system and pension funds. Banks might cause the financial system to fail, since they are interconnected. Pension funds only use the financial market, a failure within this financial system may cause pension funds to fail. Therefore the direct relation is the other way around. Pension funds invest part of their assets in the financial market and when this market fails their assets decrease, possibly causing underfunding. Hence multiple failing pension funds may be a symptom of a systemic failure of financial institutions on the financial market.

Motivations to save a pension fund because of economic and social unrest may exist, but in a different form than in case of banks. With a bank failure economic and social unrest partly arises because of the failing of the financial system. As discussed pension funds will not cause this type of failure. Nevertheless, a failing pension fund may have a direct effect on the social and economic order via participants. Failure of a pension fund will decrease current and future income. When pension entitlements are decreased, current retired beneficiaries immediately have less income and will therefore have to decrease their spending. For the younger generation their future income will decrease and, because of consumption smoothing (Friedman, 1957) they may also decrease their spending today. Therefore consumer spending will decrease and this affects the entire economy, dependent on the size of the decrease. Another way in which the failing of a pension fund is able to cause social and economic unrest is via a decrease in consumer confidence. The problems of pension funds, triggered by the financial crisis in 2008, caused a huge public debate about collective pension schemes. Many participants are not fully aware of the risks of pension funds. This makes some sense since many schemes are DB and in these schemes the nominal benefits a retired person gets are set. However, even these funds are at a certain point obliged to reduce the pension entitlements. But if the Dutch society is not fully aware of this possibility this decrease may cause a lot of social unrest. The strength of the spillovers to other sectors causing social and

economic unrest is influenced by the magnitude of the failure of a pension fund. When a failure is small relative to the GDP it is unlikely to pose a significant threat to the stability in the economy and society. Since an idiosyncratic failure is only one pension fund failing it is unlikely to spillover to other sectors and cause social and economic unrest. A systemic failure may be TITF. The size of failure relative to GDP is also of importance; a large systemic failure relative to GDP is more likely to be TITF than a small systemic failure.

By analyzing the spillover effects we found that an idiosyncratic failure is no motivation for TITF. In chapter four we will further examine whether there are also empirical results to support this. Now we conclude that systemic failure may be TITF failure because of the risks on social and economic unrest as described above.

Table 3 Motivation government saving TITF banks applicable for pension funds?

Banks	Applicable for pension funds?
Affecting own sector *Interbank credit exposure *Reaction of creditors on similar exposure	*No *No
Affecting other sectors	Depends -The type of failure -The size of systemic failure relative to GDP

**3.3 Saving**

We have discussed what a failing pension fund is, we are now also able to describe saving in the case of a pension fund. In the case of a bank failure there were two saving vehicles; a deposit insurance and a government bailout. There are four possible saving policies that can be activated ex post for pension funds: a company bail out, a pension guarantee fund, temporarily relaxing funding rules and a government bailout. Here we will shortly examine what type of saving vehicles exist and in the next section we will discuss if they are indeed applicable as saving vehicles in the case of systemic failure.

A deposit insurance is not a saving vehicle for pension funds, as a deposit insurance is to prevent failure due to bank runs. However, because of the structure of the pension fund sector a pension fund cannot fail due to a run. This because an underfunded pension fund in no longer allowed to transfer capital to a different pension fund. Hence there is no need for a deposit insurance. However, there is a different type of insurance that may be used to save pension funds in case of failing; a pension guarantee fund.

A pension fund may be saved by increasing its assets. Similar to a bank bailout, the government may act as a lender of last resort for a pension fund by bailing out a pension fund. There is also the possibility for an employer bailout, this is only possible for corporate pension funds, not for industry or occupational pension funds. The third party that can increase assets in the pension fund is the group of active participants, by means of a premium increase. However, this is a measure that would be used before pension entitlements would be



reduced. Therefore we know that a premium increase would disproportionately harm the active participant or employer. Hence a premium increase is not saving vehicle.

A different saving vehicle than capital, that the government may use when pension funds have to reduce the pension entitlements, is time by means of temporarily relaxing the rules. Since there is no risk of a run on the pension fund the supervisor may decide to relax the rules to give the pension fund more time to increase their assets.

### 3.3.1 Saving policies for too important to fail pension funds: TITF policies

We discussed multiple saving vehicles, but as with banks not all saving vehicles are TITF policies. There is a saving vehicle by the employer by means of a bailout and three vehicles by the government; a guarantee fund, a bailout, relaxing the rules. Saving a pension fund is a TITF policy when the motivation is in preventing the risks to economic and social order.<sup>10</sup> We will discuss these saving vehicles; the specific motivations and problems that occur with each policy. We will determine whether they are TITF policies, an overview will be given in Table 6.

#### *1. Company bailout*

In case a corporate pension fund is failing the employer may bailout its pension fund by means of an additional payment. This has also happened in the past in the Netherlands<sup>11</sup>. An employer making additional payments is only possible for corporate pension funds it is not a possibility for industry or occupational pension funds.

##### *Motivation*

A motivation for a company bail out may be found in the direct link between a company and a corporate pension fund. Because of fear of damage to the reputation of the company it may be inclined to make an additional payment for the pension fund. In case it is a large company that is listed on a stock market; the news that its pension fund is failing may have negative effects on its stock price. Yet providing additional capital may also reduce the stock price because of reduced profits (Lemmen, 2003). Therefore it is ambiguous whether, in general, an employer will save a failing pension fund because of effects on the stock prices. The reputation damage may also have a negative influence on the labor supply for that specific company. Employees or potential future employees are more likely to apply for work at a company with a healthy pension fund.

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<sup>10</sup> For banks preventing a significant risk to the financial system is also a motivation. However, as explained in 3.2.1 this is not a motivation for a TITF on pension funds.

<sup>11</sup> For example, Shell and ING injected capital in their corporate pension fund

## *Problems*

There is a problem that may occur in a pension fund anticipating a employer bailout; excessive risk taking. Since there are motivations for a employer bailout and it also has happened in the past it may create the incentives for a corporate pension fund to take excessive risk. This because this extra risk taking increases expected return and the company, not the pension fund, will bear the downward risk. This might be in the interest of the beneficiary of the pension funds. However, whether excessive risk taking indeed happens is ambiguous. First of all, excessive risk taking does not have to be in the interest of the active beneficiaries. Since a bailout comes with costs it is likely that the margin for pay decreases due to additional payments made by the employer. Hence the active participants may not gain from excessive risk taking. Second, representatives of the employer are also in the board of the pension fund. And it is not in the interest of an employer to take excessive risk in its pension fund because it is the employer that bears the costs in case it bails out its pension fund. Hence it is ambiguous whether corporate pension funds would take more risks than an occupational or industry pension fund. Therefore we will in chapter four examine whether corporate pension funds take more risks.

### *Is it a TITF Policy?*

An employer bailout is not a TITF policy. A company is not responsible for maintaining economic and social rest, which is the responsibility of the government. An employer may indeed save its pension fund because it is in its own interest, but not to prevent social and economic unrest.

## *2. Pension guarantee fund*

There are multiple countries that have a pension guarantee fund. Three countries with a relatively large pension sector, like the Netherlands, with a type of guarantee fund in place are: the US, the UK and Switzerland<sup>12</sup>. A guarantee fund acts as insurance; pension funds pay premiums and the guarantee fund takes over the risks of a pension fund not meeting its obligations (Stewart, 2007). The reason of failure may differ between countries, for example in the US and UK a failing pension fund evolves from a failing sponsor. However, in Switzerland a pension fund will also be rescued because the pension fund itself fails, not the sponsor (Broeders and Haan, 2010). A guarantee fund is a policy that has to be in place before a pension fund fails; ex ante. Nevertheless it is only activated, save a pension fund, ex post. Therefore it as a saving vehicle.

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<sup>12</sup> More information on the pension funds in these countries may be found in appendix B

### *Motivation*

A motivation for the government to install a pension guarantee fund is that the costs of individual pension funds failing are redistributed on the pension fund sector as a whole. Pension funds contribute to the guarantee fund by means of a premium and in case a pension fund fails the guarantee fund saves it. One of the most important motivations given in the literature for this insurance is labor market failure (Stewart, 2007). Since pensions may be viewed as deferred wages an employee will take risks into account regarding his pension when deciding how much of his current income he is willing to give up for future income when he is retired. Hence, when a pension fund has a larger chance of defaulting, the employee will give less up of his current income, since he trades current income with future income and takes into account the default risk. However, Mitchel (1988) found that many workers do not have sufficient knowledge about their pension provision. Misinformation and missing information are main reasons for this lack of knowledge. In this case an employee is not able to make a good trade-off between current income and future income with its default risk. A guarantee fund overcomes this problem by transferring the default risk from the employer to the guarantee fund.

Another motivation in the literature for a pension guarantee fund is diversification (Stewart, 2007). When receiving current and future income from the same source, if the company goes bankrupt the employees suffer a double blow. Efficient risk bearing means diversifying risks. However, this may be difficult for an employee to do because of a lack of knowledge. A guarantee fund diversifies the risk and prevents a double blow. This motivation is, not applicable in the Netherlands, since pension funds are separated from companies. When the company fails the pension fund will not fail because of the bankruptcy of the company. Hence the current and future incomes do not come from the same source.

### *Problems*

Common incentives with insurance are moral hazard and adverse selection, this may also occur in the case of a guarantee fund. The insured will change its behavior and will take on extra risks after it is insured; moral hazard. For pension funds this may happen via a decrease in premiums, investing more risky and increasing pension benefits shortly before failing (Broeders and Haan, 2010). To a certain extent moral hazard can be avoided (Stewart, 2007). There may be rules set that premiums must increase when a fund becomes more underfunded, rules about the benefits that are covered by the guarantee fund or rules that link income of a board with the pension fund. However, it is very difficult to fully prevent moral hazard.

Adverse selection refers to another problem that occurs when the premiums are not set perfectly; the low risk pension funds will subsidize the high risk funds. If this subsidy becomes too high the low risk funds will pull out of a guarantee fund. This might occur over and over again as a kind of run on the guarantee fund. To overcome this, the premium that each pension fund should pay should be a perfect representation of their risks, but, different studies show that this is extremely difficult (Stewart, 2007). However, when the government

obliges a pension fund to be part of this insurance, the low risks fund cannot pull out of the insurance. In that case there is obligatory subsidization, which may give an incentive to the low risk fund to take more risk, reducing the subsidy (again moral hazard).

Another problem with a guarantee fund is the correlation between the risks that pension funds run. The base of any insurance is sharing of idiosyncratic risks; the risks should be relative independent across the insured. But pension funds risks are dependent across; they have similar investments, they all face aging and longevity risks (some more than others but aging and longevity are national phenomena). Hence, insurance for pension funds will not work properly. Furthermore after analyzing the literature we concluded that TITF would only apply in the case of systemic failure. Thus the use of the guarantee fund in this perspective also fails. On top of that, when pension funds fail due to the financial market, the guarantee fund itself might also be fail as it also invests in other financial institution on the financial market.

### *Is it a TITF Policy?*

A pension guarantee fund is not a TITF policy. The most important reason for this is that a guarantee fund is not appropriate in case of a systemic failure whereas it may be used in case of an idiosyncratic failure. Since we concluded that TITF failure for pension funds will only be feasible in case of systemic failure, the guarantee fund is not effective.

Furthermore, only the motivation of default risk is a motivation that is applicable to the Netherlands. However, this risk may be overcome by strict supervision which can decrease the default risk. The strict supervision and legal separation of company and pension fund decrease the labor market failure (Broeders and Haan, 2010). In addition providing more information and transparency increases the knowledge of the participants and enables them to take the default risk better into account.

### *3. Temporarily relaxing funding rules*

In 2009 this policy was used; pension funds got more time to increase their assets by relaxing the rules (DNB, 2010). In 2009 the short term recovery plans for insolvent pension funds were increased from three to five years due to unique economic circumstances. Increasing the recovery time means that a pension fund gets more time to recover which means that the pension entitlements may not have to be reduced immediately.

### *Motivation*

Time may be used by the government with the motivation of optimal risk sharing amongst generations. In perspective of consumption smoothing (Friedman, 1957), smoothing shocks an infinite recovery time would be optimal. Hence increasing the recovery time means risk sharing with more generations which would be welfare increasing.

Another motivation may be because of extreme economic circumstances. This argument has been used in the Netherlands (DNB, 2010). When pension funds may start

failing because of extreme circumstances, relaxing the rules may be an option, in view of a good perspective of changing in the foreseeable future. A once-only shock may be spread under multiple generations. An advantage of this vehicle is that it is not the most drastic one and may also be used quietly without much fuss. This policy has already been used in the Netherlands and it indeed happened without a huge public debate and unrest.

### *Problems*

A problem that may occur with this saving vehicle is that it does not solve problems, it only shifts the problems. It can be useful to increase the use of intergenerational risk sharing when it is a once-only shock. However, when there are structural problems temporarily relaxing funding rules will not solve these problems. The problems will remain and relaxing the rules does not change that.

Furthermore, this policy increases the intergenerational risk sharing which may put stress on the relation between young and old. Since this policy is a saving policy and is activated ex post to a shock, the generation that finds it unattractive to participate may increase (this will be explained in more detail when discussing a bailout). The unattractiveness to participate for certain groups may also cause social unrest.

### *Is it a TITF policy?*

Relaxing the rules is a TITF policy. It prevents pension funds from failing by giving them temporarily more time to increase their funding ratio. Therefore this tool prevents failing in the short term and thereby may decrease economic and social unrest of failing in the short term. Yet, as it also increases unattractiveness to participate for certain (younger) generations it may also cause social unrest. But an important advantage is that this policy may be incorporated without much fuss as the past shows. Hence it is fit policy to spread a onetime shock. In case of fundamental problems it may be useful to give pension funds extra time to solve the fundamental problems. However, the policy itself does not solve the fundamental problems.

### *4. Government bailout*

A bailout by the government is the most direct form of saving and comes with the highest costs for the government, since they inject direct capital in the pension funds. The government may gather this capital via issuing bonds or otherwise directly via taxes. It is important to notice that pension funds are long term investments and only pay monthly income when retired. This implies that in the case of a failure the bailout does not have to be activated at once. The nature of pension funds also allows the government to spread the bailout over multiple years since it is not needed immediately.

### *Motivation*

The motivation for this specific policy is that a bailout gains from intergenerational risk sharing. When paying for the bailout by issuing bonds the costs can spread over more generations than gathering the money via taxes. Repaying the bonds can be deferred or extended over a long time. Whereas via taxes the costs are paid by the current generations but also nearby future generations since the bailout does not have to be activated all at once.

Furthermore, if returns on human capital exceed returns on financial capital investing in human capital may increase the expected return. In case a bailout is paid by means of tax on wages the investments of shift from financial capital towards human capital. This is for example the case when the system is transferred to a pay-as-you-go (PAYG) system. What this type of system is will be explained in the next section.

Finally, by increasing the assets of pension funds the deficit problems are solved at once, which may increase social and economic stability.

### *Costs<sup>13</sup>*

A bailout is a policy that enables us to give a concrete overview of the costs: how much capital is indeed needed. As pointed out before a large advantage of saving pension funds is that the capital does not have to be available at once, but per year, every year. To make the costs of a capital injection less abstract we looked at the possible cost in 2008, in the worst case scenario of all assets in the sector vaporizing. The government does not have to inject capital for all the liabilities at once but per year. Therefore we examine the costs of one year; the actual payments to pension fund beneficiaries in 2008. An overview of the figures will be given below in Table 4 and Table 5.

In 2008 the benefits paid to retirees of pension funds was approximately 21 billion euro net. This is after taxes, that were 0.4 billion euro, so there is no more tax claim on this amount by the government. The paid benefits are equal to 3.6 percent of Dutch GDP in that year.

In that year the taxes were 136 billion euro, of which 66 billion was income and capital taxes, respectively 22.8 percent and 11.7 percent of GDP. This includes the 0.4 billion taxes retirees paid on their pension benefits. If the governments would have paid the retirees directly their net pension benefits, the taxes would have been 0.4 billion lower. If in 2008 all nett pension fund payments would have been paid by means of tax income it would have been, *ceteris paribus*, 15.8 percent of total tax income and 32.6 percent of income and capital tax income. This is without tax income on the benefits paid to retirees of pension fund, since we use nett payments. In the case that retired participant of pension funds are paid by means of taxes, the government should have either economized on their spending or increased the taxes. In the first case the government should have decreased their spending with 21 billion euro. In the second case tax revenues for the government should have been 21 billion higher

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<sup>13</sup> All the figures in this section have been retrieved from CBS STATLINE

than they were. Taxes should then have been raised from 135 billion euro (22.7 percent of GDP) to 156 billion euro (*ceteris paribus* 26.3 percent of GDP).

The government may also gather the money necessary to pay the pension fund retiree's income by means of issuing government bonds and thereby increasing the government's debt. In 2008 the government had a debt of 347 billion euro, approximately 58.4 percent of Dutch GDP. When the government issues a debt for 21 billion euro the government debt will rise (*ceteris paribus*) with the 3.6 percentage points increasing the total government debt to 62 percent of GDP. This may interfere with agreements the Netherlands has signed as will be explained in the next section.

Nevertheless one thing has still been overlooked so far; pension premiums. In the case that the sector fails completely and the government takes over this sector, active participants also no longer have to pay any pension premiums since there are no more pension funds. In 2008 the total pension premiums were 27 billion euro. When current active do not have to pay pension premiums anymore there is an opening for an increase in taxes. When the government takes over the sector and uses income taxes to pay the current retired, the second pillar changes into a PAYG system. In 2008 this change could probably have happened without too many problems financially as the pension premiums were higher than the payments. Therefore transferring to a PAYG would have been possible without many consequences in 2008 as the premiums pension funds received were higher than the payments they made to beneficiaries. However, in the future such a transfer may cause problems which will be discussed in more detail in the next section.

Table 4 Figures of 2008

<b>2008</b>	<i>In millions</i>	<i>% of BBP</i>
BBP	594 481	100
Gross benefits to retirees	21 814	3.7
Nett benefits to retirees (bailout)	21 383	3.6
Taxes on benefits retirees	431	0.1
Total taxes	135 578	22.8
Total taxes (nett <sup>14</sup> )	135 147	22.7
Income and capital taxes	66 013	11.1
Income and capital taxes (nett)	65 582	11.0
Government debt	347 065	58.2
Total pension premiums	27 179	4.6

<sup>14</sup> Note that we use in this table the term nett taxes as the taxes without the taxes paid over benefits paid to retirees of pension funds (of 0.4 billion).

Table 5 A bailout in 2008 paid for in different ways

<b>Bailout paid for by</b>	<b>Before bailout</b>	<b>After bailout</b>
<i>Taxes</i>		
Total (nett <sup>15</sup> )	135 147	156 530
% BBP	22.7	26.3
<i>Debt</i>		
Total	347 065	368 448
% of BBP	58.4	62.0
<i>Pension premiums</i>	27 179	5 796

### *Problems*

As mentioned before optimal risk sharing between all generations means spreading risks over infinite generations, then the recovery time should be infinite. However, as explained, there may be continuity problems with intergenerational risk sharing: different perspective ex ante and ex post. Intergenerational risk sharing is a characteristic of pension funds, a bailout increases this intergenerational risk sharing. This increase in intergenerational risk sharing comes from the fact that the failure will be transferred to current and future active generations from the current retired. As soon as a pension fund needs saving to prevent failing we are ex post and it is clear which generations lose welfare; the “transfer generation”. Since this is a TITF policy it will only be implied in case of systemic failure. Hence it will affect a large part of or the entire pension fund sector and its participants. This may cause the “transfer generation” to resist this policy and the expansion of intergenerational risk sharing. A generation conflict may unfold because of these time inconsistent policies.

In case of excessive intergenerational risk transfer, the “transfer generation” will want to leave the pension fund. Westerhout (2011) points out that this generation may try to leave the mandatory pension funds by means of voting with their feet. In case of a systemic failure one has to move to another country to leave the failing pension fund sector. Immigrating to another country does not happen overnight. Hence this road is partly blocked.

Since this transfer to the young is a claim on future labor income, the “transfer generation” may reduce the labor supply (Mehlkopf, 2010). A decrease in labor supply and future labor income will also affect the economy because the younger generation can spend less.

It may also cause governing a board much more difficult since the interest of the employees differs within the group which will also cause governing problems. The interests of (former) employees will differ between generations. Generations that gain from a bailout will have a different opinion compared to generations that loose from this policy.

Moreover the mandatory participation may be at stake, since pension funds are only made compulsory when there is support for it. When the “transfer generation” becomes large

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<sup>15</sup> Note that we use in this table the term nett taxes as the taxes without the taxes paid over benefits paid to retirees of pension funds (of 0.4 billion).



this support may decrease and cause the pension fund to no longer be mandatory. When the pension funds are no longer quasi-mandatory the pension funds also fail. Even if the “transfer generation” is not able to prevent the mandatory participation them resisting this bailout will cause social unrest in addition to affecting the economy. Hence, the solution may come with the same problems as the problem started with.

Another problem arises with the second motivation of a government bailout, the returns on human capital. Indeed when the returns on human capital are higher than on financial capital, decreasing investments in financial capital and increasing investment in human capital increases the return. However, this decreases the diversification of risks. Furthermore there is a problem with changing back to investments in financial capital when the returns on financial capital increase and are higher than on human capital. The most explicit form of investing in human capital is a PAYG system, it cannot be changed into a funded system easily. This because in case of a change of PAYG to a funded system the active generation that is paying for the current retired, should also save for their own pensions. In other words this generation has to pay for two pensions. It is unlikely that a generation is willing to do this. Furthermore the active generation paying and saving for two pensions will harm the economy because the consumer spending will decrease. Hence it is unlikely that it is possible to change back to investing in financial capital. This is an issue that should be kept in mind when it is decided to invest in human capital.

For the bailout there are some other specific problems with the example of the described costs in the worst case scenario of all assets vaporizing. The numbers used to gain insight are only from one year: 2008. In the worst case scenario that all the value in a pension fund vaporizes these retirement payments have to be paid for many years. This means a permanent increase of taxes or decrease of other government expenditures or issuing a government debt for many years.

Transforming the second pillar into a type of PAYG system was feasible in 2008 in terms of cost. However, if this happens, the tool of the financial market via investment returns disappears. On top of that one should keep in mind the aging and longevity problems in the Netherlands. The number of active participants per retired participant will decrease in the future. Therefore the premiums paid to the pension fund will no longer be higher than the pension benefits paid. Hence in the future this solution will decrease the net income of labor for the active participants. Therefore this policy is may not be so easy to implement even if the picture of pension payments and pension premiums in 2008 have given a different view.

Furthermore the costs of a bailout can also come with other problems with respect to the government’s budget. The Netherlands is part of the Euro zone and therefore has to respect its agreements. One of the most important agreements is the Stability and Growth pact (SGP). Two important criteria in SGP are: the national debt is lower than 60 percent of the GDP (or approaching that value) and the annual budget deficit may not be higher than 3 percent of GDP. This restricts the government in its options if it wishes to save the pension fund sector.

A last remark concerning the described cost is the assumption that all other things are kept the same (*ceteris paribus*). However, this is not realistic, since this government policy cannot be viewed in isolation; it will have multiple influences. Nevertheless, assuming that all other things stay the same enables us to give a clearer overview. Furthermore there is one thing that we would like to highlight; the reason for failing. As was explained before, an important reason for the entire pension fund sector to fail is a systemic failure of financial institutions on the global financial market. The consequences of the financial market crashing will be appalling. It will affect the entire economic and social order. A systemic failure on the financial market also has an influence on social and economic stability. It should be noticed that if the reason of a systemic failure of pension funds is a failure of the financial market the consequences will be even larger. Furthermore in 2008, the government would have been restricted in its spending on pension funds also. The literature shows that there are many banks that are too important to fail and the banking sector is more interconnected, larger and less substitutable than the pension fund sector. Therefore it is realistic that if the government saves the pension fund sector they should also save the banking sector, which again increases the costs for the government.

*Is it a TITF policy?*

A bailout is a TITF policy since it can be used in case of systemic failure. The main motivation for a government bailout is intergenerational risk sharing and may be helpful with TITF failure, since it increases the intergenerational risk sharing characteristic of pension funds. The policy increases may therefore be welfare improving *ex ante*. However, *ex post*, when it is activated, this may no longer be the case. An increase in intergenerational risk sharing may cause a generation conflict. The “transfer generation” resisting the TITF policy might cause social and economic unrest. Therefore the policy may not solve the problem, it may just shift the origin of the unrest.

Table 6

<b>Saving vehicle</b>	<b>Too important to fail policy?</b>
Employer bailout	No
Guarantee fund	No
Relaxing the rules	Yes
Government bailout	Yes

3.2.2 Too big to save

The problems and costs that come with TITF policies may also cause pension funds being TBTS, as may be the case with banks. As Demirgüç-Kunt and Huizinga (2010) report the subsidies to the banking sector from the government may be limited by the state of public finances (Demirgüç-Kunt and Huizinga 2010). They examined this by using the funding costs as a measure to determine whether the bank is TBTS, however, this is not possible for pension funds. This is due to the structure and quasi-mandatory participation in the Netherlands, pension funds therefore do not have similar funding costs incorporating a default risk. Still,

the government bailout comes with explicit costs for the government. Therefore this bailout may indeed be limited by public finances. The example used in the section above, the costs of a government bailout in 2008, gave insight into this. What further limits the government as to the public finances is the reason for the systemic failure. If indeed the financial market failing causes pension funds failing, the costs for the government rising because of an economic set back due this failure on the financial market is highly likely. These extra higher costs will constrain the government even more.

Next to the limitation by public finances problems of TITF policies arise for pension funds, because of the character of TITF policies; increasing intergenerational risk sharing in pension funds. This is true for both temporarily relaxing funding rules and a bailout. The main problem is the ex post welfare. As stated before even if the policies are ex ante welfare improving because of risk sharing, ex post this does no longer have to be the case. Hence pension funds may be TBTS when the interests of generations become too diverse with respect to TITF policy. The policy may cause conflict between generations and therefore also come with social and economic unrest. Limiting the transfer between generations is a solution (Westerhout, 2011) that may also prove to be welfare improving also ex post. A way to limit the transfer between generations is by not saving the entire pension fund.

### **3.4 Preventing too important to fail**

Because of the problems that come with pension funds being TITF and the possible problems with TITF policies, the government may take actions to prevent pension funds from becoming TITF. For banks this may be done by downsizing so that they are not too big anymore or by decreasing the risk of failure. This is, however, not applicable to pension funds since we discussed that an idiosyncratic failure is not TITF but a systemic failure is. This suggests that the current setup of the sector and supervision in the Netherlands is able to prevent the belief that a single pension fund is TITF and will be saved in case of idiosyncratic failure. Hence extra arrangements to prevent TITF on an individual level are not needed. To prevent TITF failure a systemic failure of pension funds should be prevented.

The point that Acharya and Yorulmazer (2007) make for regulations on too many to fail, focusing on policies at a systemic level, is therefore applicable to pension fund regulation. Given the differences among countries there should also be systemic regulation on a national level for pension funds. The immediate cause of a systemic failure of Dutch pension funds is likely to come from a systemic failure of financial institutions on the financial market. Therefore there should also be supervision on an international level to prevent global systemic failure of financial institutions. The international supervision should supervise the global financial market since a crisis on the financial market spreads to national pension funds. More strict supervision on financial institution globally to decrease the risks of a global systemic failure and increase the transparency on products traded on the market will decrease the risk of a systemic failure of Dutch pension funds. Increasing transparency is important because when pension funds are better aware of the risks they run on investments they are better able to incorporate these risks.

For banks Living Wills were proposed to prevent banks from becoming TITF, this is relatively similar to recovery plans. They are both designed by the institution in case things go wrong. However, there is an important difference. Living Wills are developed before times of financial stress and recovery plans during times of financial distress. The largest effects from Living Wills are the ex ante effects (Avgouleas E. et al, 2010). When the plan is developed while the fund is failing, the ex ante effects are non existing.

Nevertheless, also an ex ante plan to deal with failure may be developed for pension fund similar to Living Wills. The IMF suggests ensuring that institutions will not be viewed as TITF and reinstate market discipline. The four elements suggested by the IMF<sup>16</sup> are also applicable to pension funds. As with the Living Will, these elements are already partly integrated by the recovery plans and the supervision on pension funds<sup>17</sup>. However, there is still room for improvement to prevent TITF failure even more. The third element of the IMF - enhanced transparency and disclosure requirements - should be improved ex ante. As explained above transparency should be increased on the investment level of pension funds, the financial market, but also within the pension funds transparency should increase. Mitchell (1987) found that many workers do not have sufficient knowledge about their pension provision. Misinformation and missing information are the main reasons for this lack of knowledge. The required uniform pension overview (UPO) provides participants with information on their pensions. Nevertheless, as the public debate showed, there is more need for information regarding the security of pension entitlements. There are two main points of misinformation. The first is that participants are not aware of the way pensions are invested in pension funds and the mismatch between assets and liabilities. Second, as explained above, risks are not allocated and therefore it is not clear which participant in a pension fund runs what risk. Hence participants are not aware of the risks and the possibilities of reducing pension entitlements and rights, that even exist in case of DB schemes. Therefore the transparency should be increased by allocating risks and providing more information on these risks. This ensures that it is clear who runs what type of risk (both negative and positive risk). However, there is the risk that the ex post consequences may be less strong because of time inconsistency. Avgouleas et al (2010) explain that in times of crisis the authorities may ignore the arrangements and behave as they see fit. This also holds for allocating the risks in a pension plan. Ex post authorities may decided to ignore these allocations. Still allocating the risks is important to increase transparency. Pension funds are TITF when their failure poses a significant risk to social and economic stability. When it is clear what risks all the participants in a pension fund run, social unrest due to negative risk is less likely to occur. More transparency will cause a failure to be less of a shock and therefore will cause less social unrest reducing the necessity of (ex post) too important to fail policies.

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<sup>16</sup> 1. More stringent capital requirements, 2. intensive and proactive supervision, 3. enhanced transparency and disclosure requirements and 4. effective resolution regimes

<sup>17</sup> Such as: the required funding ratio (1), already intensive supervision (2), pension funds are obliged to provide participants with a uniform overview of their pensions (3). And in case of a deficit (before failing) a recovery plan needs to be handed in (4).

### **3.5 Conclusion**

A pension fund fails when it has to reduce the pension entitlements and rights. The reason of failure is because the assets are lower than expected or the liabilities being higher than anticipated (or a combination). We focus on the first reason. This failure becomes TITF when it is a large systemic failure (multiple funds failing at once). The main motivation for the government to step in is to prevent economic and social unrest. There are two saving vehicles that fit TITF policies; temporarily relaxing funding rules and a bailout. These are TITF policies because both are useful in case of systemic failure. Both these policies increase the intergenerational risk sharing characteristic of pension funds. An important difference is that relaxing funding rules increases intergenerational risk sharing less and the past showed that this policy can be implemented easily. A bailout is similar to a bank bailout with the important difference that because of the long investment horizon of pension funds the assets do not have to be increased at once. Still the government may be restricted by the public finances. Furthermore, the problem with increasing intergenerational risk sharing too much is that it may cause a generational conflict which in itself will cause economic and social unrest. Since this is exactly what TITF policies wants to prevent it may cause the pension fund to be TBTS. Therefore arrangements to prevent a systemic failure are very important. There are two main prevention vehicles. The first is reducing the risk of a systemic failure on the financial market. The second is increasing transparency by means of allocating risks and providing more information about these risks.

## 4 Empirical analysis of too important to fail

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In chapter three we have discussed and analyzed possible TITF policies. This was based upon the assumption, derived from the literature, that an idiosyncratic failure is not a TITF failure. In this chapter we want to analyze this assumption empirically

An analysis of the literature on banks showed that for banks an idiosyncratic failure could indeed be a TITF failure. The incentives that came with this were excessive risk taking, excessive growth and low funding costs due to lower market discipline. Excessive growth and funding costs are not applicable to pension funds because of way Dutch pension funds are setup. So the only moral hazard that may be applicable to pension funds when an idiosyncratic failure is viewed as a TITF failure is excessive risk taking. If pension funds speculate that in case of an idiosyncratic failure they will be rescued, larger funds will take more risks. Large pension funds will be viewed as TITF rather than small pension funds, as one of the characteristics of TITF is size (IMF, 2011). Therefore, larger pension funds would take more risk if they anticipated on an idiosyncratic failure being TITF failure.

### 4.1 Hypotheses

When the investment risks a pension fund depends on size, it supports the view idiosyncratic failure may be viewed as TITF. Because size is a characteristic of TITF and a large pension fund is more likely to affect the social and economic stability than a small pension fund. Table 7 displays the hypothesis to test the relation between size and risk taking.

Table 7 Hypothesis

Hypothesis    H0: There is **no** difference in risk taking of pension funds dependent on size  
                  H1: There is **a** difference in risk taking of pension funds dependent on size

### 4.2 Data

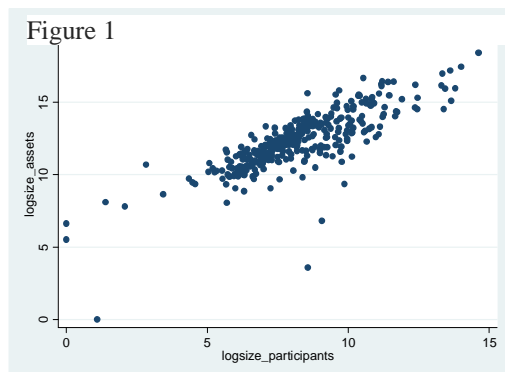
For the empirical analysis we use data from De Nederlandsche Bank (DNB). Dutch pension funds report regularly to DNB on funding level, asset allocation, assets under management and liabilities. Pension funds also report about the key characteristics of the beneficiaries. The status of the participants (active, retired or dormant member) is reported and also the age characteristics. The data used in this thesis are from 2010. The control variables are taken from the year 2009. When filtering for outliers, missing data and double counting we are left with 477 pension funds, out of the 514 pension funds in the whole sample. The number of pension funds used in the regressions depends on the availability of the dependent variables.

### 4.3 Methodology

We use Ordinary Least Squares regressions (OLS) for testing the hypothesis. We have to determine the dependent variable and independent variables for this hypothesis.

In the hypothesis we use the term ‘risk taking’. There are two variables that measure the level of risk taking. The first one is the allocation to risky investments. In this case risky investments are defined as 1 minus the allocation to bonds and cash. This captures all investments in equities, private equity, real estate, hedge funds, commodities etcetera. The second variable is the so called required funding ratio from the Financial Assessment Framework. The required funding ratio is based on the well-known Value-at-Risk (VaR) risk measure on a one-year horizon and a confidence level of 97.5%. This means that, theoretically, the required funding level is at least enough to prevent the assets from falling below the level of the technical provisions with a level of probability of 97.5% in the subsequent year. A pension fund that is taking more risks is required to have a higher funding ratio. Instead of the first dependent variable the second one also takes into account any interest rate hedging pension funds have in place.

For the variable size we use the total assets rather than total participants. However, note that assets and participants are strongly and positively related as shown in Figure 1. The



dependent variable used for size is log assets. Because the relation between risk taking and assets does not have to be linear we have added the square of log assets. To enable us to draw conclusions we need variables to control for other effects that might influence the relation. In total there are five variables next to the log assets and squared log assets. These control variables are average age, funding ratio, reinsurance, occupational pension fund and industry pension fund. The last three variables are all three dummy variables. The reinsurance variable is a dummy for whether a pension fund is reinsured. We define this as at least 2/3 of their liabilities reinsured. Hence a reinsured pension fund does not have to mean that they are fully reinsured. A fully reinsured pension fund is fully reinsured by means of a guaranty contract; this type of contract covers all the risks. Therefore we define full reinsurance as all liabilities insured in a guarantee fund. A fully reinsured pension fund has no risky investments since all risks are insured. We assume that the insurance company is working properly and not defaulting on its commitments. Hence the part that is reinsured is risk free. The two other dummy variables, occupational and industry pension fund are variables to control for the effect which the type of pension fund has on risk taking. Table 8 gives an overview of the discussed variables in the regression.

Table 8 variables in OLS regression

	<b>Model 1</b>	<b>Model 2</b>
<b>Dependent variable</b>	Risky investments	Required funding ratio
<b>Independent variable</b>	Log assets	Log assets
	Square log assets	Square log assets
	Average age	Average age
	Reinsured (dummy)	Reinsured (dummy)
	Occupational pf (dummy)	Occupational pf (dummy)
	Industry pf (dummy)	Industry pf (dummy)
	Funding ratio (FR)	Funding ratio (FR)

From the literature there are some expectations we have regarding the independent variables. As already explained it is expected that size does not have an influence on risk taking since we examine an idiosyncratic failure. Furthermore average age is expected to have a negative influence on risks. A pension fund with on average older participants has less time to overcome failure since the average payment of pension entitlements is on a shorter time horizon. Such a pension fund may choose a risk adverse investment strategy. The expectation of the independent variable reinsured is negative for risk taking. Since we assume that the insurance company will hold their commitments, a reinsured pension fund will face less risk. The effect of the type of pension fund is ambiguous, as we know that only in corporate pension funds an employer bailout is a possibility. However, as we discussed in section 3.3.1 it is unclear whether a corporate pension fund will find it beneficial to rescue its pension fund. Therefore it is ambiguous if corporate pension funds will anticipate on this failure and take more risks. Nevertheless, we are able to say more about the expectations of the type of pension fund. Since only a corporate pension fund can bailout its pension fund we expect that, if there are differences between types of pension fund, occupational and industry funds will take less risk. The funding ratio is expected to have a positive effect on risk. Because a pension fund with a higher funding ratio has more buffers and is therefore able to take more risk.

Furthermore, when running an OLS there are certain requirements. One of these requirements is exogeneity. Exogeneity means that the independent variables are uncorrelated with the error term in the regression. A variable is exogenous when it is set externally and changes from external forces and is not caused by another variable in the model. However, in this OLS there might be endogenous independent variables which would make the regression biased. For example, the risky investments may influence the funding ratio, causing this independent variable to be endogenous. To overcome this endogeneity problem we delay the independent variables by one year. The independent variables are therefore from 2009 (lagged variables) while the dependent variables are of 2010. Another implication of an OLS regression is homoskedasticity, meaning that the errors have a constant variance that is conditional on the explanatory variables (Wooldridge, 2009). We use a Breusch-Pagan test to test for homoskedasticity. The null hypothesis in this test is that the residuals are homoskedastic. If we have to reject the null hypothesis it means that the regression is not homoskedastic. In that case we use the robust standard errors, as they can overcome the



heteroskedastic problem. If we cannot reject the null hypothesis we assume the regression to be homoskedastic and we may use normal standard errors. We will analyze the dependent variables

In summary we will run two OLS regressions, since we have two dependent variables. These dependent variables are from 2010, while the independent variables are from 2009. Furthermore we will test for homoskedasticity by means of a Breusch Pagan test.

#### 4.4 Results

This section explores the results from the regressions; Table 9 contains the results discussed. We conducted the Breusch Pagan test for both regressions. We can reject the null hypothesis with a confidence level of 95 percent but not with a confidence level of 99 percent. Therefore we explore both regression with normal and robust standard errors<sup>18</sup>.

Table 9<sup>19</sup>

	(1)	(1) robust	(2)	(2) robust
Log assets	3,429 (3,344)	3,429 (4,502)	-0,329 (1,384)	-0,329 (1,947)
Squared log assets	-0,012 (0,130)	-0,012 (0,168)	0,037 (0,054)	0,0369 (0,074)
Average age	-0,238*** (0,088)	-0,238** (0,100)	-0,247*** (0,036)	-0,247*** (0,038)
Reinsured	-3,770* (2,009)	-3,770** (1,842)	-1,385* (0,832)	-1,385 (0,923)
Occupational	0,952 (3,928)	0,952 (3,044)	-0,436 (1,626)	-0,436 (1,195)
Industry	-2,396 (1,776)	-2,396 (1,857)	-1,434* (0,735)	-1,434** (0,712)
FR2009	0,150*** (0,041)	0,150*** (0,040)	0,070*** (0,017)	0,070*** (0,020)
cons	-6,753 (22,623)	-6,753 (29,863)	118,523 (9,364)	118,523 (12,864)
Breusch Pagan (P>chi2)	5.88** 0.0153		6.07** 0.0138	
n	333	333	333	333
R2 (adjusted R2)	0.21 (0.19)	0.21	0.17 (0.15)	0.17

<sup>18</sup> The regressions and Stata tables of those regressions may be found in Appendix C.

<sup>19</sup> (1) risky investments, (2) required FR. Significance is denoted as follows: \*\*\* p<0.01, \*\* p<0.05, \*p<0.1

The key observation is that size does not have a significant effect upon risk taking of pension funds. We cannot reject the null hypothesis. Size is not significant for any of the four regressions, as shown in Table 9.

Average age does have a significant effect on risk taking; it has a negative influence on risk taking; when the age increases risk taking decreases. In case the of the dependent variable required funding ratio the effect of average age is larger than in case of risky investments. However, for both dependent variables the t-value is relatively large.

Reinsurance also has a negative influence on risk taking. For all the regressions it is the case that when a pension fund is reinsured the risk decreases. For the first three regressions it is a significant effect but not for the last one. However, since three out of four regressions show a significant effect and all regressions show a negative effect we conclude that reinsurance reduces risk taking.

The type of pension fund does probably not have an effect on risk taking. This is because of the dummies on type; only the dummy industry pension fund has a significant effect when the dependent variable is the required funding ratio. The dummy for occupational pension fund does not have any significant effect nor does the dummy industry when the dependent variable is risky investments. Therefore the type of pension fund probably does not affect risk taking.

Furthermore, the funding ratio has a significant positive effect on both measurements of risk taking. This indicates that pension funds with higher funding ratios take more risks. Table 10 provides a short overview of the results.<sup>20</sup>

Table 10 overview results

1. Larger pension do not take more risk
2. Older pension funds take less risk
3. Reinsured pension funds take less risk
4. Type of pension fund does probably not affect risk taking
5. Pension funds with higher funding ratios take more risk

**4.5 Conclusion**

We conclude that large pension funds in the Netherlands do not take more risk. This indicates that pension funds themselves do not anticipate on being rescued more likely when they are larger. The results indicate that the market does not anticipate on an idiosyncratic failure being a TITF failure, which is in line with the theoretical framework. It also suggests that current supervision and policies are able to prevent individual funds from being viewed as TITF. This is important information with regard to determining policies and supervision on pension funds concerning TITF.

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<sup>20</sup> Moreover, we also run the regression using participants as size, this gave similar results to using assets as size.

## 5 Conclusion & further research

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This chapter will conclude this paper and give policy recommendations. Furthermore it points out suggestions for further research.

### 5.1 Main conclusion and policy recommendations

Failure in case of pension funds arises when a pension fund reduces pension rights and entitlements. The empirical result in this paper supports the theoretical framework and therefore we conclude that pension funds are only TITF in case of a systemic failure and not in case of an idiosyncratic failure. This suggests that the current setup of the sector and supervision is able to prevent idiosyncratic failure from being perceived as TITF. Therefore, we may conclude that of the four possible saving vehicles - bailout by the company, a pension guarantee fund, temporarily relaxing funding rules and a bailout by the government - only the last two are actually TITF policies. The main motivation for these policies is preventing social and economic unrest.

These two TITF policies both increase the intergenerational risk sharing within pension funds. Temporarily relaxing funding rules gives pension funds more time and prevents failing in the short term. It is a fit policy to spread a one-time shock. In case of fundamental problems it may also be useful; it gives pension funds extra time to solve their fundamental problems. Although it is easy to implement, this policy in itself does not solve these problems. It stretches intergenerational risk transfers and may result in a conflict between generations. The “transfer generation” will resist the TITF policy since they have to transfer wealth to other generations. This resistance may cause social and economic unrest after all. Since the main motivation for a TITF policy is preventing this unrest, this policy may not solve the problem; it just shifts the origin of the unrest. Limiting the transfer between generations is a solution (Westerhout, 2011) that may prove to be welfare improving, also ex post, and therefore prevent the intergenerational conflict. Concrete examples may be letting funds fail partly and be saved partly: hence the costs are shared between all current and future generations. This may also indirectly happen by bailing out the fund and increasing taxes that the retired have to pay.

Because of the problems that may come with the ex post TITF policies we recommend that the focus of supplementary policies should be on preventing systemic failure. The most important prevention measure is increasing transparency and supervision. First, transparency and supervision on financial institutions that trade on the global financial market should be increased. Dutch pension funds invest much of their assets in other financial institutions. Therefore it is important that the risks of a systemic failure on the financial market, possibly causing a systemic failure of Dutch pension funds, decrease. Of course supervision cannot prevent systemic failure on the financial market, but, it can decrease the risk of this failure. Furthermore it is important that the enhanced supervision also focuses on increasing transparency of products of financial institutions traded on the financial market. This to ensure that pension funds are better aware of the risks of the products they invest in. This will enable pension funds to better incorporate and internalize the risks they run. Second,

transparency for participants of pension funds should be increased by means of increasing disclosure to all the stakeholders of the pension funds about the risks they are exposed to. When it is clear to all the participants in a pension fund what the risks are, social unrest due to negative risks is less likely to occur. More transparency will cause a failure to be less of a shock and therefore will cause less social unrest reducing the necessity of (ex post) too important to fail policies.

## 5.2 Final remarks

Additional research needs to be done to get a more detailed understanding of the subject. A useful extension is to calculate the bailout costs in different scenarios of declining assets. Also the timeframe of these calculations could be expanded. In this paper the costs of failing in 2008 for the year 2008 were calculated. It would also be valuable to estimate the costs in future years with the use of estimations of longevity and aging. Furthermore, the empirical analysis could be expanded by increasing the years. The risk taking of pension funds should be examined for multiple years. It is also important to take into account the risks the reinsured assets of pension funds run. Now we assumed that insurance companies work properly and do not default on their commitments. When incorporating the risks of the insurance companies defaulting on their commitments we can give an even better insight in the risks a pension fund runs.

Another interesting and important perspective to incorporate in this research is the political aspect. Since politicians are part of the decision making process in case of failing pension funds, especially when it comes with a public debate and social unrest. The agreement for restructuring pension funds<sup>21</sup> led by the minister of Social Affairs, shows this involvement. This indicates that politics also influence the process in case of failure of pension funds. It was beyond the scope of this research to examine this influence. Nevertheless, it is possible that politicians may have different interests than the economy alone. Hence it may be beneficial to extend this research with the interest of politicians in the matter of failing or saving of pension funds.

An important conclusion of this paper is to further enhance global supervision of institutions managing large asset pools. This can be done, amongst others, by means of more proactive supervision, increasing transparency, more stringent capital requirements. However, it was beyond the scope of this paper to fully analyze the possibilities to enhance supervision on these institutions.

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<sup>21</sup> Introduction

## References

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# Appendix A

## Dutch pension system

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The Netherlands has one of the largest pension systems in the world, capital relative to GDP (Tower Watson, 2011). It consists of three pillars; state pension, occupational pensions and private pension provisions. The Netherlands has a three pillar system. The first pillar is the state pension (AOW) to prevent poverty. It provides a basic income for people above 65 who have either lived or worked in the Netherlands between age 15 and 65. This is a pay-as-you-go (PAYG) system: contributions by the current workforce are used to pay the benefits to the current retirees. If this is not enough to pay all retirees at a certain point in time, it will be paid out of general tax income. The second pillar consists of pension rights that are part from terms of employer. These are funded collective pension schemes and pension funds and insurance companies administer these schemes. We will focus on pension funds that administer the second pillar pensions; occupational pensions. This is a large and important sector in the Netherlands; the invested capital of pension funds was 745 billion in 2010 (DNB, 2011), which is approximately 126 percent of GDP<sup>22</sup>. The pension benefits received from pension funds counted for 8.1 percent of the total income of the Netherlands (CBS Statline). Furthermore data from CBS shows that replacement rate<sup>23</sup> of pension entitlements in the second pillar was, for residents aged fifteen to sixty-five, 38 percent in 2008. This shows that pension funds and their payouts have a huge impact on society. Furthermore, there is the third pillar, the voluntary individual pension schemes.

Since pension funds are part of the second pillar, the collective pension schemes, we will discuss this more detailed. Most pensions in this pillar are managed by pension funds, there were 514 in 2010 (DNB, 2011). There are three types of pension funds; occupational, corporate and industry pension funds. The first is for independent professionals such as dentists. A corporate pension fund is for a single company. The last type, industry, is for an entire sector such as the construction sector. All types are non-profit and are legally independent from the companies. Next to pension funds, insurance companies may also administer the pensions in the second pillar.

There is a quasi-mandatory participation with regard to pension funds. There is no law that obligates to become a participant of a pension fund. Nonetheless, if the social partners decide that they will provide a pension scheme, the government can make a pension fund mandatory for an entire sector or a profession. If a company is not part of such an industry or occupational pension fund, it can opt for a corporate pension fund or an insurance company. The participation in a pension scheme is part of employment agreement.

A board of trustee's governance the pension fund, this board consists of representatives of employers and employees. Since pension funds are non-profit organizations they only have to act in the interest of the two groups that pay premiums.

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<sup>22</sup> GDP in the Netherlands was 590.1 billion euro in 2010 (CPB)

<sup>23</sup> Pension entitlements as a percentage of current income.

Both employers and employee pay premiums to the pension fund in name of the beneficiary. The distribution of payment is agreed upon in labor agreement, in general the distribution is 2/3 employer and 1/3 employee. These paid premiums are invested and paid when the participant retires. The relation between premiums and benefits depend on the type of fund. There are three types of pension schemes; defined benefits (DB), defined contribution (DC) and hybrid schemes. Currently in the Netherlands most pension schemes are defined benefits (DB) with some hybrid aspects such as non-required indexation.

The premiums paid will be invested and used to pay the pension entitlements once someone is retired. Pensions are paid every month when people are retired; it is deferred income. A participant is not able to receive his pension entitlements at once as a lump sum payment. Hence, pension funds have long time horizons when investing since they only have to start paying entitlements at the retirement age and then not all at once but spread over time. The only possible capital transfer that is possible is to another pension fund which takes over the wealth and will pay the pension entitlements once the participant retires. Furthermore this transfer is only allowed in case that the pension fund transferring the capital to another pension fund is perceived to be healthy.

The premiums paid to the pension fund are exempted from income tax, there is however a tax claim on the pension payments. Hence when one retires and receives his pension it has to pay income tax over the second pillar pensions. However, this second pillar pension taxes are exempted from taxes used to pay the first pillar pensions.

Solidarity and risk sharing are important factors in the collective supplementary pension schemes. Solidarity is shown in the contributions to the pension fund; they are the same for all participants the same (same percent of wage). There is no distinction made based upon age, gender or medical status when determining the premium. Since pension funds are insurances for income when old, risk sharing is an important factor. Intergenerational risk sharing is the main type.

Two regulators are in place which monitor pension funds, the Authority for Financial Markets (AFM) and DNB. The AFM monitors behavior of financial institutions, including pension funds. DNB have supervision on the financial position of pension funds and also monitor pension fund governance. Governance monitoring is done via the Guidelines for Pension Fund Governance. They relate to the governing body, accountability, internal supervision and directly insured schemes. In this paper we will focus on the financial status of pension funds.

The Financial Assessment Framework (FTK), part of the pension act, lays down financial requirements (DNB website). We will discuss the requirements of most interest for this paper. Valuation of both the investments and obligations are on the basis of market value. Furthermore FTK obliges cost-effective contributions. Also the own funds of pension funds are discussed. A pension fund should have enough own funds to ensure that the pension fund investments will not be lower than the provision within one year, with 97.5 percent confidence. This is the minimum of required own funds. If their own funds are lower than the required own funds a pension fund has either a reserve deficit or a funding deficit. In case of a reserve deficit the own funds are below the required own funds but above the minimum (this

is when a funding ratio is below approximately 125 percent). The DNB requires these funds to hand in a recovery plan that consist of a long term plan to ensure that within 15 years this reserve deficit disappears. When the own funds of a pension fund even fall below minimum requirement we speak off a funding deficit (this is when a funding ratio is below approximately 105 percent). A pension fund then also has to hand in a recovery plan, the difference is that this should also include a plan to ensure that the funding deficit disappears in three<sup>24</sup> years. If, even the recovery plan is not able to reduce the funding deficit and the pension fund is not able to increase the funding ratio without disproportional harm one type of beneficiary (active, passive or retired) or the employer the pension entitlements and rights should be decreased.

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<sup>24</sup> In 2009 this increased to five years because of extreme economic circumstances (DNB, 2010).

# Appendix B

## Pension guarantee funds in different countries

The three countries described are the US, UK and Switzerland. They all have, as the Netherlands, many assets in their pension funds relative to their GDP. The three will be shortly discussed to give insight in how other countries (that are relatively similar to the Netherlands) have designed these guarantee funds.

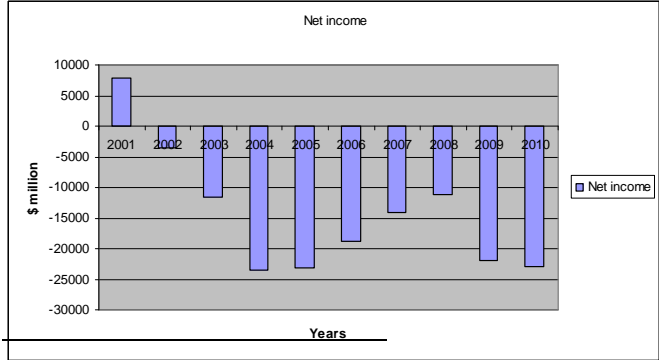
### The US

The US has a guarantee fund for its pension funds with assets equal to 104% of GDP in 2010 (Tower Watson, 2011). Since 1974 the Pension Benefit Guarantee Corporation (PBGC) is in place to protect pension benefits in defined benefit plans<sup>25</sup>. This is a mandatory insurance program (Boyce and Ippolito, 2002) that will pay the benefits to participants when a plan terminates without sufficient assets to pay all benefits. When this happens the PBGC will take on all assets and liabilities of the plan. The benefits paid are limited to a maximum set by law. An important reason for PBGC to take over a fund is in case an employer goes bankrupt. A series of corporate failures preceded this guarantee fund.

The PBGC needs income to finance its operations. This is done via premiums, investment income, trustee assets and recoveries from companies that were responsible for the plans (PBGC website). These premiums are set by Congress and consist of three types; a flat-rate premium, a variable-rate premium and a termination premium. The first is a per participant premium that a plan has to pay yearly. The second premium only has to be paid by underfunded single-employer plans. The last premium has to be paid by certain sponsors of terminating plans. They are required to pay this annual premium for three years after their plan terminates.<sup>26</sup>

However, the income of this explicit guarantee is not enough. The annual report of 2010 shows a deficit of 23.03 billion USD. And as Figure 2 shows 2001 was the last year that the PBGC had a surplus.

Figure 2 Net income of PBGC 2001-2010 (PBGC, 2011)



<sup>25</sup> The PBGC guarantees pension benefits of more than 29 000 plans with more than 44 million participants. Currently it pays or owes pension benefits from 1.5 million people (PBGC website)

<sup>26</sup> PBGC Website

## The UK

Since April 2005 the UK also has an explicit guarantee for pension funds in the form of the Pension Protection Fund (PPF). The total assets in pension funds in 2010 were according to Towers Watson (2011) equal to 101 percent of GDP. The PPF provides insurance to participants in defined benefit pension schemes and defined benefits elements in hybrid schemes. In case of insolvency of the employer and when there are insufficient assets in a scheme PPF will compensate participants. In this case the assets and liabilities will be taken on by the PPF. Furthermore the board of PPF also runs the Fraud Compensation Fund (FCF). The FCF will compensate all occupational pension schemes in case a pension fund has financially lost out due to dishonesty and the employer is insolvent (PPF website).

To enable PPF to compensate when necessary it needs income. It has several sources of income, the main are; pension protection levy, investment returns, assets and recoveries of schemes transferred to PPF. The pension protection levy consists of two parts. The first part is the scheme-based levy which is based upon the liabilities of a scheme to its participants. Second there is the risk-based levy that as the name says takes into account risk. There are two types of risks the insolvency risk and underfunding risk.

However, the income of the PPF is not always enough to meet all liabilities. The annual report of 2009/2010 (PPF, 2010) shows a surplus for the first time since PPFs establishment.

## Switzerland

In Switzerland the invested assets of pension funds were 126 percent of GDP in 2010 (Tower Watson, 2011). The LOB guarantee fund (in German: Sicherheitsfonds GVB) subsidizes benefit schemes with unfavorable pension schemes. Furthermore it protects the benefits schemes when their assets can no longer meet its liabilities (GVB website). Swiss pension funds are also insured by this guarantee fund. It guarantees the claims on occupational benefits for insured persons. Stationary benefits are guaranteed fully. Regulatory benefits are guaranteed up to a certain ceiling depending on wage. The LOB is mandatory for most employees. Employees that earn below a certain amount are not required to join their employer's pension scheme and are therefore also not required to be insured by LOB. However, they may do so voluntarily. The same holds for self-employed.

Pension funds pay a contribution to the LOB for the insurance it provides. Since 2000 all pension funds that are governed by the Vesting Law pay contributions. 2000 was also the last year where the fund had a negative reserve. Since 2001 the revenues have always exceeded the expenditures and therefore the fund reserves have been steadily increasing the last ten years (annual reports 2000-2010, GVB 2001-2011).

Furthermore the guarantee fund for underfunded pension funds is often used. In 2010 the insolvency cases were 1988 cases in total of which 1429 were made by collective and communal pension funds (GVB, 2011). Finally, the government also stated that the motivation for this bail out was a feeling of responsibility as owner of the stocks of the company and former employer. Therefore we do not view this as a rescue in a TITF context.

# Appendix C

## Regressions

### Regression 1: Risky investments

Risky investments<sub>i2010</sub>

$$= \beta_0 + \beta_1 \log assets_{i2009} + \beta_2 sqlog assets_{i2009} + \beta_3 average\ age_{i2009} + \beta_4 reinsured\ dummy_{i2009} + \beta_5 occupational\ dummy_{i2009} + \beta_6 industry\ dummy_{i2009} + \beta_7 funding\ ratio_{i2009} + \varepsilon_{i2009}$$

Source	SS	df	MS	Number of obs = 333		
Model	12549.8901	7	1792.84145	F( 7, 325)	=	12.34
Residual	47206.2456	325	145.249986	Prob > F	=	0.0000
				R-squared	=	0.2100
				Adj R-squared	=	0.1930
				Root MSE	=	12.052
risky_perc~t	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logsize_as~s	3.429415	3.343674	1.03	0.306	-3.148562	10.00739
sqlogsize_~s	-.0116908	.1297385	-0.09	0.928	-.266924	.2435424
average_age	-.2376956	.0875772	-2.71	0.007	-.4099853	-.0654058
Reinsured2	-3.769746	2.009412	-1.88	0.062	-7.722843	.1833508
occupation~f	.9517928	3.928483	0.24	0.809	-6.776672	8.680258
industry~f	-2.39584	1.776381	-1.35	0.178	-5.890497	1.098818
FR2009	.1502442	.0414461	3.63	0.000	.0687077	.2317807
_cons	-6.75281	22.62327	-0.30	0.766	-51.25935	37.75373

### Regression 1, Breusch Pagan test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

H0: Constant variance

Variables: fitted values of risky\_percent

chi2(1) = 5.88

Prob > chi2 = 0.0153

### Regression 1, robust

Linear regression

Number of obs = 333

F( 7, 325) = 13.18

Prob > F = 0.0000

R-squared = 0.2100

Root MSE = 12.052

risky_perc~t	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
logsize_as~s	3.429415	4.502135	0.76	0.447	-5.42759	12.28642
sqlogsize_~s	-.0116908	.1675467	-0.07	0.944	-.3413037	.3179221
average_age	-.2376956	.0998756	-2.38	0.018	-.4341798	-.0412114
Reinsured2	-3.769746	1.841719	-2.05	0.041	-7.392941	-.1465514
occupation~f	.9517928	3.043634	0.31	0.755	-5.035917	6.939503
industry~f	-2.39584	1.857497	-1.29	0.198	-6.050074	1.258395
FR2009	.1502442	.0400201	3.75	0.000	.0715131	.2289754
_cons	-6.75281	29.86321	-0.23	0.821	-65.50241	51.99679

Regression 2: Required funding ratio

Required  $FR_{i2010}$

$$= \beta_0 + \beta_1 \log assets_{i2009} + \beta_2 sqlog assets_{i2009} + \beta_3 average\ age_{i2009} + \beta_4 reinsured\ dummy_{i2009} + \beta_5 occupational\ dummy_{i2009} + \beta_6 industry\ dummy_{i2009} + \beta_7 FR_{i2009} + \varepsilon_{i2009}$$

Source	SS	df	MS	Number of obs = 333		
Model	1666.85388	7	238.121983	F( 7, 325)	=	9.57
Residual	8086.83784	325	24.882578	Prob > F	=	0.0000
				R-squared	=	0.1709
				Adj R-squared	=	0.1530
				Root MSE	=	4.9882

FR_req_per~t	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logsize_as~s	-.3290402	1.383928	-0.24	0.812	-3.051629	2.393548
sqlogsiz~ets	.0369487	.053698	0.69	0.492	-.0686909	.1425883
average_age	-.2474074	.0362477	-6.83	0.000	-.3187171	-.1760976
Reinsured2	-1.385135	.8316847	-1.67	0.097	-3.0213	.2510302
occupation~f	-.4356247	1.625977	-0.27	0.789	-3.634394	2.763144
industry~pf	-1.434396	.7352344	-1.95	0.052	-2.880815	.0120236
FR2009	.0701123	.0171543	4.09	0.000	.0363648	.1038598
_cons	118.5232	9.363647	12.66	0.000	100.1022	136.9443

Regression 2, Breusch Pagan test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

H0: Constant variance

Variables: fitted values of FR\_req\_percent

chi2(1) = 6.07  
 Prob > chi2 = 0.0138

Regression 2, robust

Linear regression

Number of obs = 333  
 F( 7, 325) = 8.80  
 Prob > F = 0.0000  
 R-squared = 0.1709  
 Root MSE = 4.9882

FR_req_per~t	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
logsize_as~s	-.3290402	1.947251	-0.17	0.866	-4.159849	3.501768
sqlogsiz~ets	.0369487	.0740036	0.50	0.618	-.1086379	.1825353
average_age	-.2474074	.0376269	-6.58	0.000	-.3214303	-.1733844
Reinsured2	-1.385135	.9227683	-1.50	0.134	-3.200488	.4302181
occupation~f	-.4356247	1.195497	-0.36	0.716	-2.787513	1.916264
industry~pf	-1.434396	.7119996	-2.01	0.045	-2.835105	-.0336861
FR2009	.0701123	.0202695	3.46	0.001	.0302363	.1099883
_cons	118.5232	12.8636	9.21	0.000	93.21682	143.8297