Master Thesis Finance

The impact of the financial crisis on the individual risk tolerance level of an investor

How is the relationship between risk tolerance and demographic factors affected by the crisis?

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Abstract

This research investigates the relationships between the subjective risk tolerance level and eight demographic characteristics of investors for the years 2006, 2008, 2010 and 2012. By comparisons between the various years, there can be determined whether the risk tolerance has actually dropped by the effects of the financial crisis as it is claimed and which demographic factors affect this change in attitude towards risk. This study uses data from the DNB Household Survey and the ordered probit method is used because the dependent variable risk tolerance is measured on an ordinal scale. Based on the findings from the different regressions, it can be concluded that only the variables gender, education and income have a significant influence on the individual risk tolerance in several years. Both men and women become more reluctant in taking risks, but men continue to tolerate more risks than women. In addition, higher educated take less risk than lower educated during the crisis and there is a negative relationship between risk tolerance and income. However, respondents with higher income levels take slightly more risks during the crisis than in times of economic growth compared to respondents with lower income levels. Moreover, it is interesting to note that the demographic characteristics age, marital status and accommodation are only significant in the base year 2006. An explanation for this may be that respondents do not have a clear investment pattern during the financial crisis.

Keywords: Risk tolerance, Demographics, Financial crisis, Investment

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1. Introduction

It is alleged that the individual risk tolerance level of investors or the investor's attitude regarding the acceptance of risk has changed in recent years by the many uncertainties in the financial markets and the lower returns that are achieved (Hoffman & Post, 2013). If this is assumed, it is plausible that both risk tolerant investors as risk adverse investors are less willing to take risks, because they are both hit by the effects of the financial crisis. The stock prices are significantly reduced allowing the value of the portfolio and therefore the return of risk tolerant investors is considerable lower than expected. Additionally, risk adverse investors thought to have safely stored their savings at high interest rates, for example in Icesave, an Icelandic bank, and at the DSB bank, a Dutch bank. However, the banks could no longer fulfill their obligations in October 2008 and October 2009 respectively and therefore they were declared bankrupt. The savings were reimbursed up to an amount of €100,000 which means that investors with more than €100,000 in savings have lost a lot, while it seemed a risk free investment (Danielsson, 2008; Steen, 2009).

The degree of risk tolerance is affected by both own experiences as the general economic situation. The investment choice can be based on previously obtained results; investors are more risk tolerant after profits and more risk averse after losses, and based on the perceived risks in the area. In case of the latter one can think of the probability of dismissal. During periods of crisis, the risk of dismissal increases for everyone and this can have a negative impact on the risk tolerance level, since investors must be able to bear the losses of an investment. As a precaution, investors take less risk in making investments. Therefore, it is important to know the risk profile of investors and the changes in the attitude towards risks so that the expected rates of return of the investments are in line with the actual achieved results. In this study, it is investigated whether the individual risk tolerance level of investors has actually been changed by the financial crisis of 2008 and which demographic factors affected this attitude. Researchers such as Roszkowski and Davey (2010), Hoffmann, Post and Pennings (2011) and Guiso, Sapienza and Zingales (2013) have also examined the changes in risk tolerance by the crisis and have concluded that the risk tolerance of investors has declined or the risk aversion has increased due to the many uncertainties in the markets. However, they have primarily made a distinction between risk tolerance and risk perception and have not used demographic characteristics of respondents.

The first signs of deterioration of the global economy were noticeable in December 2007 when the housing market collapsed in the United States. Many Americans could no longer pay the monthly

mortgage payments, whereby major mortgage banks such as Fannie Mae and Freddie Mac nearly went bankrupt ("Economische crisis", n.d.). The consequences were not limited to the Unites States; due to the strong connectedness between international financial markets, the banks in Europe and Asia were also struggling with financial problems in the course of 2008. Although the central banks have reduced interest rates and the stock prices have declined significantly, there was less invested because the confidence in the economy for both companies and individual investors was diminished by the economic and political uncertainties in the market. In addition, consumers have quickly changed their behavior and lifestyle in which they spend less money and consequently this would have negative impacts on business. As share issuing companies earn lower profits, they are forced to dismiss employees and to reduce the returns for individual investors in order to avoid bankruptcy. Investors receive a lower return than expected and therefore they become more reluctant. It is difficult to break the vicious circle, because the credit crisis has developed into a broad economic crisis and it has also reached the Netherlands several years ago. To restore the situation in the market, the confidence in the market must be recovered.

Because investors have little confidence in the market, it is assumed that individual investors will invest less, or even sell their existing shares. However, the purpose of investments remains the same; individual investors invest to generate a higher return or wealth and not to solve financial problems. By taking risks, higher returns can be achieved since risk-taking is rewarded. However, the negative effects of taking risks can be calculated by virtue of the product of the probability and the impact of an event. No matter how small the risk or impact is, the investors must be financially able to bear the consequences. The amount of risk that investors want to bear depends on the background characteristics and thus on the risk tolerance level (Linciano & Soccorso, 2012). On the one hand, risk tolerant investor will probably invest more in risky assets, assets whose future returns are uncertain, such as stocks of new companies. On the other hand, an investor with a low risk tolerance level, a risk adverse investor, will mainly invest in stable stock and/or high graded bonds such as Treasury bonds. These bonds are considered as risk free assets because there is practically no default risk and therefore actual return will be almost equal to the expected rate of return.

In this research, objective or demographic factors are used to accurately estimate the individual risk tolerance level of investors because risk tolerance is a subjective variable. The relationships between risk tolerance and the demographic factors age, gender, marital status, education, income, accommodation, primary occupation and the sector in which the respondent is employed are explored by using an ordered probit regression. Many of these factors are already used in existing studies to predict the risk tolerance level. However, since there is often no consistent relationship between the

independent demographic variables and the dependent variable, the relationships are re-examined. Furthermore, in this study comparisons are made between the years 2006, 2008, 2010 and 2012 in order to establish the impact of the financial crisis on the risk attitude. Firstly, it is examined if the investor's risk tolerance actually has decreased during the crisis. Secondly, it is determined which demographic factors affect the risk tolerance level of an investor and whether the factors change if the financial crisis persists even longer. This study makes use of data collected by the DNB Household Survey (DHS); an independent panel at CentERdata at the University of Tilburg which contains a representative sample of the Dutch-speaking population of the Netherlands.

The remainder of this paper proceeds as follows. Chapter 2 describes the different types of risks of investing, the relationship between risk and return and the different investment strategies. Chapter 3 presents a literature overview of previous research of the relationships between risk tolerance and demographic factors. Furthermore, the hypotheses of this study are formulated. The next chapter contains the empirical research with data description and it checks whether there actually is a difference between the risk tolerances of respondents across several years. Chapter 5 illustrates based on the ordered probit regressions which demographic factors affect the risk tolerance and finally, the conclusions are drawn and recommendations are given.

2. Background information of investments

Due to the financial crisis, it is expected that investing becomes riskier because of the large economic and political uncertainties in the market. Therefore, risk management is becoming increasingly important and is it essential to identify all risks of an investment and to accept or to reduce the uncertainty in decision-making. The purpose of risk management is not to reduce fluctuations in cash flows or value, but it provides protection against possible negative and overvalued investments that can cause financial problems for companies or individual investors (Stulz, 1996). This paper focuses only on the negative outcomes for individual investors caused by economic uncertainties such as interest rate risk, default risk, inflation risk, business risk and valuation risk.

2.1. Different kinds of risks

2.1.1. Interest rate risk

The first economic uncertainty of investing, that is discussed, is interest rate risk. Interest rate risk is the possibility that the value of an investment changes due to a change in interest rates. In theory, there is an inverse relationship between the changes in interest rates and the price of securities meaning that when interest rates fall, the value of the security will rise and vice versa (Duffee, 1998). The economic situation affects the level of the interest rates and therefore it has an indirect impact on the stock price. For example, the American National Bank (ANB) and the European Central Bank (ECB) have lowered interest rates several times since the financial crisis of 2008 to encourage investments and to avoid a major growth slowdown in the world economy (Verdanov, 2009). If the interest is low, it is more attractive for individual investors to borrow money for investments because it is cheaper than in periods of high interest rates. In addition, money in the savings account grows less so investors are likely to invest in e.g. stocks or real estate in order to create more value. It is assumed that these investments stimulate the economy, because the issuing companies get enough equity to invest and to increase sales and as a result, companies can pay out more dividends to investors. However, the theory of the inverse relationship between interest and stock price is not in line with the real situation in the market (De Rooij, 2013). In the beginning of May 2013, the ECB lowered the interest rates to 0.50 percent; a decrease of 0.25 basis points and the ECB gives banks the permission to borrow unlimited money until mid-2014. The interest rate reduction is especially good news for the banking sector, 0.50 percent is the remuneration that banks pay when they borrow short-term at the ECB. In addition, the President of the ECB, Mario Draghi, hopes that banks will lend money to companies and individual investors more easily because banks have unlimited access to money. In this way Draghi hopes that the business activity of companies

increases and that it gives investors more certainty of return allowing investors will invest. However, experts expect that the decrease in interest rate does not cause a rebound in the economy since individual investors and companies still have little confidence in the market. By lack of confidence, it is assumed that companies invest less whereby their business activities does not increase and that investors invest less or even sell their existing shares by the large uncertainties in the market. If the supply of shares exceeds the demand, the stock price will fall.

Despite of low interest rates and low share prices, investors opt for the safety of government bonds (Schaap, 2012). Since December 2011, the interest on the Dutch and German government bonds is even negative; investors pay more money than the total loan. A reason for this is that these bonds are virtually risk free because it is improbable that the country cannot pay back its debt obligations. Due to the large demand for these bonds, both the Dutch as the German government can further reduce the interest, because there is enough money (Jongsma, 2012). A consequence is that the return to investors had not increased rapidly and thus investors remain reluctant and the economy is not stimulated. The economy is in a low point and the vicious circle is hard to break because of the lack of confidence of all market participants.

2.1.2. Default risk

The second risk of investing is default or credit risk; the security's sensitivity to default or the risk that borrowers are not able to pay the principal and dividend to individual investors. To restrict the impact of credit risk, investors can appeal to the information that is provided by the three big credit rating agencies Moody Investor Services, Standard & Poor's Corporation and Fitch Investor Service who hold 95 percent of the rating market. Credit rating agencies (CRAs) are private companies who evaluate the creditworthiness of large debtors by virtue of which companies are ranked. A credit rating is indicated by letter grades and gives an assessment of the ability and willingness of the debtor to pay the principal and dividend to investors (only default risk), which means that the rating does not represent the profitability of the debtor (Behena, 2010). The letter grades vary from service to service; Standard & Poor's uses rating from AAA down to D, although Moody's Investor Services rates the different securities from Aaa down to C (Holthausen & Leftwich, 1986). The higher the rating the lower the credit risk and the expected return for the investor. Bonds can be divided into two categories: the investment-grade bonds and speculative-grade or junk bonds. Investment-grade bonds have a high credit quality and a low risk of default (rated BBB or above) and speculative-grade bonds have a higher default risk (rated BB or lower) and therefore a higher expected return (Bodie, Kane & Marcus, 2011). A combination of these bonds in an investment portfolio reduces the risks significantly. Credit rating is the most common widely used

technique to decide upon the composition of the investment portfolios of lenders. The level of the accepted credit rating depends on the risk tolerance level and the financial position of investors (Hilscher & Wilson, 2013).

Until several years ago, the financing or creditworthiness of companies was rated by commercial banks. However, in recent years the complexity and the uncertainty have increased enormously by the financial crisis with the consequence that credit rating is done by CRAs. The ratings are published public and thereby the efficiency of the market is improved; each individual investor can easily view the expected performance of the securities. As a result, investors are strongly dependent on CRAs and a miscalculation can have enormous consequences in the financial market (Bahena, 2010). This was the case in 2008 at Lehman Brothers Holding Inc. Lehman Brothers was the fourth-largest U.S. investment bank which started with an AAA rating, but was merely valued with an A rating one month before its collapse. In September 2008, Lehman Brothers was searching for a buyer to improve its capital. The CRA gives an ultimatum; the credit rating will be downgraded if the capital position of the bank is not improved. This has major consequences for the large investment company. Because of this decline in rating, capital increase is almost impossible which makes it difficult to continue paying investors. A couple days after the ultimatum, 15 September 2008, Lehman Brothers is declared bankrupt because they were not able to find a buyer and thus they could not improve its capital position. This bankruptcy and the unexpected downgrading caused many fluctuations in the financial market, not only the financial positions of banks are affected by a downgrade, but also the solvency of insurance and investors are influenced. It appears that CRAs have overvalued companies for a long time and they have kept up the appearances that companies were doing well financially.

In fact, the success of a CRA is dependent on its reputation. The product of a CRA is providing information that is accurate, unbiased and timely. However, the ongoing crisis has shown that this is not always the case and therefore market participants have no more trust in the given rating of a CRA. The absence of legislation caused minimal control of public authorities on the actions of CRAs, but due to the events in mid-September 2008 in the United States, there is more supervision to stimulate CRA competition, transparency and accountability to investors (Washington, 2008). By comparing CRAs, investors are better informed and therefore considered investment decisions can be taken and the level of investors' risk tolerance is not exceeded (Bahena, 2010).

2.1.3. Inflation risk

Inflation risk is an important economic risk factor for individual investors with long-term investments because it indicates uncertainty about the future value of the investment portfolio since the

performance is influenced by inflation. The performance of an investment can be calculated on the basis of interest rates and inflation since there is a logical relationship between these variables. In 1930, Irving Fisher developed an equation, the so-called Fisher equation, to approximate the relationship between the interest rate and the inflation rate. The approximation formula is: R = r + E(i), where R is the nominal interest rate; the growth rate of money, r is the real interest rate; the growth of the purchasing power of an investor i.e. the return at the end of the investment horizon and E(i) is the expected inflation rate at the end of the investment horizon (Bodie et al., 2011). The Fisher equation implies that the real interest rates are reasonable steady; it suggests that the nominal interest rate changes one-for-one with the expected inflation (Crowder & Hoffman, 1996). If the historical data expect that the inflation rate rises, bond issuers will offer a higher nominal interest rate to investors, so that investors do not lose purchasing power. However, if it is established that inflation increases more than expected, e.g. the real inflation rate is higher than the nominal interest rate, the performance of the bond is lower than expected what means that investors lose purchasing power (Lynx, 2012).

In order to protect the purchasing power of investors, the first inflation-indexed bonds were introduced in 1980 by the U.K. government and these bonds protect the performance of investors against the negative effects of inflation risk. Since 1997, the U.S. government has issued Treasury Inflation-Protected Securities (TIPS); these inflation-indexed bonds are extremely low-risk investments because investors are compensated for each increase in inflation. This type of bonds promised the real interest rates rather than the nominal interest rate, so that the inflation risk is reduced (Campbell, Shiller & Viceria, 2009). However, the inflation rate is relatively low during the financial crisis through which the performances of these bonds are extremely low. This makes it unattractive for most investors to invest in inflation-indexed bonds (Aisen & Franken, 2010). Therefore, investors could also invest in precious metals like gold and silver, because the prices of gold and silver have risen sharply in recent years, while the value of the euro and the dollar has reduced. Precious metals generate no income such as interest and dividend, investor only achieve a profit when the selling price is higher than the purchase price. In other words, this investment is less dependent on the financial situation in the market, so the investment risks are lower, while the yield may be higher (Verdanov, 2011).

Before the financial crisis began, inflation was stationary and fluctuated around the mean of 2.0 percent; the objective of the ECB. Central banks thought that inflation would rise during the financial crisis, because by reducing the interest rates, investments become more attractive. Through investments with positive returns, the economy can grow and the inflation rate increases because consumers have more money to spend. The growth in inflation has actually taken place until the middle of 2008, but

thereafter the inflation has fallen sharply or in other words there was deflation. This is caused by the bankruptcy of the investment bank Lehman Brothers; the confidence in the market is disappeared and therefore investors have taken their money back from banks and they have spent less money. There were hardly any investments by which the economic condition deteriorated (Allen & Moessner, 2010). Initially, deflation appears beneficial for the economy, but it can also be very harmful in the long term because expenditures are postponed. It is expected that the real value of money and the real value of debt is increased, allowing consumers wait with spending money and investors borrow less money. A consequence is that companies reduce their product prices to retain customers, but as a result, businesses perceive their revenues decline drastically. The waiting of consumers is rewarded which results in a negative spiral. In this situation, the supply of goods increases faster than the supply of money since banks provide less credit due to defaults (Verdanov, 2010). To solve deflation, central banks need to print money to support the economy. More money supply increases the inflation and reduces in all probability the reluctance of companies and individual investors to invest by weakening the currency. Moreover, individual investors must also deal with the credit risk of companies and therefore take measures against deflation; they can put their money in a savings account, invest in basic necessities or shares with branding or invest in countries where the economic situation is better (Pettinger, 2011). These measures provide greater certainty of return for investors during a deflation, while not many risks are taken.

2.1.4. Business risk

The fourth risk faced by investors is business risk; the possibility that share issuing companies have earned a lower profit than expected and that therefore the return to investors is lower than expected. Business risk of a company depends on several factors, namely the sales price, sales volume, manufacturing costs, competitive position, the government regulations and the financial conditions in the market. As mentioned, by the deflation of 2008 and the reluctance of consumers to spend, companies are forced to reduce their selling prices which caused an increase of the business risk. This has deteriorated the financial position of the company and thus its competitive position in the market. The high business risks of a company are often accompanied by high debt ratios. A consequence is that investors invest less in such companies because investors only get their money back after the debt holders are paid. Therefore, a reduction of business risk or a better business performance is beneficial to investors because generally it increases the shareholder value (Amit & Wernerfelt, 1990). However, this is not the case when the interests of investors are not in line with the interests of the managers. For example, managers can reduce the probability of bankruptcy by making new investments with the

profits, while investors like to receive the profits in the form of dividends. In other words, managers can reduce business risks on the expense of equity holders; this disagreement is called the agency problem (Jensen & Meckling, 1976). Although debt increases the risk of bankruptcy, it is also used to monitor the actions of managers. On the one hand, if there are no debt holders, managers have considerable investment freedom and have fewer reasons to invest in projects that maximize profits. As a result, the company receives a lower rating and the costs of capital are very high. On the other hand, if there are debt holders, it is costly for managers if the profit is not maximized because managers lose the perquisites of their position when the company goes bankrupt. Therefore, managers generate profits implying that the company is valued highly and it provides more certainty for investors (Grossman & Hart, 1982). In short, debt to a certain extent is advantageous for the company, the business risks and thus for investors.

2.1.5. Valuation risk

Finally, attention is given to valuation risk; the chance that the price of a financial security is higher than the market price. In other words, overvalued stocks are worth less than expected when they are sold or have matured. Conversely, undervalued stocks are worth more than expected, because the asset price is lower than the market price, thus investors can make profits by selling their stock. This section only considers overvalued assets, because those assets have negative consequences for investors (Mishkin, 2009). An incorrect assessment of the stock price can be caused by market instability, incomplete information and by an increasing demand from investors for a certain asset. For example, a growing demand can increase the price of the stock, while the financial condition of the issuing enterprise remains constant. Therefore, the dividend payment will not increase and thus investments in these overvalued stocks have no added value. Moreover, in times of financial crisis or market instability, it is plausible that companies get worse business results than expected due to fewer sales, lower revenue or less growth projections. If this results in losses, the companies cannot pay out dividends and the value of the stock will decrease. This is unfavorable for investors and therefore the demand for these assets will decrease. The share price drops to an average price in time and the new price gives a better reflection of the financial condition of the issuing company. Overvalued and undervalued stocks are temporary because the value of the stocks returns ultimately to a long-term average. This theory is called mean reversion; the problem solves itself (Boeschoten, 2012).

The ongoing crisis has a major impact on the share price and therefore the valuation risk has increased. The prices of most U.S. shares have been considerably decreased between October 2007 and

March 2009 by as much as 50 percent (Dwyer, 2009) and as a result, the investor confidence in the market decreased seriously. The continued decline in price has ensured that some investors even expected a decrease while investing, implying that they make losses when prices increase. Last years during the financial crisis, the mean reversion theory was not applicable, but nowadays, the economy is picking it up again because the share prices worldwide have increased since May 2013. Investors establish that the value of their investment increases, leading to more confidence and positivism in the market and a decrease in valuation risk of investors ("Hogere Koers Aandelen Verwacht", 2013).

2.2. Two types of risks

The above mentioned risks can have a significant impact on the returns of an investor, while the purpose of investors is to maximize expected investment returns with a minimum of risks. Whenever investors know with certainty the future returns, they only invest in one security, the one with the highest expected return. However, nowadays there are many uncertainties in the market which makes investing in a portfolio more attractive because it reduces risks. Investing in multiple assets or in a portfolio is called diversification (Markowitz, 1991). However, a large number of stocks in the portfolio does not remove all the risks. This is because there are two types of risks, knowing systematic and non-systematic risk. Interest risk and inflation risk are examples of systematic risk, i.e. risks of external factors of an organization that are uncontrollable and risks that always exist. Companies and individual investors are trying to determine and to estimate the macroeconomic risks as good as possible. However, during the financial crisis this is very difficult because the systematic risk is much higher by major changes in the market than during periods of economic growth. In contrast, business risk and valuation risk are part of non-systematic risk. These risks are determined by internal factors of a company; they are controllable (Beja, 1972) and can be restricted by diversifying the portfolio of the investor. If investors invest in several securities, the exposure to firm-specific factors is distributed; the portfolio volatility will decrease to the volatility of systematic risk. Thus, the portfolio standard deviation falls as the number of securities increases, but it cannot be reduced to zero (Bodie et al., 2011).

Default risk is debatable and can belong to both systematic and non-systematic risk. During times of stagnation or economic growth, default risk is according to Bodie, Kane and Marcus (2011) a non-systematic risk because investors can investigate the creditworthiness of companies by means of commercial banks or rating agencies. The creditworthiness can be estimated well because the markets are less complex and less uncertain and rating changes are scarce. By diversifying, these risks can be minimized and only the macroeconomic risks will persist. In contrast, because of the financial crisis there

is a lack of confidence of investors in the credit rating agencies (CRAs), while investors are entirely dependent on these agencies. For a given rating, there is an expected return and on that basis investors decide to invest or not and a sudden downgrading in the rating is not expected in advance. This uncertainty can ensure that default risk belongs to the systematic risk that is inevitable. The classification of credit risk is thus accompanied by the economic situation in the markets.

2.3. Investment strategies

Investment decisions depend on the expected investment return and on the individual risk tolerance level of investors. French, Schwert, Stambaugh (1986) and Chan, Karolyi, Stulz (1992) concluded that there is a positive relationship between the stock market volatility and the expected stock return. It is logical that the compensation for risky assets is higher than for risk free assets because the possible losses are also larger and no one takes more risks without receiving additional return. Using both the expected return and the risk tolerance level, the investment strategy of an investor can be determined. There are two types of strategies, knowing the active and the passive investment strategy (Fabozzi, 1998). The passive investment strategy is based on the efficient market hypothesis which means that the market is a reflection of all the information and therefore individual stock selection is meaningless. Passive investors invest in broad markets and hold well-diversified portfolios of common securities to spread the risks. There is no distinction between attractive and unattractive securities and it is not examined whether there are possible positive price fluctuations in the market. The optimal portfolio for passive investors to achieve the best returns is to invest in long-term index funds such as the S&P 500. The advantage of this long-term investment is that the transaction costs and expense ratios are minimized and that these cost of investing are generally lower than in actively managed funds (Bodie et al., 2011). In conclusion, the negative effects of price fluctuations in the future are avoided with this kind of strategy because of the diversity of the portfolio.

In contrast to passive investors, active investors make use of the price fluctuation in the market. This is because the purpose of active investors is to outperform the market by estimating price fluctuation correctly and to have better performance than the average or passive investor. Active investors can take advantage of price increase by investing in undervalued stocks, but they can also take advantage of price reductions by short selling (Fabozzi, 1998). The latter means that the investor borrows stocks from a broker and sells it for the market price. If the market price has dropped, the short-seller buys the same kind of shares to replace the loaned shares and to give them back to the broker. The difference between the sale and purchase price of shares is the reward for this way of investing

(Woolridge & Dickinson, 1994). However, there are many risks for these investments, because if the market price increases, it is an adverse investment and the returns are negative. This also means that, if the price fluctuation is consistent with the expectation, there are high efficiencies.

When selecting an optimal active portfolio of risky assets, the costs are much higher than for an optimal passive portfolio, because individual investors or financial advisors have needed considerable time and resources to make a good estimation of the changes in the market. There are actually two styles of active stock selection, i.e. the top-down and the bottom-up approach (Gallagher, 2003). The top-down approach is first looking at the market as a whole and examines which sector outperforms the market because the current economic cycle is probably wrong. After that, the financial and strategic situation of issuing companies are examined and based on the best outcome a choice is made for the specific stocks. The bottom-up investment approach, in contrast, is based on the financial circumstances and individual attributes of issuing companies while the economic situation is disregarded. There will be invested in companies that have a good financial basis and in companies where, for example, it is expected that earnings will grow. The two approaches are very different but both can achieve above average returns due to the high risks.

An active investment strategy is not necessarily better and achieves not always higher returns than the passive investment strategy. This is because passive investors can benefit from the acts of active investors; this is called the free-rider benefit (Bodie et al., 2011). Because active investors invest in undervalued and overvalued assets, most assets will be eventually fair priced by virtue of the mean reversion theory. Therefore, the well-diversified portfolios of passive investors are a reasonably fair purchase and small price fluctuations make the portfolio not inferior than the portfolios of active investors. In other words, the return of the different investment strategies is dependent on the previous events in the markets and on the individual risk tolerance level of investors.

3. Literature review

Taking risks depends on the individual risk tolerance level of investors and this is determined by specific characteristics of investors. This chapter discusses previous literature studies that have examined the relationship between the risk tolerance level and demographic factors like age, gender, marital status, education, income, accommodation, primary occupation and the sector in which individuals are employed. In this research, these factors are considered as the independent variables which explain the dependent variable risk tolerance.

3.1. Risk tolerance

As mentioned, when making an investment decision, there is a tradeoff between the performance and the risk level of an investment and the portfolio choice depends on the risk tolerance level or the risk aversion level of investors. There has been much research done on the risk tolerance of investors, but Kogan and Wallach (1964) were one of the first researchers who gave a definition of risk tolerance:

"Risk tolerance is the willingness of an individual to engage in a behavior where there is a desirable goal but attainment of the goal is uncertain and accompanied by the possible of loss."

– Kogan and Wallach (1964) –

3.1.1. Steps in investment decision

For individual investors, it is important to know their risk profile, their financial situation, their time horizon and their desired performance of the investment so that the investment portfolio can be composed and the optimal result can be achieved. Additionally, it is also necessary for investment managers to know these characteristics of investors in order to give correct advice and to ensure that the expectations of investors are in line with the actual results. To determine the risk profile, investment managers want to use qualitative information of investors such as past achievements, investment patterns and the proportion of risky assets in a portfolio. However, these data are often not available and therefore a relevant investment decision is based on subjective judgments such as the risk tolerance level of investors (Snelbecker, Roszkowski & Cutler, 1990). Using the risk tolerance level, the investment strategy and several portfolio compositions can be determined and by investigating all the possible portfolios, a considered decision can be made that is in line with the requirements and expectations of the individual investor. However, due to uncertainties in the market during the financial crisis, it is essential to know the changes around the expected rate of return of the investment portfolio (Clarkson,

1963). In this case, it is an advantage for investors to get financial advice, because financial managers keep a close eye on the market conditions. Therefore, they know when it is necessary to reallocate the portfolio assets or to rebalance the investment strategy. If the investment horizon is expired, individual investors and financial managers evaluate the results of the investments and determine whether this corresponds with the expectation (Grinblatt & Titman, 1992).

3.1.2. Normative and descriptive models

Risk tolerance is explained many times by researchers through normative and descriptive models. On the one hand, a normative model determines the risk appetite of investors using the portfolio theory and the expected utility theory. The basic assumption of the portfolio theory is that investors are risk averse which means that if investors can choose between two portfolios with the same expected return, they select the portfolio with the lowest level of risk (Reilly & Brown, 2000). The expected utility theory is developed by Von Neumann and Morgenstern in 1947 and they assumed that investors are rational and that the risk preferences of investors are constant. Moreover, they expected that investors choose portfolios with the highest expected results or the highest utility. By combining these two theories, the general purpose of investors is to maximize the expected investment return with a minimum of risk; the maximum risks that are accepted by the investor. This preferred portfolio is called the optimal portfolio (Fabozzi, 1998) and is dependent on the risk tolerance and rational behavior of investors.

On the other hand, the descriptive models are based on the different psychosocial and behavioral perspectives and attempt to explain why investors invest differently than expected. According to Friedman and Savage (1948), descriptive models suggest that risk tolerance is a changeable characteristic of investors whereby investors are not always investing rationally. Therefore, the type of investment is important in determining the risk tolerance. In the case of insurance, certainty is chosen in preference to uncertainty, while at gambling, investors choose uncertainty over certainty. This paradox has among others been confirmed by Coombs (1975), Tversky and Kahneman (1979, 1981) and Bell (1982). The standard financial models do not reflect the actual behavior of investors and therefore the growing evidence of the paradox has developed the behavioral finance theory or the prospect theory (Kahneman & Tversky, 1979). Investment choices are based on previously obtained results, so investors are more risk averse after losses and more risk tolerant after profits. However, there is an exceptional case that is when investors have suffered enormous losses. These investors take a lot of risks in the hope that they achieve high returns in order to survive. Investing with the underlying idea to financially survive is called gambling for resurrections (Tversky & Kahneman, 1981). Thus, the risk tolerance level of

investors depends on the behavior and previous actions of investors. In this study, it will be assumed that investors invest with the objective to increase their wealth and not to solve financial problems.

Investors behave differently during the crisis than the standard financial or normative models predict. The behavioral finance theory gives a better explanation, for example, interest rate reductions during the crisis do not always result in a positive effect on investments. The reaction to various risks, as discussed in Chapter 2, is influenced by the risk attitude of investors. During the financial crisis, it is essential for at least two reasons to know the risk tolerance or risk aversion level of investors (Pålsson, 1996). The first reason is that risk tolerance is indirectly related to the economic growth of a country or the world. In times of recession, investors have a more risk adverse attitude implying that companies are forced to reduce prices of risky assets to attract investors or that companies have to deal with less capital. A consequence may be that companies invest fewer which can result in a slowdown in economic growth. Secondly, the economic situation affects the risk tolerance of investors and hence the welfare of households. Due to the economic crisis, households are more reluctant to invest in risky assets by an increasing probability of negative returns. A result is that households obtain no more than an average growth in wealth and therefore households have less disposable income than in times of economic growth. Thus, the risk tolerance of investors has a major impact on the economy and therefore it is important to monitor the changes in risk tolerance and to estimate the changes in the market.

3.2. Demographics related to risk tolerance

Individual risk tolerance is a subjective factor that is explained in this study on the basis of the following demographic factors: age, gender, marital status, education, income, accommodation, primary occupation and the sector in which investors work. These demographic factors influence the investment decisions of investors, but previous research has shown that not all variables have an unambiguous relationship with risk tolerance. In this section, the literature background of the demographic factors is shown and hypotheses are formulated. It is estimated by means of demographic factors what the impact of the crisis is on the risk appetite of investors.

3.2.1. Age

Several researchers have examined the relationship between the risk tolerance level and age. According to Wallach and Kogan (1961), Morin and Suarez (1983) and Pålsson (1996), there is an inverse relationship between the two variables; the risk tolerance of an investor decreases with age. Wallach and Kogan (1961) were the first researchers who investigated the relationship and used choice dilemmas.

The results indicated that younger investors are more risk tolerant than older investors. The underlying idea is that younger investors have a longer time horizon until retirement to recover from losses from risky investments. Therefore, younger investors accept more risk and thus tolerate more risk. In contrast, older investors have a shorter investment horizon and thereby a lower risk tolerance (Hallahan, Faff & McKenzie, 2003). The study of Wallach and Kogan has stimulated other researchers to investigate the relationship between risk tolerance and age. Pålsson (1996) expected that there is a difference between the risk aversion level of households due to the varying characteristics such as gender, age, marital status, number of children, income, employee status and geographic factors. Hereby, risk aversion is defined as "the unwillingness to incur risk'' (p.773) and is measured as the ratio of total wealth invested in risky assets to total net wealth. The results of the ordinary least square (OLS) regression concluded that only the variable age is systematically correlated with the risk aversion and that the regression coefficient indicated that there was a positive relationship. This is similar to a negative relationship between risk tolerance and age of investors or the head of the household.

In contrast, Hanna and Wang (1997) concluded that the risk aversion decreases with age, i.e. the risk tolerance increases with age. The risk aversion level is examined on the basis of the proportion of risky assets in the portfolio where risky assets are defined as ''assets that provide an uncertain nominal cash flow'' (p.28). Based on the Tobit analysis, age is significantly and positively related to the predicted risky asset proportion of total wealth. A distinction is made between retired and non-retired households and it turns out that if the head of household is retired, there is less risk taken with investments compared to households in which the head is not retired. However, in both households there is an equal percentage increase in risky assets as the age of the head increases. Moreover, a non-retired head invests at a younger age in risky assets compared to a retired head (30 years instead of 40 years). Before the age of 30 or 40 years, households are very risk averse because of the limited financial resources to recover losses.

However, according to Bajtelsmit and VanDerhai (1997) and Riley and Chow (1992) the relationship between risk tolerance and age is not linear. Riley and Chow (1992) concluded that investors younger than 21 years and aged over 65 are more risk averse than investors in between these ages. Young investors invest a significant proportion of the securities in personal property and this proportion decreases by age, while the proportion of securities invested in real estate increases by age. The percentage in equity grows progressively with age until the age of 65 and then there is a sharp decline. This is most likely because retired investors invest mainly in fixed income securities to reduce the risk. In conclusion, the relationship between risk aversion and age is represented by a convex line and this is

equivalent to a concave line between the variables risk tolerance and age.

Previous studies indicate that there is no unambiguous relationship between risk tolerance and age. This study will therefore examine this relationship and the expectation is that there is a non-linear relationship, i.e. a concave relationship between risk tolerance and age. This is because younger investors have less financial resources and older investors have a shorter investment horizon in order to compensate for any losses. Therefore, they will invest more in risk free securities than in risky securities. Furthermore, it is assumed that the curvature of the concave line becomes stronger by the financial crisis because investors are relatively more reluctant to risky assets.

3.2.2. Gender

The second demographic factor which is used often in the determination of the risk tolerance of an investor is gender. Previous research has shown that women often have a different investment objective and investment strategy than men. In general, women have a more conservative investment strategy and men a more aggressive strategy (Bajtelsmit & Bernasek, 1996), which means that women are more risk averse or have a less preference of financial risks, than men (Hanna & Sung, 1996). A consequence is that women generally achieve a lower return than men, but therefore the probability of large losses is smaller. It appears that women are more fearful of losses and more pessimistic about the expected return, while men are more optimistic and have more self-confidence (Grupta, Maxfield, Shapiro & Hass, 2009). This difference is according to Lusardi and Mitchell (2008) associated with the difference in financial literacy and they argued that the lack of experience is due to the traditional role of women in society. Therefore, women are more reluctant and less risk tolerant whereby they invest the majority of the portfolio in risk free assets. Nowadays, the younger generations of women have higher educational level and more knowledge about the opportunities in the stock markets which make women more confident in taking financial decisions (Bucher-Koenen, Lusardi, Alessie & Van Rooij, 2012). Although the risk tolerance of these younger generations of women is increasing compared to older generations, it remains less than that of men.

Psychological research has shown that men are more overconfident than women when making financial decisions (Barber & Odean, 2001). This involves the estimation of investor's knowledge, abilities and future expectations and this is related to the risk tolerance of investors. The more (over)confident the investor is the more the willingness to take risk (Hardies, Breesch & Branson, 2012). Therefore, they invest more of their wealth in riskier portfolios than rational investors with the same level of risk tolerance because they expect to receive a higher compensation. However, the return for

(over)confident investors is often lower than expected due to a greater risk of losses. A consequence is that the performance of men by excessive investment is lower than the performance of women, so taking risks is not always better.

As mentioned, most studies have concluded that women are less risk tolerant than men, but according to Weber, Blais and Betz (2002) it depends on the situation and the type of decisions. Weber et al. have examined the risk attitude and decision making of investors in five different areas knowing financial, social, health/safety, ethical and recreational decisions. They concluded that women are more risk averse than men in all situations except when making social decisions; in this case the risk attitudes of men and women are equal. In addition, research by Croson and Gneezy (2009) demonstrated that the risk attitude of women in financial decisions is context-specific. Women are affected by the social environment and make their financial investment choice by virtue of the investment strategies and attitude of investors in the environment. Women are more stimulated by convictions of a group and they prove to choose riskier outcomes in an experimental group of only women than in a mixed group (Booth & Nolen, 2012). In other words, it is important to investigate the environment from investors before it is assumed that women generally take less risk than men.

Because the majority of the researchers have shown that men are more risk tolerant than women, this study assumes the same, but there is no specific research on the environment of the investors. In addition, it is expected that, by the impact of the financial crisis, men take relatively fewer risks because of the decline in returns. In contrast, the risk tolerance level of women remains reasonably equal because they already invest the majority of the portfolio in risk free securities.

3.2.3. Marital status

The relationship between the individual risk tolerance level and the marital status of investors is explored in this study and thereby it is interesting to combine the marital status and gender. Many researchers have investigated the relationship and thereby made a distinction between married individuals and singles. Hartog, Ferrer-I-Carbonell and Jonker (2002) found that singles are more risk tolerant than married individuals. It is assumed that prenuptial agreements provide more responsibilities to the partners and/or children and therefore married couples are more risk averse. Cohn, Lewellen, Lease and Schlarbaum (1975) concluded that married individuals invest a relative lower proportion of wealth in risky assets compared to single investors because married investors are more sensitive to social risks. They appreciate the opinions from the environment and therefore they are less willing to take risks by the increase of potential losses (Roszkowski, Snelbecker, & Leimberg, 1993).

Moreover, Hanna and Yao (2005) and Bertocchi, Brunetti and Torricelli (2011) have examined

the effect of the combination of marital status and gender on the financial risk tolerance of investors. The results of Hanna and Yao (2005) showed that single men tolerate the most risk, followed by married men, single women and finally married women; they are most risk averse. These findings are consistent with previous studies, but the outcomes are combined. Generally, married couples take less financial risks than singles and women are more risk averse than men. The results of Bertocchi et al. (2011) are not entirely in accordance with earlier research. They state that their hypothesis is that marriage can work as a kind of safe assets and that this applies most for women because they tend to take a more uncertain societal role. They concluded that single women invest more in safe assets than married men and women.

The relationship between the individual risk tolerance level and the marital status seems fairly clear, but some researchers suggest that the causal relationship remains cautious. Variables such as age and gender logically affected by the risk tolerance of investors, but the direction of causality in the marital status, education and wealth is difficult to determine (Halek & Eisenhauer, 2001). It is expected that married couples take less risky decisions because they are accountable to their partner, but a reverse causality is also possible; risk adverse investors get married often. This causality dilemma is called the 'chicken or egg principle'. In this study, it is assumed that the demographic factors affect the risk tolerance level of investors and not vice versa. This means that the marital status is the independent variable and explains the dependent variable risk tolerance.

Firstly, this research examines whether there is a significant relationship between risk tolerance and marital status. If this is the case, a distinction is made between married men/women and single men/women, just as Hanna and Yao (2005) and Bertocchi et al. (2011) have done. The first hypothesis is that singles take more risks than couples, because they have no responsibilities towards a partner. During the financial crisis, this difference in risk tolerance will be reduced because there are many uncertainties in the market and therefore the risk aversion level increases for singles, while the risk aversion level of couples remains reasonably equal. In addition, it is expected that men and woman behave stereotypical when making investment decisions and that the outcome corresponds to the results of Hanna and Yao (2005). Due to the crisis, the expectation is that the increase in risk aversion level is highest for single men and lowest for married women; however, single men and married men remain more risk tolerant than single women and married women.

3.2.4. Education

There is a considerable debate about the relationship between the level of education and the individual

risk attitude of investors. Numerous researchers implied that the educational level, defined as ''formal attained academic training'' (p. 15; Grable & Lytton, 1997), influences the risk tolerance of investors instead of risk tolerance that affects the educational level of investors. The researchers which support the latter view do not use the definition of education as mentioned above; they define education as the financial knowledge of investor obtained from previous investments. By regularly investing, investors gain more experience with assessing situations and this increases the financial knowledge. In other words, the 'chicken and egg' problem also applies to this variable. Therefore, this research focuses only the educational level, i.e. the highest attained diploma, of investors and disregards the financial knowledge obtained by previous investments.

Baker and Haslem (1974), Zhong and Xiao (1995) and Hanna and Sung (1996) concluded that there is a significant and positive relationship between financial risk tolerance and education. A higher level of education encourages taking risks because investors with higher education are generally more financial literate and therefore they are better able to assess the risks and benefits of an investment decisions than less educated investors (Hanna & Sung, 1996). Baker and Haslem (1974) have related the educational level to the importance that investors attach to price stability and found that less educated investors assign more value to price stability than higher educated investors. Moreover, Zhong and Xiao (1995) have determined education by looking at the number of years that investors have gone to school. The difference in educational years between investing in bonds and stocks is not large, but the average number of years that stockholders have studied is higher. It means that taking risk increases as the level of education increases, i.e. higher educated investors tolerate more risk. Hallahan et al. (2003) expected also a positive relationship between the demographic factor education and the subjective risk tolerance; however, they have not found a significant relationship like previously mentioned researchers did.

In this study, it is assumed that the independent variable education explains the dependent variable risk tolerance and not vice versa, because generally investors have already finished their education before they invest. Therefore, the risk tolerance level of investor will not affect the level of education. The hypothesis concerning the variable education is that higher educated investors can better assess the financial situation of investments and this encourages investing in risky securities. In addition, education has a similar effect on the risk tolerance as gender during the economic crisis. All investors are more reluctant and both high educated and less educated make safer investments. But highly educated have relatively the biggest changes in their portfolio or return, because they exchange a large proportion of the risky stocks for risk-free shares.

3.2.5. Income

The risk that investors can take when making investments depends both on the risk appetite as on the overall financial condition of individual investors. The total wealth of an individual investor consists of two parts, knowing financial assets and human capital. Financial assets are income generated by investment and human capital is defined as the present value of future labor income of individuals (Chen, 2007). Younger investors have a greater proportion of human capital than financial capital compared to older investors. This is because younger investors generally have less invested and the longer lifespan gives them more labor flexibility. The labor flexibility is a kind of insurance against negative investment results because financial losses can be recovered easily and therefore investors with much human capital are capable to take more risk and invest more aggressive (Bodie, Merton & Samuelson, 1992). However, the certainty of the human capital of investors is influenced by both the conditions in the market as the vocational choice. The financial crisis makes future labor earning uncertain due to the higher risk of unemployment and each occupation that is performed has a different risk profile. For example, the human capital of a stockbroker is more uncertain and fluctuates more than that of a teacher, because it depends on the changeable stock market and the salary is usually not a fixed amount (Groot & Oosterbeek, 1992). This would suggest that stockbrokers are more risk adverse investors than teachers, but as mentioned the investment decision also depends on financial capital and financial knowledge. It is plausible that stockbrokers have more financial knowledge which makes them more able to assess the risks and benefits of investments. According to Lusardi and Mitchell (2008), investors with more financial knowledge are more risk tolerant. Furthermore, if more risks are taken, higher returns can be achieved implying the financial capital increases more. In other words, the composition of wealth depends largely on the sector where the investor operates. However, this study focuses only on the human capital of an investor because the direction of the relationship between the individual risk tolerance and income is more clear than that between the variables individual risk tolerance and total wealth. A higher risk tolerance level has no effect on income, although the income level may have an impact on the risk tolerance of the investor. By contrast, a higher risk tolerance level can provide more wealth, but more wealth can also provide a higher acceptance of risk (Halek & Eisenhauer, 2001).

Researches such as Cohn et al. (1975), MacCrimmon and Wehrung (1986), Shaw (1996) and Grable and Lytton (1997) have shown that there is a positive relationship between the risk tolerance level and the income level of investors. Shaw (1996) established that a wage growth is negatively correlated with the risk aversion level of investors because individuals with higher income are better able to compensate for the possible losses than individuals with lower income (Grable & Lytton, 1997).

However, not all researchers confirmed the positive relationship. Samuelson (1969) concluded with the Bernouilli utility model that a higher income does not automatically result in taking a higher risk. This is supported by Friend and Blume (1975) who ascertained that risk preferences remained reasonably constant when income or wealth increases. Finally, the examination of Pålsson (1996) has viewed whether changes in income of households affect the risk tolerance during investment and she found that there is no systematic relationship.

Similar to age, researchers have found no clear relationship between risk tolerance and income. The hypothesis in this study is that there is a positive relationship between the variables because this is confirmed by most researchers. Due to the increasing uncertainties in the market, there is less invested in risky assets, because the risk of dismissal has increased in recent years and therefore, there is a chance that the future labor income or human capital will be lower. Consequently, investors become more cautious and more reluctant, because they want to be able to take care of their losses. Hence, it is expected that the proportion of risky securities relatively decreases and the proportion of risk free securities increases in the portfolio of high-income investors as the crisis persist longer. In contrast, the portfolio of low-income investors will not change a lot during the financial crisis since they already mainly invest in risk free securities.

3.2.6. Accommodation

In most cases, owning a home is seen as an investment with significantly less risks than stocks, while a similar rate of return can be achieved. The greatest risk a homeowner has to deal with is a decrease in the value of the house so that the added value is less than expected. However, the home price will decrease more gradually than the stock price thus the risk of investing in real estate will be lower than investing in stocks. Moreover, another advantage of investing in real estate is that the investor owns something tangible; the investor can use it for own purposes, but can also rent the house to create more return (Brueggemen, Chen & Thibodeau, 1984). The rental income is indexed and therefore investing in real estate is an inflation-proof investment (Frick, 2008). By contrast, the price of a rental property increases as the inflation increases and therefore a rented accommodation becomes more expensive and there is no advantage gained. However, in this investigation, the variable accommodation is not seen as an investment, but with the variable it is examined whether individuals that own a home take more or less risk than individuals with a rented house. To date, there is limited research done concerning the direct relationship between risk tolerance and accommodation and thus the distinction between an owner-occupied property and a rented property. Sung and Hanna (1996) have examined the relationship

and they have found that homeowners with mortgage turn out to be more risk tolerant than renters and homeowners without mortgage. However, when other variables, such as years of retirement, are taken into account, the variable homeowner is no longer significant.

Despite the lack of previous studies, the relationship between the risk tolerance and the variable accommodation is examined in this research, because it is an interesting variable since the collapse of the housing market in the United States in December 2007. The Dutch housing market noticed the consequences at the end of 2008 and the average Dutch house prices have fallen sharply. According to the Central Bureau of Statistics (CBS), housing prices have dropped with 10 percent in 2013, in comparison with the price of homes in 2012 (Reumer, 2013). Because of this, many consumers have no confidence in the development of house prices and this discourages potential homebuyers to purchase a home. They often opt for a rental house, while buying a house is supposed to be attractive because of the low prices (Aldana, 2012). Therefore, in this study, the hypothesis is that homeowners take more risk in times of economic growth and less risk in times of the crisis than people in a rental property. This is because the actual overvalue of the house is significantly lower than the expected overvalue during the crisis, due to the decline in home prices. Therefore, the disposable income is lower than expected and there is less money available to compensate possible losses from risky investments. Therefore, property owners will tolerate fewer risks when making investments than renters.

3.2.7. Primary occupation

In many investigations the relationship between risk tolerance and occupation is inspected, whereby occupancy is defined as the main activity for which someone gets paid. This could include manual labor, managers, administrators, physician, freelancers etc. According to Roszkowski et al. (1993) the professional status is a classification factor to determine the degree of risk tolerance of an investor; the higher the ranking of occupational status, the more risk there is tolerated. That risk-taking is associated with the occupational choice is among others confirmed by Masters (1989). His results showed that the category 'non-professionals' (farmers, laborers and servants) have a more conservative investment strategy than the category 'professionals'(lawyers, entrepreneurs, managers, educators) and 'pensioners'. This does not mean that non-professionals have less money available to invest, but they will invest differently as a group.

However, this study solely makes a distinction between respondents who earn money (employed) and respondents who do not make money (unemployed). This distinction is rarely used in previous studies and therefore the relationship between primary occupation and risk tolerance is

predicted as follows. In times of economic growth, it is plausible that working individuals are more risk tolerant than non-working individuals because they have more financial resources and therefore the ability to recover from possible losses. In contrast, in times of recession, it is expected that non-working individuals accept more risk associated with investments in relation to working individuals. One reason for this is that the crisis may have little or no impact on their lifestyle; the payments of retirees are fixed and graduates who have not yet found a job have the same financial resources as when they were student. In contrast, the financial crisis increased the risk of dismissal for working individuals and this may change the financial situation of the household significantly. As a precaution, respondents of the 'employed' category will take less risk and will be more reluctant in making investment than in periods of economic growth. In other words, the hypothesis is that the investment strategy of unemployed respondents is almost equal in good and bad economic times, while employed people get a more risk adverse attitude as the economic situation deteriorates.

3.2.8. Sector

The independent variable sector is in line with the variable primary occupation as formulated above. Primary occupation only makes a difference between employed and unemployed and with the variable sector it is examined which sector is most risky. Certain occupations have high health risks, including risk of injury, a fatality or other health problems, while other professions have high economic risks, such as risk of unemployment and a varying salary (Bonin, Dohmen, Falk, Huffman & Sunde, 2006). The variable sector distinguishes between working in the private sector versus working in the public sector and this study focuses only on the economic risk that an employee can be dismissed.

Colombier, Boemont, Lohéac and Masclet (2008) have concluded that self-employed workers accept more risks than salaried workers and according to Roszkowski and Grable (2009) people from the private sector tolerate more risk than people working in the public sector. These results are confirmed by Bonin et al. (2006), but they focus more on occupational risk or earnings risk; the variance in earnings. They argue that there is a strong positive and significant relationship between occupational risk and the risk attitude of employees. The occupational risks are higher in private companies than in public companies and therefore, the employees of private companies generally tolerate more risk and thus receive more salary. Employees with a higher risk appetite accept the higher variability of income and in times of a growing economy it will result in higher earnings, because it is a compensation for taking risks. As a result, through the occupational choice, risk adverse and risk tolerant individuals are sorted.

In addition to occupational risks, the probability of being unemployed is in most countries

considerable lower for individuals working in the public sector than for those working in the private sector. Because of the stability of employment or the higher job security in the public sector, there are mostly risk adverse individuals working in this sector (Bloch & Smith, 1977; Bellante & Link, 1981; Buurman, Dur, Delfgaauw & Van den Bossche, 2012). However, in this research it is expected that during the financial crisis respondents of the public sector are more willing to take risks when making investments compared to respondents of the private sector because of the higher job security. This assumption arose because many companies were declared bankrupt during the crisis, but these are only private companies since the government practically cannot go bankrupt. Therefore, for individuals in the private sector it is more likely to be fired and this affects the available power to make investments and to pay any losses. This can be a reason to make less risky investments. In summary, the hypothesis is that individuals in the private sector become more risk averse than those in the public sector due to the crisis and this is reversed in times of economic growth and stagnation.

3.3 Overview of the hypotheses

Based on the ordered probit regression analysis, this study investigates the relationship between the risk tolerance level of investors and several demographic factors. By comparing the years 2006, 2008, 2010 and 2012, the impact of the financial crisis on the individual risk tolerance level of investors can be determined. The expectation is that the composition of the portfolio of risk tolerant investors relatively changes the most compared to risk adverse investors due to the many uncertainties in the market. Investors become more reluctant and therefore risk tolerant investors invest more in risk free securities. In contrast, risk adverse investors already invested a large proportion of the portfolio in risk free securities before the crisis. Hence, the composition of the portfolio of these investors will be less changed during the crisis.

This chapter has drawn the hypotheses that will be tested in the following chapters. For the purposes of this investigation, it is hypothesized that (1) there is a non-linear relationship between risk tolerance and age; younger and retired investors are more risk averse than investors between these age groups; (2) men are more risk tolerant than women; (3) married individuals are less risk tolerant than single individuals; (4) there is a positive relationship between risk tolerance and education; higher educated investors invest more in a risky portfolio than lower educated investors; (5) individuals with higher income levels tolerate more risk than individuals with lower levels of income; (6) homeowners are more risk tolerant than tenants during economic growth, but less risk tolerant during the crisis; (7) in times of economic growth, working investors take more risks than non-working investors, while working

investors are more reluctant during the financial crisis by job insecurity and finally; (8) previous to the crisis, investors in the private sector accept more risk, but during the crisis they become more risk averse than investors in the public sector.

4. Empirical methodology

This study attempts to answer two questions, that is, (1) does the financial crisis had an impact on the average risk tolerance of investors and; (2) in what way is the individual risk tolerance level affected by individual background characteristics based on comparisons made between the years 2006, 2008, 2010 and 2012. Is risk tolerance an innate trait that is unaffected by general economic conditions, is it influenced by macroeconomic performance or does it change by personal experience? For example, it could be that people with an owner-occupied property were quite risk tolerant before the crisis, but have become much less risk tolerant thereafter by the collapse of the housing market. The first question, the general level of risk tolerance, is explored in this chapter and thereby it takes into account the average and the distribution of risk tolerance for the different years; the base year is 2006. But first, the data which is used for this research is described and an overview is given of the composition of the independent variables and their descriptive statistics.

4.1. Data

This paper makes use of data of the DNB Household Survey (DHS), a panel research in order to study psychological and economic aspects of financial behavior of households. DHS is a reflection of the Dutch-speaking population of the Netherlands and the datasets provide information about demographic characteristics, work, retirement, health, housing, income, financial assets and comments on psychological and economic concepts of households. Annual financial information is obtained by using six questionnaires and the data is collected from approximately 2000 households which imply approximately 4400 respondents (Teppa & Vis, 2012). For this research, the variables are extracted from three questionnaires. The independent variables age, gender, education, the primary occupation and the accommodation are obtained from the questionnaire 'General Information on the Household', the marital status and the sector in which the respondent is employed from 'Household and Work' and the independent variable income and the dependent variable risk tolerance from the 'Economic and Psychological Concepts' questionnaire. The details of the questions can be found in Appendix A.1.

In this research, the respondents who have completed all three questionnaires for the relevant year are included in the sample and those who have not filled in all the questions are excluded. Moreover, there are no respondents younger than 18 years in the dataset, the education categories '(continued) special education', 'did not have education (yet)' and 'other sort of education/training' were omitted from the analysis and the answer 'don't know' at the question regarding the net household income is not included, so that the responses are considered plausible and the variables education and

income can be ranked. Removing these respondents from the dataset causes that some answers have no respondents. Therefore, these missing categories are disregarded during this investigation. As a result, the sample sizes vary from 1269, 1237, 1299 to 1334 respondents for the years 2006, 2008, 2010 and 2012 respectively.

4.1.1. Summary statistics

The demographic factors age, gender, marital status, education, income, accommodation, primary occupation and sector, as discussed in Chapter 3, are used to determine the subjective risk tolerance level of individual investors. Appendix B.1 represents the composition and the categorization of these eight demographic factors for each year. Despite the fact that each dataset does not have the same respondents, the composition of respondents for each year is practically the same because of the use of panel data; the major differences will be appointed. The group younger than 35 years decreases, while the category 65-74 just increases over time and in addition there are significant changes in net income. In 2006, 2008 and 2010 have 67%, 72% and 78% (respectively) of the respondents an income level of at least €40,000, while this is only 33% in 2012. Furthermore, it is remarkable that there are more couples in 2008 compared to the other years and that in 2012 less respondents belong to the category 'employed' than 'unemployed'. The increase in the number of unemployed and the shift of the level of income in the Netherlands can be explained by virtue of the many bankruptcies during the financial crisis. Another explanation for the decline in the average income is that there are considerably more respondents of at least 65 years old in 2012 compared to 2006, which means that there are more retires and this group has on average a lower income than working individuals.

Moreover, Appendix B.1 shows that the variables age, education and income are ranked from low to high and therefore they are called ordinal variables. Conversely, gender, marital status, accommodation, primary occupation and sector have two categories that cannot be ranked and therefore they are nominal or dummy variables; encoded with 0 or 1. The division of gender, accommodation and sector are obvious; men, respondents with an owner-occupied property and respondents who are employed in the private sector are encoded with 1 and women, respondents with a rental accommodation and respondents who are employed in the public sector are coded with 0. The other two dummy variables have a plausible distribution, but will be explained in view of the possible answers in the questionnaire. First, the marital status is subdivided into couples (coded 0) and singles (coded 1); married people and cohabitants are among the couples and always unmarried people, widowed and divorced people are among the singles. This study is based on this classification, because it

is expected that couples take fewer risks than singles, because couples are accountable to their partners. Second, the variable primary occupation is divided into employed (coded 1) and unemployed (coded 0). Participants who work and earn money belong to the category 'employed' and students, retirees, volunteers and job seekers belong to the category 'unemployed'. This distinction is made because many people have become unemployed during the financial crisis by, for example, bankrupt companies. A consequence is that households have less disposable income what can affect the risk tolerance of respondents.

The average survey participant of 2006 is a 45-54 year old man who lives together with a partner in an occupied property, has a pre-vocational educational level and an income between €40.000 and €75.000. Furthermore, the primary occupation of the representative respondent of 2006 is working in the private sector. The average survey participant of 2012 varies most from the one of 2006; in 2012 the participant is 55-64 years old with a college level, an income between €22,000 and €40,000 and belongs to the category 'unemployed' (the rest of the characteristics are the same). The atypical survey participant in 2006 is a 75+ year old single woman with a primary educational level and a net income of less than €14,000. She has a rental property and receives no money for her primary occupation. The non-representative respondent is almost identical for all years only the age (in 2010 and 2012) and the income level (2012) are different. As previously discussed, these two variables had the greatest differences in the composition.

4.1.2. Descriptive statistics

Table 1 shows the descriptive statistics of the independent demographic variables. In this table, the variable age is not divided into categories meaning that the minimum and maximum age of the respondents in the datasets is displayed. In 2006 the youngest respondent is 23 years old, the oldest 91 years old and the average age is 51.59 years. The standard deviation (SD) is 14.81 and compared to the SDs of the other demographic factors, it seems to be very high. This is because age varies between 23 and 91, while for example the categories of the variable income vary between 1 and 5. As mentioned, the 0/1 variables are dummy variables and the closer the mean towards 0.50, the more equal the respondents are divided into the two categories. The variables gender and primary occupation are fairly even distributed, while the low average of the marital status (0.23) indicates that there are more couples than singles and the higher average of accommodation (0.73) and sector (0.78) illustrates that more respondents have an owner-occupied property and are working in the private sector.

When making comparisons between the outputs of different years, there are some notable points. Although the minimum age decreases over time, the average age has increased to 57.96 years in

2012. In 2008 the average of the marital status is significantly lower than in other years which means that there are more couples (encoded with 0) than singles in this year. This was also demonstrated in Appendix B.1, but the reason for this statement is unknown. The same applies to the averages of income; there is a shift in the distribution of incomes and this ensures that the average in 2012 is considerably lower than the averages in 2006, 2008 and 2010. The values of the remaining variables are substantially constant over time.

Table 1 Descriptive statistics of the demographic factors

	2006					2008				
	Mean	Median	Min	Max	SD	Mean	Median	Min	Max	SD
Age	51.585	52	23	91	14.813	54.133	55	23	93	14.350
Gender	0.549	1	0	1	0.498	0.559	1	0	1	0.497
Marital Status	0.234	0	0	1	0.424	0.092	0	0	1	0.289
Education	3.690	4	1	6	1.482	3.701	4	1	6	1.496
Income	3.745	4	1	5	0.870	3.874	4	2	5	0.784
Accommodation	0.725	1	0	1	0.447	0.747	1	0	1	0.435
Primary occupation	0.566	1	0	1	0.496	0.524	1	0	1	0.500
Sector	0.780	1	0	1	0.414	0.793	1	0	1	0.405

	2010					2012				
	Mean	Median	Min	Max	SD	Mean	Median	Min	Max	SD
Age	55.889	57	22	89	13.838	57.961	60	20	89	13.771
Gender	0.575	1	0	1	0.495	0.586	1	0	1	0.493
Marital Status	0.211	0	0	1	0.408	0.216	0	0	1	0.412
Education	3.790	4	1	6	1.500	3.804	4	1	6	1.511
Income	3.995	4	2	5	0.811	3.127	3	1	5	0.835
Accommodation	0.780	1	0	1	0.415	0.771	1	0	1	0.421
Primary occupation	0.528	1	0	1	0.499	0.492	0	0	1	0.500
Sector	0.810	1	0	1	0.393	0.784	1	0	1	0.412

4.2. Distribution of risk tolerance

All independent variables are analyzed and therefore, the dependent variable risk tolerance can be examined in this section. The statement, used in this research to estimate the attitude of respondents towards risks, is as follows:

"I think it is more important to have safe investments and guaranteed returns than to take a risk to have a chance to get the highest possible return.''

On a scale of 1 to 7 must be indicated to what extent respondents agree with the statement. Code 1 indicates that the respondent totally disagrees with the statement and therefore the respondent is very risk tolerant. Code 7 indicates that the respondent totally agrees with the statement, so the respondent

is very risk averse. Because of the fact that this study examines the risk tolerance, it is more logical to reverse the encoding: 1 for risk adverse participants and a 7 for risk tolerant participant.

In this section it is first examined whether the average risk tolerance has increased or decreased during the financial crisis and as secondly whether the averages are significantly different from each other. Firstly, Table 2 represents the descriptive statistics of risk tolerance for each year to determine if there is a change in the individual risk tolerance level of investors. Compared to 2006, in 2008 the risk tolerance level of participants increases and it decreases as the financial crisis persists; from 2.96 in 2006 to 2.75 in 2012. The increase in 2008 can be explained, because the effects of the financial crisis in the Netherlands were appreciable in the winter of 2008. However, there is more dispersion throughout the recession and this is already evident in 2008; in 2006 the standard deviation (SD) is 1.72 and this increases in 2008 and 2010 to 1.89 and in 2012 it drops to 1.85. Despite the small decreases in SD in 2012, it is still higher than the SD in 2006. This means that there are more 'outliers' in the financial crisis.

Table 2 Descriptive statistics of risk tolerance

Risk Tolerance	# of obs.	Mean	Median	SD
2006	1269	2.962	3	1.719
2008	1237	2.984	2	1.889
2010	1299	2.848	2	1.890
2012	1334	2.749	2	1.845

In order to test whether the differences in means are significant, the One-Way Analysis of Variance (ANOVA) method has been used. The null hypothesis at variance analysis is always that the population means of all groups (in this case all years) are equal. Thus the hypotheses are H_0: $\mu_{2006} = \mu_{2008} = \mu_{2010} = \mu_{2012}$, and H_1: $\mu_{2006} \neq \mu_{2008} \neq \mu_{2010} \neq \mu_{2012}$. Table 3 shows the output of the One-Way ANOVA test and the F-value is the test statistic. The larger the F-value, the greater the difference between the different years and the less likely that it is caused by chance. Based on the probability value (Sig. = 0.003) it can be determined that the null hypothesis is rejected, because 0.003 is less than 0.01. In other words, it can be assumed that there is a difference between the years or groups with a certainty of 99 percent.

Table 3 Analysis of Variance (ANOVA)

Risk Tolerance	Sum of Squares	df	Mean Square	F	Sig.
Between groups	46.089	3	15.363	4.551	0.003
Within groups	17,333.858	5134	3.376		
Total	17,379.948	5138	3.383		

However, when rejecting the null hypothesis it is assumed that not all population means are equal, but it is not known whether there is only one average that is different from the others or that all the averages

are different from one another. This problem can be solved by Post Hoc Multiple Comparisons tests; all groups are tested pairwise for difference in means. Therefore, the hypotheses will be as follows: H_0: $\mu_{2006} = \mu_{2008}$, $\mu_{2006} = \mu_{2010}$, … $\mu_{2010} = \mu_{2012}$ and H_1: $\mu_{2006} \neq \mu_{2008}$, $\mu_{2006} \neq \mu_{2010}$, … $\mu_{2010} \neq \mu_{2012}$. This research has selected the Fisher's Least Significant Difference (LSD) method because the Bonferroni method is seen as the strictest possible correction method since it corrects for repeated testing and therefore the method is rejected by many researchers. Appendix B.2 represents the output of the LSD test and shows all possible combinations of the different years. Moreover, a flag (*) indicates whether the population means differ statistically from each other so that the null hypotheses can be rejected. The means of the years 2006-2012, 2008-2010 and 2008-2012 are significant at the 0.10 level, and thus for these combinations, the null hypotheses are rejected. The remaining variable combinations do not differ significantly from each other.

Because there are significant differences between the average risk tolerances of different years, the distribution of the individual risk tolerance level can be determined to explain when the differences occur. Table 4 indicates that more respondents become risk averse if the crisis lasts longer. In the base year, 21% of respondents choose risk tolerance category 1 and in 2012 this increases to 33%. In addition, respondents who are very risk tolerant (category 7) also increases during the years 2008 and 2010. In 2006, 7% of respondents choose category 7, in 2008 and 2010 this is 10% and in 2012 it is 8%. Despite the many uncertainties in the market, these participants also continue to take risk during the crisis with the hope to achieve high returns if the situation in the market rebounds. This distribution explains the higher standard deviation during the years of the financial crisis.

Table 4 Distribution of risk tolerance

	2006		2008		2010		2012	
Risk Tolerance	# of obs.	% of sample	# of obs.	% of sample	# of obs.	% of sample	# of obs.	% of sample
1	267	21%	327	26%	390	30%	440	33%
2	349	28%	299	24%	321	25%	305	23%
3	249	20%	198	16%	201	15%	219	16%
4	199	16%	184	15%	165	13%	152	11%
5	71	6%	63	5%	55	4%	68	5%
6	42	3%	41	3%	39	3%	38	3%
7	92	7%	125	10%	128	10%	112	8%
Total # of respondents	1269	100%	1237	100%	1299	100%	1335	100%

In summary, by virtue of the One-Way ANOVA method, there has been established that there are significant differences between the average risk tolerance levels of respondents in several years. Thereafter, all year combinations were compared with the LSD test and it is concluded that there are some significant differences in the risk tolerance level of respondents caused by the financial crisis.

Therefore, Chapter 5 examines with the ordered probit regression which demographic factors are important and change over time.

4.2.1. A further look into the data

To get a better picture of the decline in risk tolerance, there is looked more specifically at the differences in average risk tolerance between males and females, own property owners and rental property owners and respondents working in public and private companies. The averages per category of these dummy variables are shown in Appendix B.3. Firstly, the differences in risk tolerance level between men and women are discussed. Just as previous studies, the table implies that men take more risks than women, but both averages decrease. The average risk tolerance of the category 'men' is 3.06 in 2006, increases to 3.1 in 2008 and is followed by a decline to an average of 2.85 in 2012. The average of 2.85 is still higher than the average risk tolerance of women in the base year (2.84). In addition, the percentage change is calculated and it appears that the decrease in the average risk tolerance of men and women is equal; for both a decrease of 7%. In other words, men tolerate more risk than women, but given the percentage change, the degree of restraint caused by the financial crisis is for men and women equal.

Secondly, participants with a private property take significantly less risks, both before and during the crisis, than participants with a rental property. The average individual risk tolerance of a participant with a private property is 2.85 in 2006 and 2.68 in 2012, while the average risk tolerance of a participant with a rented property is 3.25 in 2006 and 2.99 in 2012. Similar to gender, the risk tolerance level of a respondent with a rental property (2.99) in 2012 is higher than the average in 2006 of a respondent with an owner-occupied accommodation (2.85). During the crisis is it very plausible that the risk tolerance level of private property owners is lower than that of a participant with a rental property. This is because private property owners have seen that the housing market collapsed in the United States in December 2007. However, in November 2008, after Lehman Brothers was declared bankrupt, the consequences of the financial crisis on the Dutch housing market became visible (Elsinga, De Jong-Tennekes & Van der Heijden, 2011). This may explain the increase in risk tolerance level in 2008 for both owner-occupied and rental properties owners and the decrease in 2010 and 2012. Owning a home is riskier than renting, because the asset risk of the owner is directly linked to the value development of homes, while the rental price depends only on inflation and the consequences are less significant. Since the sales price of houses have dropped considerably in recent years, respondents have received a lower overvalue or even a value less than the level of mortgage debt if they sell the house. This can have an impact on the type of

investments of respondents; less risky investments to ensure that any loss can be covered with the available capital.

Additionally, it is interesting to examine whether there are differences in individual risk tolerance level between respondents who work in the public sector and respondents who work in the private sector. The change in percentage concerning risk tolerance of participants from the public sector is minimal; 1% decline in 2012 compared to 2006, while there is a 9% decrease in the risk tolerance level of respondents from the private sector. An explanation for this is the difference in job security among the different types of businesses. Generally, employment in the public sector fluctuates less than in the private sector (Buurman et al., 2012) and in addition, the chance that the government goes bankrupt is practically zero because it technically cannot go bankrupt. In contrast, the risk of insolvency to other companies has increased considerably during the financial crisis. This uncertainty affects the risk tolerance of participants because it is assumed that investments are made to increase the wealth, but not to solve financial problems. In 2006, the average risk tolerance between the two categories is nearly equivalent, for the 'private sector' category the average is slightly higher, while in 2012 the average of the private sector is lower than the 'public sector' category (2.71, 2.88 respectively).

Finally, by using the ANOVA method, it is tested whether the average risk tolerance per category are significantly different from each other. This is the case for the categories males, owner-occupied property and private sector; the probability values are less than the significant level of 10%. The other categories are not significant and therefore the null hypothesis – that all sample means of all years are equal – cannot be rejected. This may be because the samples of these variables are substantially smaller than the variables which may be significant. Larger samples might provide a solution to show that the differences in means are not based on chance.

5. Empirical results

In this chapter, it is explored by using the ordered probit regression analysis (Aitchison & Silvey, 1957) which variables affect the risk tolerance and whether the effect of background variables has changed between 2006 and 2012. This method is used because the dependent variable is measured on an ordinal scale ranging from 1 for respondents who are risk averse to 7 for those who are very risk tolerant. The ordered probit regression shows no causal relationship between the dependent and independent variables, it is a nonlinear model that determines the magnitude of the change in outcome probability as, for example, the level of education increases.

5.1. Ordered probit model

In order to be able to interpret the relationship between the variables, the ordered probit model is frequently represented as an unobserved or latent variable model; an estimation of the dependent variable. It is assumed that the latent variable y* is measured on interval scale ranging from $-\infty$ to ∞ and that y* is related linear to the observed demographic factors (McKelvey & Zavoina, 1975). The structural model in this research is:

$$y_i^* = \beta_1 Age_i + \beta_2 Gender_i + \beta_3 MaritalStatus_i + \beta_4 Education_i + \beta_5 Income_i + \beta_6 Accommodation_i + \beta_7 PrimaryOccupation + \beta_8 Sector + \varepsilon_i \qquad \text{for } i = 1, 2, \ldots, N$$

Where β is the vector of regression coefficients or parameters which are estimated, N is the number of participants and ε is the error term which is assumed to be normally distributed. Moreover, the threshold values or cut-off points (μ_1, μ_2,… μ_6) are estimated with the ordered probit regression to determine to which risk tolerance level the respondents belong. The following condition is applied: $\mu_1 < \mu_2 < \mu_3 < \mu_4 < \mu_5 < \mu_6$, and it is observed that $y_i = 1$ if $y_i^* \leq \mu_1$, $y = 2$ if $\mu_1 < y_i^* \leq \mu_2$, etc. The purpose of the probit model is to estimate values for the parameters and cut-off points so that the likelihood function is maximized (Greene, 2003) and so that the probability that a certain respondent selects, for example, risk tolerance category 1 is almost in line with the actual data. The probability functions of the different risk tolerance categories can be formulated as follows: $Pr(y_i = 1) = Pr(\beta X_i + \varepsilon \leq \mu_1)$, $Pr(y_i = 2) = Pr(\mu_1 < \beta X_i + \varepsilon \leq \mu_2)$ etc.

For the years 2006, 2008, 2010 and 2012 ordered probit regressions are performed with all the eight independent variables and the results are shown in Table 5. In addition to the estimated regression coefficients and cut-off points, the pseudo R-square and the likelihood ratio Chi-square are displayed for

each model. The pseudo R-squares as presented are McKelvey and Zavoina R-squares (1975), because their approach is most similar to the R-square of the OLS regression. The McKelvey and Zavoina's R-squares are estimations because the residuals cannot be observed in an ordered probit analysis. Additionally, using the likelihood ratio test is examined whether a model with predictors is better than a model without predictors.

5.2. Post-estimation analysis of the full probit models

5.2.1. Interpretation

As mentioned, the probit models for categorical outcomes are nonlinear and therefore the parameters are difficult to interpret. The estimated coefficients do not directly describe the relationship between the demographic factors and the individual risk tolerance level of investors; however, a positive estimated coefficient implies that an increase in the independent variables allows an increase in the predicted probability of risk tolerance. Moreover, an increase of an independent variable with a negative estimated coefficient ensures that the predicted probability decreases. Per variable, it will be viewed whether the direction is consistent with the hypothesis as formulated in Chapter 3 and whether the variable has a significant impact on the risk tolerance of respondents. After that, the relationships will be assessed using the marginal effects; the change in the estimated probabilities. These results are presented in Appendix C.

Table 5 Ordered probit regressions of 2006 - 2012

	2006		2008			2010		2012	
Risk Tolerance	Model 1	Model 2	Model 1	Model 1.1	Model 2	Model 1	Model 2	Model 1	Model 2
Age	-0.081***		-0.012	-0.020		-0.010		-0.028	
	(0.026)		(0.029)	(0.027)		(0.029)		(0.030)	
Age^2		0.000***			0.000		0.000		0.000
		(0.000)			(0.000)		(0.000)		(0.000)
Gender	0.210***	0.215***	0.211***	0.269***	0.278***	0.252***	0.246***	0.223***	0.223***
	(0.062)	(0.063)	(0.067)	(0.064)	(0.064)	(0.062)	(0.062)	(0.062)	(0.062)
Marital Status	-0.141*	-0.138*	-6.708			0.081	0.076	0.020	0.020
	(0.077)	(0.077)	(129.71)			(0.089)	(0.089)	(0.079)	(0.079)
Education	0.010	0.012	-0.051**	-0.058***	-0.058***	-0.044**	-0.043**	-0.055**	-0.054**
	(0.022)	(0.022)	(0.023)	(0.022)	(0.022)	(0.021)	(0.021)	(0.022)	(0.022)
Income	-0.149***	-0.148***	-0.208***	-0.107**	-0.107**	-0.098**	-0.100**	-0.028	-0.028
	(0.038)	(0.038)	(0.046)	(0.044)	(0.044)	(0.044)	(0.044)	(0.043)	(0.043)
Accommodation	-0.165**	-0.168**	-0.237***	-0.174**	-0.174**	-0.086	-0.086	-0.105	-0.105
	(0.072)	(0.072)	(0.078)	(0.074)	(0.074)	(0.078)	(0.078)	(0.076)	(0.076)
Primary occupation	-0.011	-0.030	0.018	0.015	-0.010	0.045	0.071	0.087	0.083
	(0.079)	(0.081)	(0.084)	(0.080)	(0.083)	(0.082)	(0.086)	(0.082)	(0.084)
Sector	0.000	-0.001	-0.152*	-0.072	-0.072	0.032	0.030	-0.110	-0.110
	(0.071)	(0.071)	(0.078)	(0.074)	(0.074)	(0.085)	(0.085)	(0.072)	(0.072)
/cut1	-1.645	-1.624	-2.121	-1.371	-1.403	-0.981	-0.928	-0.837	-0.821

	(0.186)	(0.181)	(0.221)	(0.205)	(0.199)	(0.221)	(0.214)	(0.207)	(0.194)
/cut2	-0.863	-0.843	-1.333	-0.715	-0.747	-0.330	-0.278	-0.244	-0.227
	(0.184)	(0.179)	(0.218)	(0.204)	(0.198)	(0.221)	(0.214)	(0.207)	(0.194)
/cut3	-0.346	-0.325	-0.870	-0.292	-0.324	0.087	0.140	0.206	0.223
	(0.183)	(0.179)	(0.218)	(0.204)	(0.198)	(0.221)	(0.214)	(0.207)	(0.194)
/cut4	0.181	0.202	-0.362	0.187	0.155	0.514	0.567	0.602	0.619
	(0.183)	(0.179)	(0.217)	(0.204)	(0.198)	(0.221)	(0.215)	(0.207)	(0.194)
/cut5	0.451	0.472	-0.134	0.403	0.371	0.701	0.753	0.839	0.856
	(0.184)	(0.180)	(0.217)	(0.204)	(0.198)	(0.222)	(0.215)	(0.208)	(0.194)
/cut6	0.664	0.686	0.048	0.577	0.545	0.861	0.914	1.007	1.023
	(0.185)	(0.180)	(0.217)	(0.204)	(0.198)	(0.222)	(0.215)	(0.208)	(0.194)
LR $chi^2(8)$	46.63	47.18	407.63	45.79	46.50	33.44	33.34	25.76	25.80
Prob > chi^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001
Pseudo R^2	0.039	0.040	0.790	0.040	0.041	0.028	0.029	0.022	0.022
Obs.	1269	1269	1237	1237	1237	1299	1299	1334	1334

There are two regressions performed to investigate the relationship between risk tolerance and age more accurately; model 1 includes the variable age and model 2 the variable age-square. Both models show that age has a negative impact on the predicted probability of tolerating risk for all years. The parameters of age-square seem to be zero, but more decimals indicate also a negative sign. Given the pseudo R-squares, model 2 explains more of the variance of risk tolerance than model 1 and therefore model 2 is preferred. This is equivalent with the expectation as formulated in Chapter 3; a non-linear or inverse U-shaped relationship between the variables. This means that younger and older people have less risk appetite than middle-aged respondents. This is because young people have less financial resources and the elderly have a shorter investment period in order to compensate for possible losses. However, both age and age-square only have a significant impact on the risk tolerance in 2006.

The second demographic factor is gender and this variable has a significant impact on the individual risk tolerance in all years. Therefore, it is an important factor in explaining the dependent variable. Moreover, all coefficients have a positive influence on the predicted probability of risk tolerance and this is confirmed by many previous studies; men tolerate more investment risks than women or women have a more conservative investment strategy while men have a more aggressive strategy.

The variable marital status has no influence on the individual risk tolerance during the crisis; only in 2006, it has a significant impact on the willingness to take risks. In 2006, the regression coefficient have a negative sign indicating that singles are more risk averse than couples because an increase in marital status leads to a decrease in the predicted probability of risk tolerance. A possible explanation may be that singles have one income and therefore it is more difficult to recover possible losses. This negative relationship is not in line with the hypothesis that couples are less inclined to take risks than singles. In 2008, an additional regression is carried (model 1.1) in which the variable marital status is

excluded, because this variable has influenced the regression enormously. In model 1 marital status has no significant influence on the risk tolerance, but the estimated coefficient is very high in comparison with the other years and the other variables. In addition, the likelihood ratio Chi-square and the pseudo R-square are also much higher than in the other years which it is not a realistic assessment. Therefore, by removing the variable in 2008, there is a better estimation of the coefficients and the threshold values. In this research, model 1 is disregarded in 2008 and further post-estimation analyses are based on model 1.1.

The expectation that higher educated people have more knowledge in order to estimate situations and therefore tolerate more risk when making investments is not confirmed by the significant coefficients of education. Only during the financial crisis education has a significant influence but it is negative related to the risk tolerance level. One statement could be that higher educated use the news about the crisis as a source of information to assess the market situation. It is observed that the financial crisis has a negative impact on the performance of companies and on the return of investments. Therefore, the confidence in the market is reduced with the result that higher educated investors become more reluctant and more risk averse compared to the years before the crisis.

Similar to the variable education, the results of income are not in accordance with the hypothesis as formulated in Chapter 3. To be exact, Table 5 shows that the higher the income level, the lower the predicted probability of risk tolerance. In other words, income has a negative effect on the individual risk tolerance. A reason for this connection may be that respondents with higher income levels generally have a higher educational level, making them better able to assess the financial situation in the market. The market has changed in a negative way and the risk of dismissal has been increased by the financial crisis. As a precaution, there is less risk taking when making investments, because if the respondent is dismissed, losses cannot be paid. Moreover, the variable income is an important variable in determining the risk tolerance level of investors, because in the years 2006, 2008 and 2010 the regression coefficients are significant. In 2012, the variable does no longer have a significant influence on risk appetite and this can be caused by the shift of income as discussed in Section 4.4.1.

The direction of the relationship between risk tolerance and accommodation is remarkable, because it was expected that the direction of the parameter in the base year would be opposite to the direction of the parameters during the crisis. However, the coefficients of accommodation have a negative impact on the risk tolerance in all years, which means that people with a private property tolerate fewer risks than people with a rental property. In times of crisis this is plausible, but precisely in the years 2010 and 2012 the parameters are not significant. Although 2008 belongs to the crisis, it is not

remarkable that it has a significant impact on the risk tolerance because the consequences of the collapse of the housing market in the United States were noticeable in the Netherlands at the end of 2008. Because of the collapse of the housing market in the Netherlands and the many uncertainties in the financial market, respondents probably invested randomly whereby there is no longer a significant relationship between risk tolerance and the demographic factor accommodation.

Finally, the variables primary occupation and sector are included in the ordered probit regressions, but actually no coefficient of these variables has a significant influence on the predicted probability of risk tolerance. In model 1 of 2008, the variable sector has a significant impact on risk tolerance, but as indicated, this model does not give a good view of the reality.

5.2.2. Marginal effects

To interpret the results more clearly, the marginal effects at the mean are calculated for each year and these outputs can be found in Appendix C. The marginal effects are calculated because the regression coefficients have a constant effect on the latent variable y*, but no constant effect on the original y. It is expected that the relationship between original risk tolerance and the background variables is s-shaped and consequently the marginal impact of changing a variable is not constant. Moreover, all independent variables are important in determining the impact of x_i on risk tolerance and therefore the mean is used for each demographic factor. This section focuses only on the marginal effects of the variables gender, education and income, because these variables have a significant impact on the predicted probability of risk tolerance over the years.

In all years, the marginal effects of gender have a negative value towards the first two categories of risk tolerance, which means that the likelihood of men choosing these categories is less than the likelihood of women choosing these categories. More precisely, in 2006, males are 6.2 percentage points less likely to choose risk tolerance category 1 than females. By contrast, categories 3 to 7 have a positive marginal value indicating that the chance that men choose these categories is larger. Category 7 has the highest positive value (2.8 percentage point) and this confirms the hypothesis again; men are willing to take more risk when making investments than women are. In 2008, the chance that a man chooses category 1 (-0.091) is even smaller than in 2006 (-0.062), while the probability of a man chooses category 7 (0.046) is increased. Thus the risk attitude of men and women has become more diverse. The spread in risk attitude in 2010 and 2012 is less than in 2008, but it is still larger than the spread in 2006. After 2008, as the crisis has become more noticeable in the Netherlands, men are more reluctant in taking more risk. The chance that men choose category 7 becomes smaller and the chance that they choose

category 1 has grown slightly relative to women. However, there will always be daredevils who will take risks, because if the market will pick up again, great returns can be achieved.

At the marginal effects of education, a distinction can be made between 2006 on the one hand and 2008, 2010 and 2012 on the other hand. The results of 2006 indicate that higher educated tolerate more risk than lower educated; the marginal values increase as the risk tolerance category increases. This relationship is in line with the expectations, but as can be observed, this coefficient is not significant. By contrast, the opposite is true for the years 2008, 2010 and 2012; the risk appetite of higher educated respondents is lower than the willingness of taking risk of lower educated respondents. In these years, the marginal values of risk tolerance categories 1 and 2 have a positive sign which means that the higher the educational level, the higher the chance that the respondent chooses these categories. The probability that a participant with a university education is very risk averse and chooses risk tolerance category 1 in 2012 is 11.4 percentage points (6*0.019) and the probability that the participant is very risky and choose risk tolerance category 7 is -4.8 percentage points (6*-0.008). This negative value implies that the respondent with a university education is 4.8 percentage points less likely to choose category 7 than someone who has only completed primary education. However, there may be no comparisons made between the marginal effects of the years before and during the financial crisis, because the coefficients of 2006 are not significant.

For the variable income, the years 2006, 2008 and 2010 are important, because in these years the parameters have a significant impact on the individual risk tolerance level. High income participants choose more often risk tolerance categories 1 and 2 than the other categories; the first two categories have positive marginal effects and the other categories have a negative value. Remarkably is that all marginal values have dropped a little in both 2008 and 2010 compared to 2006. The first category decreases from 4.2 percentage points to 3.5 and the final risk tolerance category increases from -1.9 percentage point to -1.7. The shift entails that during the financial crisis the likelihood that respondents with higher income are risk averse has narrowed and the chance that they make riskier investments has increased slightly compared to respondents with a lower income level.

6. Conclusion and discussion

The objectives of this research are (1) to investigate the relationship between the individual risk tolerance level and demographic factors of investors and (2) to determine if these relationships change by the effects of the financial crisis. For this purpose, this study makes use of the ordered probit regression analysis, because the dependent variable risk tolerance is measured on an ordinal scale ranging from 1 for respondents who are risk averse to 7 for those who are very risk tolerant. With this model, it is tested which demographic factors have a significant impact on the predicted probability of risk tolerance and whether the composition of the significant factors is changed by the financial crisis. For this study, data from the DNB Household Survey (DHS) has been used; a panel research in order to study psychological and economic aspects of the financial behavior of Dutch-speaking households of the Netherlands. Comparisons are made between the regression coefficients of the years 2006, 2008, 2010 and 2012, but also between the marginal effects of the different years as there is a nonlinear relationship between the individual risk tolerance and demographic factors.

The results of the regressions reveal that gender, education and income are the most important variables in determining the individual risk tolerance, on average, since these variables have a significant influence in at least three years. Firstly, the variable gender has in all four years a significant impact on the predicted probability of risk tolerance and all the parameters have a positive value, meaning that men tolerate more risk than women. The marginal effects have showed that men have become more reluctant in taking risks as the effects of the crisis are more visible. However, the percentage change in the average risk tolerance of men and women is equal, for both a decrease of 7%. Secondly, the variable education has a significant and negative influence on risk tolerance during the crisis years, which means that the higher the educational level of a respondent, the lower the willingness to take risk. However, because the variable in 2006 has no significant influence on risk tolerance, there may be no comparisons made between the marginal effects of the years before and during the financial crisis. Finally the variable income, this variable has a significant effect on the predicted probability of risk tolerance in the years 2006, 2008 and 2010. Moreover, the regression coefficients have a negative sign which implies that the higher the level of income of the respondent, the less risk there is tolerated. In view of the marginal effects, in 2008 and 2010, the chance that respondents with higher income levels are risk averse has narrowed and the chance that they make riskier investments has increased slightly compared to 2006. The relationships are not all in line with the expectations as formulated in Chapter 3. The direction of the relationship between gender and risk is consistent with the hypothesis, but the association between

education and risk tolerance and income and risk tolerance are opposite to the hypothesized relationships.

The aforementioned results have some limitation and there are a number of recommendations for future research. Indeed, it is noteworthy that the other demographic factors age, marital status, accommodation, primary occupation and sector are not both during economic growth and economic crisis affecting the individual risk tolerance. In 2006, the variables age, marital status and accommodation have a significant impact on risk tolerance and the variable accommodation has this impact as well in 2008. One reason for this may be that respondents do not have a clear investment pattern because of the crisis. They have become more reluctant or they invest randomly in the hope that the desired return is achieved. Another reason may be that the relationship is based on chance; that the variables are significant by coincidence in 2006. This probability is small, since this applies to three variables, but for full exclusion, there can be added an additional base year in future research; a year of economic growth. In addition, the variable accommodation also has a significant influence on risk tolerance in 2008, which can be explained using the effects of the collapse of the housing market. This collapse has happened in the United States in December 2007 whereby in this study the year 2008 belongs to the crisis, while the consequences in the Netherlands were noticeable at the end of 2008. Further research could focus more on the year 2008 and could examine accurately when which consequences of the crisis are noticeable in the Netherlands and how the different effects affect the risk tolerance level of individual investors.

Moreover, the relationship between the income level and the individual risk tolerance has been studied, while wealth gives a better understanding of the financial situation of the respondent (Finke & Huston, 2003; Hallahan et al., 2004). It is possible that an individual with a high income level is not wealthy and therefore more risk averse, while someone with a low income is very wealthy and therefore more risk tolerant because possible losses can be recovered. Wealth consists of income, valuable possessions and previously obtained returns from investments and all these factors are closely interrelated and affect the risk tolerance level of the individual. However, the disadvantage is that the latter factor, previously obtained returns, ensures that the direction of the relationship between risk tolerance and wealth is unclear; a higher risk tolerance can provide more wealth, but more wealth can also provide a higher acceptance of risk. For further research, it is therefore recommended to take only experienced investors in the dataset so they all make their investment decision on the basis of, among other things, previous obtained results.

Finally, the respondents, who filled out the questionnaires, are representative for the Dutch-

speaking population of the Netherlands. However, due to the fact that not all respondents have completed all the required questions for this study, a reasonable number of respondents is removed from the datasets. By using a larger sample in future research, the results are more reliable and the likelihood of remarkable shifts in the composition of the data is smaller.

To conclude, the present study has showed that the variables gender, education and income are important predictors of the individual risk tolerance level of investors. Moreover, the behavior towards risks of respondents has changed by the financial crisis; respondents are more reluctant which may explain that many demographic factors are not significant during the crisis.

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Appendix A

A.1 Questions used for this examination

1. **Year of birth** of the respondent

2. **Sex** of the respondent

3. Highest level of **education** completed
    a. (continued) special education
    b. Kindergarten/primary education
    c. Pre-vocational education
    d. Pre-university education
    e. Senior vocational training or training through apprentice system
    f. Vocational colleges
    g. University education
    h. Did not have education (yet)
    i. Other sort of education/training

4. **Primary occupation** of the respondent
    a. Employed on a contractual basis
    b. Works in own business
    c. Free profession, freelance, self-employed
    d. Looking for work after having lost job
    e. Looking for first-time work
    f. Student
    g. Works in own household
    h. Retired (pre-retired, AOW, VUT)
    i. (partly) disabled
    j. Unpaid work, keeping benefit payments
    k. Works as a volunteer
    l. Other occupation
    m. Too young, has no occupation yet

5. Type of **accommodation**
    a. Owner-occupied property
    b. Rented house/flat
    c. Sub rented house/flat
    d. Free accommodation
    e. unknown

6. What is your **marital status**?
   *) including separation from bed and table
   a. Married or registered partnership (including separated), having community of property *)
   b. Married or registered partnership (including separated), with a marriage settlement *)
   c. Divorced from spouse
   d. Living together with partner (not married)
   e. Widowed
   f. Never married

7. **[Are/Were] you employed** on a contractual basis by a government institution (national. provincial. or local government), or by a private limited company, or by another institution (public limited company, foundation, association, or cooperative society)?
   a. Yes. employed by the government
   b. Yes. employed by a private limited company
   c. Yes. employed by another institution (public limited company, foundation, association, or cooperative society)

8. The **total net income of your household** consists of the income of all members of the household, after deduction of taxes and premiums for social insurance policies, over the past 12 months. Into which of the categories mentioned below did the total net income of your household go in the past 12 months.
   a. Less than €10.000
   b. Between €10.000 and €14.000
   c. Between €14.000 and €22.000
   d. Between €22.000 and €40.000
   e. Between €40.000 and €75.000
   f. €75.000 or more
   g. Don't know

9. Please indicate on a scale from 1 to 7 to what extent you agree with the statement.
   "I think it is more important to have safe investments and guaranteed returns than to **take a risk** to have a chance to get the highest possible return.''

Appendix B

B.1 Summary statistics of the demographic factors

	2006		2008		2010		2012	
	N	% of sample	N	% of sample	N	% of sample	N	% of sample
Total number of respondents	1269	100%	1237	100%	1299	100%	1334	100%
Panel A: Age								
< 35 years old	218	17%	147	12%	99	8%	62	5%
35-44 years old	222	17%	193	16%	211	16%	202	15%
45-54 years old	286	23%	259	21%	235	18%	258	19%
55-64 years old	269	21%	310	25%	372	29%	338	25%
65-74 years old	180	14%	226	18%	269	21%	326	24%
≥ 75 years old	94	7%	102	8%	113	9%	148	11%
Panel B: Gender								
Males	697	55%	692	56%	747	58%	782	59%
Females	572	45%	545	44%	552	42%	552	41%
Panel C: Marital Status								
Couples	972	77%	1123	91%	1025	79%	1046	78%
Singles	297	23%	114	9%	274	21%	288	22%
Panel D: Education								
Primary education	50	4%	46	4%	38	3%	37	3%
Pre-vocational education	356	28%	353	29%	365	28%	370	28%
Pre-university education	142	11%	140	11%	134	10%	158	12%
Senior vocational training	249	20%	233	19%	225	17%	209	16%
Vocational colleges	333	26%	316	26%	369	28%	372	28%
University education	139	11%	149	12%	168	13%	188	14%
Panel E: Income								
< €14,000	25	2%	0	0%	0	0%	51	4%
€14,000 and €22,000	75	6%	63	5%	70	5%	200	15%
€22,000 and €40,000	308	24%	279	23%	220	17%	649	49%
€40,000 and €75,000	652	51%	646	52%	656	51%	396	30%
> €75,000	209	16%	249	20%	353	27%	38	3%
Panel F: Accommodation								
Owner-occupied property	920	72%	924	75%	1013	78%	1028	77%
Rented property	349	28%	313	25%	286	22%	306	23%
Panel G: Primary Occupation								
Employed	718	57%	648	52%	686	53%	656	49%
Unemployed	551	43%	589	48%	613	47%	678	51%
Panel H: Sector								
Public sector	279	22%	256	21%	247	19%	288	22%
Private sector	990	78%	981	79%	1052	81%	1046	78%

B.2 Least Significant Differences (LSD) test

	2006	2008	2010	2012
	Mean Difference b / se	Mean Difference b / se	Mean Difference b / se	Mean Difference b / se
2006		0.022	-0.114	-0.213***
		(0.073)	(0.073)	(0.072)
2008	-0.022		-0.135*	-0.235***
	(0.073)		(0.073)	(0.073)
2010	0.114	0.135*		-0.099
	(0.073)	(0.073)		(0.072)
2012	0.213***	0.235***	0.099	
	(0.072)	(0.073)	(0.072)	

* p < 0.10; ** p < 0.05; *** p < 0.01

B.3 Risk tolerance level per demographic subgroup

	Males				Females			
	N	Mean	%	Δ%	N	Mean	%	Δ%
2006	697	3.063	100%		572	2.839	100%	
2008	692	3.129	102%	2%	545	2.800	99%	-1%
2010	747	2.963	97%	-3%	552	2.694	95%	-5%
2012	782	2.852	93%	-7%	552	2.632	93%	-7%

	Owner-occupied property				Rented property			
	N	Mean	%	Δ%	N	Mean	%	Δ%
2006	920	2.854	100%		349	3.246	100%	
2008	924	2.864	100%	0%	313	3.339	103%	3%
2010	1013	2.761	97%	-3%	286	3.157	97%	-3%
2012	1028	2.677	94%	-6%	306	2.992	92%	-8%

	Private sector				Public sector			
	N	Mean	%	Δ%	N	Mean	%	Δ%
2006	990	2.974	100%		279	2.921	100%	
2008	981	2.948	99%	-1%	256	3.121	107%	7%
2010	1052	2.855	96%	-4%	247	2.822	97%	-3%
2012	1046	2.712	91%	-9%	288	2.882	99%	-1%

Appendix C

C.1 Marginal effects of 2006

Risk Tolerance	Coeff_all	1.	2.	3.	4.	5.	6.	7.
	b / se	b / se	b / se	b / se	b / se	b / se	b / se	b / se
Age^2	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender	0.215***	-0.062***	-0.024***	0.010***	0.025***	0.014***	0.010***	0.028***
	(0.063)	(0.018)	(0.007)	(0.003)	(0.007)	(0.004)	(0.003)	(0.008)
Marital Status	-0.138*	0.041*	0.015*	-0.007	-0.016*	-0.009*	-0.006*	-0.017*
	(0.077)	(0.023)	(0.008)	(0.004)	(0.009)	(0.005)	(0.003)	(0.009)
Education	0.012	-0.003	-0.001	0.000	0.001	0.001	0.001	0.002
	(0.022)	(0.006)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.003)
Income	-0.148***	0.042***	0.017***	-0.006***	-0.017***	-0.009***	-0.007***	-0.019***
	(0.038)	(0.011)	(0.005)	(0.002)	(0.005)	(0.003)	(0.002)	(0.005)
Accommodation	-0.168**	0.046**	0.020**	-0.006***	-0.019**	-0.011**	-0.008**	-0.023**
	(0.072)	(0.019)	(0.009)	(0.002)	(0.008)	(0.005)	(0.004)	(0.011)
Primary Occupation	-0.030	0.009	0.003	-0.001	-0.003	-0.002	-0.001	-0.004
	(0.081)	(0.023)	(0.009)	(0.003)	(0.009)	(0.005)	(0.004)	(0.011)
Sector	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.071)	(0.020)	(0.008)	(0.003)	(0.008)	(0.005)	(0.003)	(0.009)

* p < 0.10; ** p < 0.05; *** p < 0.01

C.2 Marginal effects of 2008

Risk Tolerance	Coeff_all	1.	2.	3.	4.	5.	6.	7.
	b / se	b / se	b / se	b / se	b / se	b / se	b / se	b / se
Age^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender	0.278***	-0.091***	-0.020***	0.011***	0.028***	0.014***	0.011***	0.046***
	(0.064)	(0.021)	(0.005)	(0.003)	(0.007)	(0.004)	(0.003)	(0.011)
Education	-0.058***	0.019***	0.004***	-0.002**	-0.006***	-0.003**	-0.002**	-0.010***
	(0.022)	(0.007)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.004)
Income	-0.107**	0.035**	0.008**	-0.004**	-0.011**	-0.006**	-0.004**	-0.018**
	(0.044)	(0.014)	(0.003)	(0.002)	(0.004)	(0.002)	(0.002)	(0.007)
Accommodation	-0.174**	0.055**	0.014**	-0.005***	-0.017**	-0.009**	-0.007**	-0.031**
	(0.074)	(0.023)	(0.007)	(0.002)	(0.007)	(0.004)	(0.003)	(0.014)
Primary Occupation	-0.010	0.003	0.001	0.000	-0.001	-0.001	0.000	-0.002
	(0.083)	(0.027)	(0.006)	(0.003)	(0.008)	(0.004)	(0.003)	(0.014)
Sector	-0.072	0.023	0.006	-0.002	-0.007	-0.004	-0.003	-0.013
	(0.074)	(0.023)	(0.006)	(0.002)	(0.007)	(0.004)	(0.003)	(0.013)

* p < 0.10; ** p < 0.05; *** p < 0.01

C.3 Marginal effects of 2010

Risk Tolerance	Coeff_all	1.	2.	3.	4.	5.	6.	7.
	b / se	b / se	b / se	b / se	b / se	b / se	b / se	b / se
Age^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender	0.246***	-0.086***	-0.011***	0.013***	0.023***	0.011***	0.009***	0.041***
	(0.062)	(0.022)	(0.003)	(0.004)	(0.006)	(0.003)	(0.003)	(0.010)
Marital Status	0.076	-0.026	-0.004	0.004	0.007	0.003	0.003	0.013
	(0.089)	(0.030)	(0.005)	(0.004)	(0.008)	(0.004)	(0.003)	(0.016)
Education	-0.043**	0.015**	0.002*	-0.002*	-0.004**	-0.002*	-0.002*	-0.007**
	(0.021)	(0.007)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.004)
Income	-0.100**	0.035**	0.005**	-0.005**	-0.009**	-0.004**	-0.004**	-0.017**
	(0.044)	(0.015)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.007)
Accommodation	-0.086	0.029	0.005	-0.004	-0.008	-0.004	-0.003	-0.015
	(0.078)	(0.026)	(0.005)	(0.003)	(0.007)	(0.004)	(0.003)	(0.014)
Primary Occupation	0.071	-0.025	-0.004	0.004	0.007	0.003	0.003	0.012
	(0.086)	(0.030)	(0.004)	(0.004)	(0.008)	(0.004)	(0.003)	(0.014)
Sector	0.030	-0.011	-0.001	0.002	0.003	0.001	0.001	0.005
	(0.085)	(0.030)	(0.004)	(0.005)	(0.008)	(0.004)	(0.003)	(0.014)

* p < 0.10; ** p < 0.05; *** p < 0.01

C.4 Marginal effects of 2012

Risk Tolerance	Coeff_all	1.	2.	3.	4.	5.	6.	7.
	b / se	b / se	b / se	b / se	b / se	b / se	b / se	b / se
Age^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Gender	0.223***	-0.081***	-0.007***	0.014***	0.020***	0.012***	0.008***	0.033***
	(0.0620	(0.023)	(0.002)	(0.004)	(0.006)	(0.004)	(0.003)	(0.009)
Marital Status	0.020	-0.007	-0.001	0.001	0.002	0.001	0.001	0.003
	(0.079)	(0.028)	(0.003)	(0.005)	(0.007)	(0.004)	(0.003)	(0.012)
Education	-0.054**	0.019**	0.002**	-0.003**	-0.005**	-0.003**	-0.002**	-0.008**
	(0.022)	(0.008)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.003)
Income	-0.028	0.010	0.001	-0.002	-0.003	-0.002	-0.001	-0.004
	(0.043)	(0.016)	(0.001)	(0.003)	(0.004)	(0.002)	(0.002)	(0.007)
Accommodation	-0.105	0.037	0.004	-0.006	-0.009	-0.006	-0.004	-0.016
	(0.076)	(0.027)	(0.004)	(0.004)	(0.007)	(0.004)	(0.003)	(0.012)
Primary Occupation	0.083	-0.030	-0.003	0.005	0.008	0.005	0.003	0.013
	(0.084)	(0.030)	(0.003)	(0.005)	(0.008)	(0.005)	(0.003)	(0.013)
Sector	-0.110	0.039	0.004	-0.006	-0.010	-0.006	-0.004	-0.017
	(0.072)	(0.025)	(0.004)	(0.004)	(0.006)	(0.004)	(0.003)	(0.012)

* p < 0.10; ** p < 0.05; *** p < 0.01