**ERASMUS UNIVERSITY ROTTERDAM**

**ERASMUS SCHOOL OF ECONOMICS**

**MSc Economics & Business**

**Master Specialisation Financial Economics**

**Risk appetite of pension funds and cultural differences among countries**

**Author:** **T.Nellopoulou**

**Student number: 357822**

**Thesis supervisor: Jairo Rivera Rozo**

**Finish date: November 2013**

# PREFACE AND ACKNOWLEDGEMENTS

*I would like to thank my supervisor Jairo Rivera Rozo for his support during the writing of this thesis and his trust in my independence and work ethic. I am grateful for trusting me with this research topic and supporting me with his constructive guidance.*

*With this thesis my studies and student life comes to an end. “One of the joys of completion is to look over the journey past and remember all the friends and family who have helped and supported you along this road.” This is why I would also like to thank my friends and the “Fantastic4” for helping me with the layout of this thesis and keeping me focused to my goal. I see all of them as my family, my home away from home, and having them next to me is a blessing.*

*Finally, I could never leave out my parents and sisters. They are my cornerstone and their support and faith is what always keeps me going. Great gratitude to my mother, her love is the fuel for my ambitions.*

*I dedicate this to the person that affects me and believes in me the most, my father. Thank you.*

**Copyright Statement**

The author has copyright of this thesis, which represents part of the author’s study programme while at the Erasmus School of Economics (ESE). The views stated therein are those of the author and not necessarily those of the ESE.

**Non-plagiarism Statement**

By submitting this thesis the author declares to have written this thesis completely by himself/herself, and not to have used sources other than the ones mentioned. All sources used, quotes and citations that were literally taken from publications, or that were in close accordance with the meaning of those publications, are indicated as such.

ABSTRACT

This thesis investigates the risk appetite of pension funds in different countries and how this can be explained by cultural differences among them. We use a sample of 49 countries and after dividing our sample into Developed and Developing countries, we construct several OLS regressions. In order to quantitate cultural differences, we use the four cultural dimensions from Hofstede’s research. Despite the fact that we could not establish a strong relationship between culture and risk appetite of pension funds, we believe that we set the grounds for future research, giving a direction that could be of great use for governments and pension funds.

**Keywords:** pension funds, risk appetite, cultural dimensions, cultural differences, equity allocation.

# TABLE OF CONTENTS

[PREFACE AND ACKNOWLEDGEMENTS 2](#_Toc367967998)

[ABSTRACT 3](#_Toc367967999)

[TABLE OF CONTENTS 4](#_Toc367968000)

LIST OF TABLES..................................................................................................................................5

[LIST OF FIGURES](#_Toc367968001) 6

CHAPTER 1 : Introduction 7

CHAPTER 2 : Literature review 9

CHAPTER 3 : Data..............................................................................................................................20

CHAPTER 4 : Methodology 30

CHAPTER 5 : Results and conclusions 48

CHAPTER 6 : Limitations and recommendations for future research 50

REFERENCES 51

[APPENDIX A 54](#_Toc367968002)

**LIST OF TABLES**

Table 3.1 Cultural Dimension Scores, Hofstede 2011. 20

Table 3.2 Summary statistics for cultural dimension scores. 22

Table 3.3 Equity investments in relation to total assets per country. 23

Table 3.4. Descriptive statistics for the control variables. 29

Table 4.1 Correlation matrix for all variables in use. 33

Table 4.2. Regression results from multiple and single models. 34

Table 4.3. List of Developed and Developing countries 36

Table 4.4 Descriptive statistics for Developed countries. 37

Table 4.5 Regression results for the multiple and single regression models:

Developed countries. 38

Table 4.6 Summary of regression results for the five control variables:

Developed countries. 40

Table 4.7 Descriptive statistics for the Developing countries. 43

Table 4.8 Regression results for the multiple and single regression models:

Developing countries. 44

Table 4.9 Summary of regression results for the four control variables:

Developing countries. 45

# LIST OF FIGURES

Figure 2.1 Asset allocation of pension funds in 2011 15

Figure 3.1 Equity allocation as a percentage of the total investments 25

Figure 3.2 Equity limits in investments as a percentage of total investments. 26

Figure 3.3 Age dependency ratio 28

**1.Introduction**

Pension funds can invest in many different types of financial assets depending on their investment policy statement. Traditionally, the type of investments a pension fund may choose mainly depends on its objectives but also on the legislation constraints. In the same time, the funds function within a society with certain cultural characteristics. Extensive literature has proved a relationship between culture and finance in general. The purpose of the current study is to investigate whether, and how, cross-country cultural differences have an impact on the risk appetite shown by pension funds in a country.

**There are no sources in the current document.**Up through the 1980s, there were emerging concerns about the augmenting demographic burden all over Europe. Life time expectancy of the population in most countries continues to increase, while Governments are still unable to fund the pensions of such an on-growing number of pensioners. Investments of pension funds should be such that make sure there are enough funds to fulfill the liabilities when they arise. It is surprising though, how little understanding there is of the asset allocation and investment strategy of pension funds. This is why the topic of this study is important. We will try to give a different explanation of how, why, where pension funds across countries invest, and how this can be explained by cultural differences among these countries, as they are presented by Hofstede’s cultural dimensions theory.

In this paper, we investigate how cultural differences affect the equity holdings of pension funds in two country categories: Developed and Developing countries. The cultural dimensions that we control for are: Uncertainty avoidance, Power Distance, Masculinity and Individualism. We are expecting a negative relationship between risk appetite and Uncertainty avoidance, and a positive one for the other three dimensions.

Although we could not establish any statistically significant relationship for none of the sub-samples, we got some answers regarding which external factors can influence risk appetite. From the five contros variables that we used, namely Limits in equity investments, national wealth (GDP), relative shares of Defined benefit plans, Age dependency ratio and Market capitalization, apparently in Developing countries, only the national wealth measured in terms of GDP, and the relative shares of Defined Benefit plans, play a role in the asset allocation of funds in these countries. The lower the GDP levels and the presence of Defined benefit plans, the more risk seeking the pension funds are. Regarding the Developed countries, none of these variables had a sustainable, significant effect.

This research topic could be of great interest for pension funds and governments, since it would give a better understanding of how risk appetite could be influenced from the culture of the society they function in. The different results between developing and developed countries give also an incentive for future research for a more in depth investigation in the forces behind these differences. Depending on that, they could differentiate their policy, rules, limitations and pension products that they offer, according to the way each cultural dimension affects risk appetite in their country.

**2. Literature review**

***2.1. Culture and cultural dimensions***

To begin with, it is important to determine culture. I this study, the cultural factor is going to be measured using the cultural dimensions developed by Geert Hofstede. His book "Cultures and organizations: software of the mind" is one of the most important studies of culture, influencing many others in cross-cultural research, and being cited in more than 180 works of study. Across the broad literature on culture, many definitions have been given for national culture, but according to Hofstede, "Culture is the collective programming of the mind that distinguishes the members of one group or category of people from others".

In his research, Hofstede, tried to establish a commonly acceptable terminology for cultures using information from more than 76 countries. He used questionnaire data on a big international company's employees, namely IBM. The analysis of the data lead him to the conclusion that "societies differ from each other in the way they deal with four main anthropological problem areas: ways of coping with inequality, ways of dealing with uncertainty, how the individual relates with his primary group, and the emotional implications of having been born as a girl or as a boy "(Hofstede,2010). These lead to Hofstede's famous four dimensions:

1. Power distance
2. Uncertainty avoidance
3. Individualism vs collectivism
4. Masculinity and femininity.

The above dimensions provide a general framework which can be applied comparatively easily and show how countries differ with each other when it comes to values, social behavior and way of thinking.

The first dimension, **Power Distance (PDI)**, expresses the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally (*Hofstede, 2010*). It refers to both followers and leaders, and how those two cope with the existing within the country inequality, regarding power, wealth and prestige (Deschepper, Grigoryan, Lundborg, Hofstede, Cohen1, Van Der Kelen1, Deliens & Haaijer-Ruskamp, 2008). It is a very important dimension, since it gives an insight of how power and wealth affects a society. In countries with High PDI scores, the inequality is commonly accepted and wanted, and the less powerful are depending on their superiors, while on the other hand, Low PDI societies tend to try to minimize the inequality gap and take good care of social relationships (*Hofstede, 2010*).

**Uncertainty Avoidance (UAI)** describes how members of a society or institution deal with unstructured and unknown situations, and in particular the way each culture teaches its members to cope with these novel and ambiguous situations. We should keep in mind that uncertainty avoidance is not equivalent to risk avoidance. The difference is that societies with high UA scores can bear a higher risk, given that there are clear laws and rules structuring those risks. For these societies, uncertainty causes stress and anxiety, and unknown situations are seen as dangerous and have to be avoided by careful planning and regulation, while novel opinions are not easily accepted. On the other side, in Uncertainty-accepting cultures, uncertainty is seen as something normal, not causing stress or a need for high regulation and strict rules.

The third dimension **Individualism (IDV)** with its opposite, **Collectivism**, refers to the extent that members of a culture are integrated into groups. Individualist societies present loose ties among their members, where everyone cares for his own interest and close family. There s a higher degree of self-importance and interest in individual rights. On the contrary, Collectivist societies have a great sense of team spirit, while people are part of large groups and families, and are willing to give up personal gains for the sake of their relatives.

The last dimension is **Masculinity** versus its opposite, **Femininity**. A society is described as Masculine when the distribution of values and gender roles are obviously discrete. Men are expected to be assertive and competitive, driven by urge for success and wealth, while women are expected to be more caring and modest, looking for a better quality of life. In Feminine societies the distribution of values and gender roles are not separate. Both genders are modest and concerned about the quality of life.

Although the above dimensions may look like an oversimplified way to analyze cultural differences among countries, it is proved through a great number of studies that they are verified across many different areas of research. As mentioned above, Hofstede's Cultural Dimension provide a general framework, which is its greatest advantage, since they can be applied to the study of many cultures, but also its biggest limitation. According to Hempel(1998), there are many specific aspects of individual cultures that are not taken into consideration. But still, even with this limitation, Hofstede's model is a powerful toolkit for those who want to examine cross cultural differences.

***2.2. Previous Literature on culture and economics***

There is a great body of literature that uses Hofstede's cultural dimensions in studies related to marketing, business administration, financial markets and many more. Some of them can give an insight of how pension funds' risk appetite can be influenced by national culture. In the section that follows, some of these studies are presented.

In a study on Iranian Stock exchange investment decisions, Amirhosseini, Branch and Okere found that Iranian investors are not following market trends because of the high level of Collectivism met in their society. Iran is a country with a high PDI score, and it is found that the high level of inequality of power and status induced by this score, influences the investment behavior, resulting in a low risk portfolio allocation. According to their results , the strong Masculinity element in Iran is linked with low risk aversion and thus leading to a more aggressive investment profile with higher returns. Finally, they found that the most important cultural dimension affecting stock exchange investments is Uncertainty Avoidance. Iran, as a high UA society, which will resist to anything new and ambiguous, making them amore risk averse. It is obvious that differences in cultural dimensions lead to differences in investment decisions.

Schuler & Rogovsky concluded that low PD score in a society is an indicator for higher social pensions and that in these countries income is reallocated to people with lower income.

Leung, Bhagat, Buchan, Erez, and Gibson (2005), made a review of all the previous studies associated with culture and international business, and came to the conclusion that cultural differences seriously affect individual behavior when exposed to uncertain conditions.

Kwok and Tadesse (2006) made an important link between risk avoidance and Uncertainty Avoidance. Hofstede clearly states that those two concepts are not the same. However, they proved that cultures with high UA levels have adopted a bank-based financial system, because of the fixed returns that bank deposits can secure. On the contrary, cultures with low UA scores show a preference for stock market investments, which are linked with higher volatility and superior returns. Aggarwal and Goodell (2009) come to support these findings in their study Markets and institutions in financial intermediation: National characteristics as determinants. Additionally, they show that a market based system is also met in countries with higher Power Distance scores.

Another example would be the findings of Chui and Kwok (2008) who, by using data from 41 countries, found that in countries with high UA levels, people are seeking security in the consumption of life insurance. They also found that Individualism is positively associated with life insurance consumption, while Masculinity and Power distance are negatively associated.

Kanagaretnam et al. (2011) add to the above literature by examining the connection of national culture and risk taking in the banking sector, and how this connection might have affected the banks' position during the recent financial crisis. They are particularly interested in the dimensions of individualism and uncertainty avoidance, and based on Hofstede's theory, they are anticipating a negative relationship between UA and risk taking, and a positive between IDV and risk taking. Using a sample of 45 banks from different countries over the period 2000-2007, they find evidence supporting their above expectations. In particular they state that *"Given the call-option character of bank equity, bankers face strong incentives to lend aggressively and take on excessive risks, often ignoring prudent risk management."* (Kanagaretnam et al. , 2011). Additionally, they also find that banks in societies that promote high risk taking behaviors were affected more from the financial crisis. Low profitability ratios, less liquidity and asset quality are some of the problems found in banks with risk-taking profiles.

Hempel argues that multinationals should take into consideration the cultural characteristics of their employees when designing the appropriate pension system. The most important cultural dimension is Uncertainty Avoidance. In high UA countries the most appropriate pension system would be the Defined Benefit (DB) plan. DB plans offer a standard amount of pension, thus reducing the risk bared by the retiree. The protection of income and low ambiguity fit to the profile of an Uncertainty avoiding society. On the other hand, Defined Contribution plans or Stock based plans share the risk with the individual, making it the right choice for a Low UA society, since people in these societies are more keen to take more risk in return for the extra possible payoff.

Hempel also finds that countries with low Power Distance scores are trying to minimize the inequality gap among people by using pension benefits. Cravens and Oliver (2010), based on Hempel's work, find that culture also determines the level and the timing of the pension contribution made by corporations.

Another study, made by Beugelsdijk and Frijns (2010), examined the reasons why investors are continuously underweighting foreign securities in their asset allocation. They found that cultural dimensions indeed have an impact on investment decisions. More precisely, high scores in UA, are linked with higher preference for home stocks, because of their risk aversion, and the uncertainty underlying foreign investments.

Uncertainty avoidance is not the only cultural dimension affecting international investment decisions. Apparently, the level of Individualism also makes a difference. According to previous literature, collective and individual decision making are connected with a different risk seeking profile *(Kerr et al., 1996).* In fact, when deciding into groups during risky situations, risk aversion is more prominent *(Hupp and Williams (2008)). Chui et al. (2010)* show that Individualism is related to overconfidence and *Van den Steen (2004)* finds that overconfidence of self capabilities leads to an overestimation of possessed information. Based on the above, Beugelsdijk and Frijns (2010) argue that an Individualistic society, would underestimate the risk of foreign investment, showing a higher preference for it, because of the overconfidence stemming from the individual decision making.

Anderson at al, also provide evidence supporting Beugelsdijk and Frijns results. They also add that Masculinity is negatively related with home investments, and that more Masculine countries diversify their portfolio with foreign investments. According to Karlsson and Norden (2007) gender can to some extent explains home bias. While Graham et al. (2009) state that competent investors, a characteristic of Masculinity, actually diversify their portfolio with foreign investments as Anderson at al showed.

Guiso et al. (2004, 2006, 2008, 2009) in their work argue that involvement in stock market and portfolio investments can be partially explained by cultural differences. *De Mooij* proves that high UA scores are also associated with a preference for precious metals and an avoidance of stock investments.

In a more recent study, Liang Shao et al. (2013) find that individualism can explain investors' behavior when it comes to risk taking in a corporate level. In particular, they discovered that countries which score high in IDV show a preference for R&D investments instead of investments in capital expenditure and cash, implying that individualism is a cultural characteristic that is connected to risk taking. They also argue that people in leading positions in individualistic societies, tend to be more self-confident and as a result, dare to be more risky in their expectations and investment decisions.

***2.3. Investments, regulation and culture***

Next to culture, another important aspect that should be taken into consideration when looking into risk appetite, is legislation. Investments should follow some general guidelines and there are even some quantitative limits in investments imposed by legislation. For example, at least 30% of the assets have to be invested in low risk assets such as government bonds. Also, there are legislation limits regarding the investments in equities. In 2000 the ceiling was defined at 70% of total assets, with most of the new schemes keeping a 50% ceiling. Last, there should not be an investment in one single company that exceeds 30% of the total (Pension Funds Online 2010).

When it comes to the effect of national culture on legislation and supervision, Van der Lecq, Rivera-Rozo and Steenbeek (2010) have show that highly Individualist countries could show signs of moral hazard attitudes, meaning that for the sake of personal benefit, riskier strategies could be adopted. They also prove that Uncertainty avoidance is negatively correlated with high equity limits, implying that Equity investments are not considered to be uncertain, but on the contrary, provide a form of guarantee for future pension benefits. Power Distance can have the opposite effect, since a low Power Distance score is linked with higher maximum limits for equity investments, allowing pension funds for a higher risk appetite.

However, Dodor, Jean Baptiste K. Rana and Dharam S. (2007) believe that in individualist countries "individuals in their efforts to pursue their own interests contribute better to the general interest of the nation" and thus, we should expect an opposite association between individualism and risk appetite than the one introduced above.

***2.4. Risk appetite of pension funds***

The second important element of this study, apart from the cultural dimensions, is the risk appetite of pension funds. The time has come that pension funds have to cope with the problem of an ageing population. An increasing number of retirement years along with low birth rates pose great challenges for the pension system. There are significant less pension contributions in comparison to the pension commitments, and with the retirement age kept unchanged, governments will find it hard to finance this augmented number of pensions. Over 60% of the total pension assets are allocated for pension commitments within the next 10 years, making pension funds "ageing giants". (Frijns, Nijssen, and Scholtens, 2010)

Pension funds have to come up with a good plan in order to meet the interests of the elderly, under the threat of the increasing maturity and the pressure of the shortened investment horizon. This means that aging will definitely have an impact on the asset allocation of pension funds. Despite the increasing importance of asset allocation and risk management, there is still surprisingly little understanding of how to invest such funds. There is no predefined way to determine the most appropriate asset mix, there are however a number of regulation constraints regarding the portfolio choice for pension funds (Davis, 2002). A fundamental rule of investing is that funds have to take into consideration the nature of liabilities when searching for the best asset mix. At any point in time, a fund should be capable of meeting its liabilities. According to Scott (1991), equities have the important advantage of "matching the attributes of long-term inflation linked liabilities, but their short-term returns are very volatile and this is why the portfolio should be diversified in order to make sure that liabilities will be met". However it may be worth taking a higher risk considering that 1% extra return equals to 30% higher pensions (EDHEC).

Life -Cycle theory

Pension funds objective is to balance consumption during working and retirement years, therefore investments should be such that ensure a good level of living in both periods (Bagliano and Nicodano, 2009). Life-Cycle theory makes a distinction between long-term and short-term investors and their optimal asset allocation. It supports that younger investors can be more risky in their investments since they face a long time horizon which helps them recover from potential financial losses. Therefore, they are urged to invest in an equity-linked portfolio of assets during the first years of the life-cycle and slowly make a shift to a bond weighted portfolio while they reach the retirement age. As they say "the equity risk premium has more time to offset the greater risk attached to equities relative to bonds" (Booth 2004; Viceira 2007; Bodie and Treussard 2007). Investments in equity although riskier, should support growth and result in a higher rate of return. However bonds form the safe way to preserve capital and income and this is why they are preferred when the retirement is getting closer. "Your age in bonds" is the rule of thumb that has prevailed among financial planners, meaning a 30% of total assets should be invested in bonds at the age of 30, and 70% in equities.

According to the lifecycle theory, funds should automatically reallocate their portfolio from equities to bonds when approaching the target year.

What is observed in practice is that at the end of 2009 in most OECD countries, is that bonds and equities were the most popular kind of investments among asset classes for the pension funds, adding up to a total of 80% of total pensions funds' assets. Although there is a great heterogeneity in asset allocation among pension funds in different countries, in 2009 there was a general greater preference for bonds over equities. The chart below shows the asset allocation of pension funds in 5 European countries in 2011. As we can see, the investing landscape shows the same patterns as in the OECD survey in 2009, with the majority of assets being held in bonds in countries across Europe.

**Figure 2.1 Asset allocation of pension funds in 2011.**

The chart is a visual presentation of the asset allocation of pension funds in 5 OECD countries in the year 2011. As we can see the equity holdings vary from 22% to 40%, and it is only an indication for the whole sample. Source: Mercer 2011, Asset allocation survey

We should also mention that real estate is an asset that is broadly chosen by pension funds with an older age structure and with a larger number of contributors with disability, since it provides a stable and less unpredictable return to cover benefits obligations. Moreover, the more the short-term payments obligations the more risk-averse a pension fund will be because of the need for liquidity.

Following the above line of thinking, in this study the risk appetite of pension funds will be expressed as the total amount of equity share taken. The more risk seeking, the higher the total amount of equity a pension fund is expected to own.

***2.5 Controlling for other factors of asset allocation***

Before formulating our hypotheses, we should also include in our research some other factors that can influence our variables in question. Below, we are presenting which control variables we are going to test and the reason why.

***2.5.1 National wealth***

According to Hofstede, we should always check for the influence of national wealth when studying the cultural dimensions in connection with other data. The reason is that Power Distance and Individualism show high correlations with wealth-related phenomena. This is why we are going to include the GDP per capita variable in our analysis as a measure of national wealth. Moreover, an increasing GDP per capita is associated with developing economies, which are always an attractive target for investors (Berkel, 2007).

***2.5.2 Stock market development***

Given that we are going to examine the risk appetite of pension funds using their total equity share holdings, it makes absolute sense that we should also check the Stock market development of each country. According to theory, a developed stock market is associated with greater liquidity, which is an element that investors are seeking for when allocating their assets. Also, we could argue that better developed stock market could facilitate higher equity investments and hence higher risk appetite.

***2.5.3 Average of participants' age***

As discussed above, the Life Cycle Theory makes a distinction between younger and older investors and long term\ short term investments. Younger investors, having more time ahead in order to correct for possible losses, tend to be more risky and invest heavier in stocks. On the other hand, older investors tend to favor bond investments. Therefore, we expect that in countries where the number of pension recipients in relation to pension contributors is higher, the risk appetite of pension funds will be lower.

***2.5.4 Limits in equity investments***

In order to adhere to the rule of the "Prudent person" regarding the safety of investments, regulators are imposing portfolio limitations to the asset allocation of pension funds. These limits are usually per asset class and form a maximum upper limits of investments. Those limits differ from country to country, and vary depending on the legislation strictness of each. Therefore, especially in cases of strict limitations in equity, we could argue that those limits could restrict the risk appetite of pension funds and have a serious impact on their asset allocation.

***2.5.5 Relative share of total assets held by Defined Benefit plans***

When it comes to private pensions, there two basic types of pension plans: Defined Benefit (DB) and Defined Contribution (DC) plans. In a DB plan there is a fixed benefit received at the time of retirement, which is calculated according to a certain formula and depends on the working years and the average salary over the latest working years. The advantages of such a plan are that the retirement benefit is not affected by market performance, but it is usually counting for inflation. Although it usually leads to a higher amount for the employee in the end, because of the calculation method, in the same time it is expensive for the employer, who makes the contributions. This is why we notice a switch from DB plans to DC.

Defined Contribution plans, work the other way around. Here the contribution is a fixed amount, calculated as a percentage of salary, and the benefit is subject to the [investment](http://en.wikipedia.org/wiki/Investment) returns. Therefore there is no safety regarding the final amount the retiree will receive. On the one hand, the investor can have a better control over his portfolio and investments but on the other hand, it is a slightly riskier choice because of the lack of safety.

In our research, taking into account which kind of pension plan is mostly preferred on a country level could be of great interest. If people choose Defined Contribution plans over Define Benefit, that would suggest a higher risk appetite from their side, since it implies that they are interested in having control on their investment portfolio and therefore seek for higher returns through riskier investments. For the above reason, we are going to use the relative share of total assets held by Defined Benefit plans in each country. The higher the percentage, the lower the risk appetite is supposed to be on a country level.

***2.6. Formulating the Hypotheses***

According to traditional finance theory, investors can minimize their investment risk by diversifying their portfolio with different asset classes. However, how tolerant investors are towards risk depends on how they perceive risk. We could hypothesize that this perception of risk is influenced by national culture. This is confirmed by many psychological studies, which report that perception of uncertainty and the reaction against it are highly dependent on the culture of the country the individual is a member of.

Despite the extended literature on cultural dimensions and their implications in various sectors of study, there is not enough previous research regarding the effect of national culture on pension funds and their investment allocations. And this is why our research is of great interest. Following the line of thinking presented in the previous section, about cultural dimensions and their connection with finance, we will try to prove a number of hypothesis and our central research question:

*"There is significant relationship between Hofstede's cultural dimensions and risk appetite of pension funds."*

The above statement summarizes the central question of this study and checks if there is a connection in general between risk appetite and national culture. More interestingly, we will go one step further by testing whether each one of the cultural dimensions effect risk appetite of pension funds and in which way.

**Main hypothesis:**

According to previous literature, Power Distance is more linked to market financing rather than to bank financing, supports lower life insurance consumption and is also linked with higher maximum limits for equity investments allowing pension funds for a higher risk appetite (F.van der Lecq, J.Rivera-Rozo, O.Steenbeek, 2013). This shows a pattern of a more risky attitude and so we make the following hypothesis:

H1: There is significant positive relationship between Power distance and risk appetite of pension funds.

In countries which score high in Uncertainty Avoidance, people feel threatened by ambiguous situations and try to eliminate unexpected events and possible risks by creating stable and predictable environments. High consumption of life insurance, a bank-based financial system, and preference for domestic investments are some characteristics of high Uncertainty Avoiding countries. Taken together all the above, they lead us to our next hypothesis. Societies with high levels of Uncertainty Avoidance are expected to be more risk averse and consequently, expected to have lower risk appetite.

H2: There is significant negative relationship between Uncertainty Avoidance and risk appetite of pension funds.

Highly individualist countries could show signs of moral hazard attitudes, meaning that for the sake of personal benefit, riskier strategies could be adopted (F.van der Lecq at al (2013)). However, Dodor, Jean Baptiste K. Rana and Dharam S. (2007) believe that in individualist countries "individuals in their efforts to pursue their own interests contribute better to the general interest of the nation" and thus, we should expect an opposite association between individualism and risk appetite than the one introduced above. However, Hupp and Williams (2008) showed that group-decision making is more cautious towards high risks in comparison to individual decision making. Chui et al (2010) linked individualism to overconfidence, which in turns is linked to overestimation of available information and possibly to greater risk taking. Following this line of thinking, we conjecture that the more Individualistic a country is, the greater the risk appetite pension funds in this country will exhibit.

H3: There is significant positive relationship between Individualism and risk appetite of pension funds.

The fourth cultural dimension, Masculinity, is expected to be associated with higher risk appetite. As in the study on Stock exchange of Iran, where the strong Masculinity element is linked with low risk aversion and thus a more aggressive investment profile, and relying on Graham et al. (2009) results, that competent investors (a characteristic of Masculinity) actually diversify their portfolio with foreign investments, we conjecture the following:

H4: There is significant positive relationship between Masculinity and risk appetite of pension funds.

**3. Data**

In this section we are going to present all the data that are used in this research in order to test our hypothesis.

***3.1 Data on Cultural Dimension Scores***

Our main independent variables are the cultural dimension scores from Hofstede's research. Those dimensions, namely Power Distance, Uncertainty avoidance, Masculinity and Individualism, refer to the different way national societies deal with four main anthropological problem areas (Hofstede). Out of the 76 available country scores, we used 49 of them due to the lack of data availability on investments allocation for the rest.

In the table below we can see the scores for the 49 countries in use.

**Table 3.1.Cultural Dimension Scores, Hofstede 2011**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Country | PDI | IDV | UAI | MASC |
| 1 | Africa S(wte) | 49 | 65 | 49 | 63 |
| 2 | Australia | 36 | 90 | 51 | 61 |
| 3 | Austria | 11 | 55 | 70 | 79 |
| 4 | Belgium | 65 | 75 | 94 | 54 |
| 5 | Brazil | 69 | 38 | 76 | 49 |
| 6 | Bulgaria | 70 | 30 | 85 | 40 |
| 7 | Canada | 39 | 80 | 48 | 52 |
| 8 | Chile | 63 | 23 | 86 | 28 |
| 9 | Colombia | 67 | 13 | 80 | 64 |
| 10 | Costa Rica | 35 | 15 | 86 | 21 |
| 11 | Czech Republic | 57 | 58 | 74 | 57 |
| 12 | Denmark | 18 | 74 | 23 | 16 |
| 13 | Estonia | 40 | 60 | 60 | 30 |
| 14 | Finland | 33 | 63 | 59 | 26 |
| 15 | Germany | 35 | 67 | 65 | 66 |
| 16 | Great Britain | 35 | 89 | 35 | 66 |
| 17 | Greece | 60 | 35 | 112 | 57 |
| 18 | Hong Kong | 68 | 25 | 29 | 57 |
| 19 | Hungary | 46 | 80 | 82 | 88 |
| 20 | India | 77 | 48 | 40 | 56 |
| 21 | Indonesia | 78 | 14 | 48 | 46 |
| 22 | Ireland | 28 | 70 | 35 | 68 |
| 23 | Israel | 13 | 54 | 81 | 47 |
| 24 | Italy | 50 | 76 | 75 | 70 |
| 25 | Jamaica | 45 | 39 | 13 | 68 |
| 26 | Japan | 54 | 46 | 92 | 95 |
| 27 | Latvia | 44 | 70 | 63 | 9 |
| 28 | Luxembourg | 40 | 60 | 70 | 50 |
| 29 | Malta | 56 | 59 | 96 | 47 |
| 30 | Mexico | 81 | 30 | 82 | 69 |
| 31 | Netherlands | 38 | 80 | 53 | 14 |
| 32 | Norway | 31 | 69 | 50 | 8 |
| 33 | Pakistan | 55 | 14 | 70 | 50 |
| 34 | Peru | 64 | 16 | 87 | 42 |
| 35 | Poland | 68 | 60 | 93 | 64 |
| 36 | Portugal | 63 | 27 | 104 | 31 |
| 37 | Romania | 90 | 30 | 90 | 42 |
| 38 | Serbia | 86 | 25 | 92 | 43 |
| 39 | S Korea | 60 | 18 | 85 | 39 |
| 40 | Slovakia | 104 | 52 | 51 | 110 |
| 41 | Slovenia | 71 | 27 | 88 | 19 |
| 42 | Spain | 57 | 51 | 86 | 42 |
| 43 | Suriname | 85 | 47 | 92 | 37 |
| 44 | Sweden | 31 | 71 | 29 | 5 |
| 45 | Switzerland | 34 | 68 | 58 | 70 |
| 46 | Thailand | 64 | 20 | 64 | 34 |
| 47 | Trinidad | 47 | 16 | 55 | 58 |
| 48 | Turkey | 66 | 37 | 85 | 45 |
| 49 | United States | 40 | 91 | 46 | 62 |

This table presents the scores of the four cultural dimensions of Hofstede for the 49 counties in use : Power Distance (PDI), Individualism (IDV), Uncertainty avoidance (UAI) and Masculinity (MASC). Source: Official website of Geert Hofstede, [http://geert-hofstede.com](http://geert-hofstede.com/)

Below, we can see the basic statistic features (descriptive statistics) for each variable of the multiple regression that we are going to perform.

**Table 3.2 Summary statistics for cultural dimension scores**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | PDI |  | IDV | UAI | MASC |  |
| Mean | 0.534 |  | 0.494 | 0.681 | 0.493 |  |
| Median | 0.550 |  | 0.520 | 0.700 | 0.500 |  |
| Maximum | 1.040 |  | 0.910 | 1.120 | 1.100 |  |
| Minimum | 0.110 |  | 0.130 | 0.130 | 0.050 |  |
| Std. Dev. | 0.203 |  | 0.236 | 0.230 | 0.223 |  |

Descriptive statistics for the four cultural dimensions: Power Distance (PDI), Individualism(IDV), Uncertainty avoidance (UAI) and Masculinity (MASC).

In addition, the mean for the IDV variable is 0.494 (SD=0.236), with the values of Individualism scores varying from 13 for Colombia to 91 for the United States. Uncertainty avoidance scores range from 13 for Jamaica to 112 for Greece, with a mean of 0.68 (SD=0.229). The minimum score for the dimension of masculinity is 5 for Sweden and the maximum is 11o for Slovakia, giving a mean of s 0.492 (SD=0.22). Last, power distance scores vary from 11 to 104 for Austria and Slovakia respectively, with a mean equal to 0.534 (SD=0.20).

Additionally, it is important to mention the results of the Jarque-Bera normality test. As we mentioned before, the null hypothesis is rejected when the probability is below 5% (confidence interval 95%). In our case, the results of JB test show that all of our variables follow a normal distribution (P>5%).

***3.2 Dependent Variable: Equity investments / Total investments***

As we have discussed in the previous chapter, in this study, we are going to express the risk appetite of pension funds as the total amount of equity share taken. The data of Pension fund total investment and asset allocation in selected OECD and non-OECD countries for the year 2011 were found in the website of OECD and refer to the same 49 countries that are mentioned in the table above.

**Table 3.3 Equity investments in relation to total assets per country.**

|  |  |
| --- | --- |
| Country | Total investments/ Investments in equity (EqAll) |
| Australia | 0.497 |
| Austria | 0.260 |
| Belgium | 0.348 |
| Brazil | 0.299 |
| Bulgaria | 0.127 |
| Canada | 0.309 |
| Chile | 0.406 |
| Colombia | 0.331 |
| Costa Rica | 0 |
| Czech Republic | 0.004 |
| Denmark | 0.128 |
| Estonia | 0.077 |
| Finland | 0.413 |
| Germany | 0.037 |
| Greece | 0.005 |
| Hong Kong SAR, China | 0.541 |
| Hungary | 0.086 |
| India | 0.188 |
| Indonesia | 0.0499 |
| Ireland | 0 |
| Israel | 0.050 |
| Italy | 0.153 |
| Jamaica | 0.160 |
| Japan | 0.087 |
| Korea, Rep. | 0.002 |
| Latvia | 0.009 |
| Luxembourg | 0.134 |
| Malta | 0.348 |
| Mexico | 0.176 |
| Netherlands | 0.335 |
| Norway | 0.290 |
| Pakistan | 0.287 |
| Peru | 0.439 |
| Poland | 0.307 |
| Portugal | 0.245 |
| Romania | 0.119 |
| Serbia | 0.054 |
| Slovak Republic | 0.013 |
| Slovenia | 0.015 |
| South Africa | 0 |
| Spain | 0.099 |
| Suriname | 0 |
| Sweden | 0.114 |
| Switzerland | 0.260 |
| Thailand | 0.118 |
| Trinidad and Tobago | 0 |
| Turkey | 0.120 |
| United Kingdom | 0 |
| United States | 0.480 |

The above table presents the data for the dependent variable EqAll (Percentage of equity investments relatively to the total investments of pension funds) in 2011 for the 49 countries. Source: OECD database.

**Table 3.4. Summary statistics for the dependent variable**

|  |  |
| --- | --- |
|  | EqAll |
| Mean | 0.156 |
| Median | 0.119 |
| Maximum | 0.541 |
| Minimum | 0.000 |
| Std. Dev. | 0.150 |

This table presents the descriptive statistics for the dependent variable EqAll (Percentage of equity investments relatively to the total investments of pension funds). in 2011 for the 49 countries.

As we can see from the table above, our sample has a mean of 0.156 with maximum values of  0.541 for Hong Kong and almost zero for India. Unfortunately for some countries there were no data available for their investment allocation in 2011. In these cases we had to choose a value of zero.

Australia, Chile, Finland, United States and Peru are also countries that maintain their equity investments above the level of 40 per cent of their total portfolio, showing a rather risk taking profile. On the other hand, Latvia, Costa Rica, Slovakia, Czech Republic, Estonia, Greece, Hungary, Israel and Japan invest less than 10 per cent of their portfolio in equity, following a more conservative strategy.

What is worth mentioning is that, from 2008 to 2011 all the countries in our sample decreased their equity investments, sometimes to half the volume than the year before. A possible explanation for that could be the credit crisis that was in its peak at that period of time, and also has a serious impact on pension funds. The only countries that exhibited an increasing equity allocation were Australia, Portugal and Jamaica, which had my average two per cent higher equity investments in 2011, n comparison with 2010.

There is an interesting point to our sample, since it is formed by 49 countries with many different investment profiles. We have countries with high, medium and low -to extremely low- equity investments, which gives a great variety in our sample and makes it interesting to compare.

**Figure 3.1 Equity allocation as a percentage of total investments**

The figure above describes the equity allocation as a percentage of the total investments for the 49 countries that we investigate. As we can see the dependent variable EqAll (percentage of equity investments relatively to the total), varies from 0% up to 54%.

***3.3 Control Variables***

***3.3.1 Equity limits***

Our first control variable is the Equity limits on investments, imposed by regulation in our 49 countries. We used public information, derived from the "Survey of investment regulation of pension funds" report from OECD, published in February 2010. As an additional source, we used information on Portfolio limits from the World Bank survey "Pension investment restrictions compromise fund performance".

The figure below presents the portfolio limits in our sample countries.

**Figure 3.2 Equity limits in investments as a percentage of total investments**

The above figure refers to the first control variable : Equity Limits. This is the maximum percentage of equity investments pension funds are allowed to maintain in their portfolio for each country. Source: OECD survey of Investment Regulation of Pension Funds 2010 & World Bank survey "Pension investment restrictions compromise fund performance".

***3.3.2 GDP per capita***

Following Hofstede's recommendation, we will control for the influence of national wealth between cultural dimensions and other data. In order to do that, we use data on the GDP per capita in our analysis as a measure of national wealth. Data on 2011 figures for the 49 countries was derived from OECD database as well. (The data can be found on the Appendix)

***3.3.3 Market capitalization***

In order to examine the stock market development of each country, given that we will work with equity investments, it is important to include a measure of Stock market development. We chose the Market Capitalization as a percentage to GDP as our third control variable. Once more, the data was derived from the World bank database. (The data can be found on the Appendix)

***3.3.4 Age dependency ratio***

World Bank database offers a range of data on population age. We used the Age dependency ratio, a percentage of working-age population, as the last control variable of our analysis. This ratio shows the proportion of people younger that 15 or older than 64 years, against the working age population (ages between 15 and 64) in each country.

*"It relates the number of individuals who are likely to be “dependent” on the support of others for their daily living – the young and the elderly – to the number of those individuals who are capable of providing this support".* (European commission, Glossary <http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Total-age-dependency_ratio>)

\*World Bank staff estimates from various sources including census reports, the United Nations Population Division's World Population Prospects, national statistical offices, household surveys conducted by national agencies, and Macro International

**Figure 3.3 Age dependency ratio**

This table presents one of our control variables, the Age dependency ratio as a percentage of working-age population. (Population younger than 15 or older than 64/ Population older than 15 or younger than 64). The figures are retreived from the World Bank database and refer to the 49 countres of our sample. The smallest dependency ratio is found in Hong Kong, with a dependency ratio of 31.94, while Pakistan has the highest ratio of 64.39. The mean for the AGEDR is 48,5 and as we can see all the values are fluctiating aroung the 50 line, with a few extreme values for Hong Kong, Pakistan, Slaovakia and Israel. An increased ratio is translated into a higher burden for the part of population which is economically active to finance the [pensions](http://en.wikipedia.org/wiki/Pension) of the economically dependent. According to the World Bank, since 2010 Japan and Europe present the higher aged dependency ratios among other regions in the world.

***3.3.5 Relative share of total assets held by Defined Benefit plans***

For the last control variable we used data found on OECD survey: "Pensions at a Glance 2011: Retirement-income Systems in OECD and G20 Countries" (2011). We retrieved data regarding the Relative shares of Defined Benefit pension fund assets.

The table below indicates the main statistic indicators (descriptive statistics) for the control variables. The control variables are:

**Table 3.4 Descriptive statistics for the control variables**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | AGEDR | LEQINV | LNGDP | LNMARCAP | DB |
| Mean | 0.485 | 0.616 | 9.674 | 3.557 | 0.167 |
| Median | 0.485 | 0.600 | 9.962 | 3.809 | 0.000 |
| Maximum | 0.644 | 1.000 | 11.65 | 5.880 | 1.000 |
| Minimum | 0.319 | 0.000 | 0.000 | 0.000 | 0.000 |
| Std. Dev. | 0.062 | 0.363 | 1.742 | 1.127 | 0.327 |
| Observations | 49 | 49 | 49 | 49 | 49 |

Descriptive statistics for the five control variables, where:

a) LEQINV is the equity limits as a proportion of investments.

b) LNGDP is the natural logarithm (LN) of the GDP per capital

c) LNMARCAP is the natural logarithm (LN) of the market capitalization as a percentage of GDP

d) AGEDR is the age dependency ratio as a percentage of working-age population

e) and DB is the relative share of total assets held by Defined Benefit plans.

The mean for the AGEDR variable is equal to 0.485 (SD=0.006), the mean of LEQINV is 0.616 (SD=0.36). The limits n equity can vary from 0% to 100% of total investments, indicating a variety in the strictness of the regulation. Also the mean for the LNGDP variable is equal to 9.67 (SD=1.74) and the mean of LNMARCAP variable is 3.56 (SD=1.126). The last control variable, the relative shares of Defined Benefit plans, can vary from zero to 100% of the total assets between the 49 countries under examination. This implies that our sample includes countries with different pension structure and risk appetite.

**4. Methodology**

The current econometric analysis consists of two parts, a theoretical and an empirical. The theoretical part includes each methodology that is used in the analysis while the empirical part presents the variables and the models that are used in the regression analysis.

***4.1 Theoretical Part***

***4.1.1 Regression Analysis***

In order to examine the relationship between our variables, we are going to run both Simple Regression Analysis and a multiple Regression Analysis. This method is usually chosen when the researcher is looking for the existence of a casual effect of one variable upon another. In our case, we are examining the impact of cultural differences on the risk appetite of pension funds among different countries.

The first step for this analysis is the collection of data for the underlying variables and the implementation of the regression in order to approximate this casual effect. Next, the researcher must examine the level of statistical significance for the results that were found, or in other words, the degree of confidence that the estimated relationship actually exists.

A typical Simple Linear Regression model could be presented as:

***Υi = β0 + β1Χi + εi,***

Where Y is the dependent variable, βο is the constant of the model, β1 is the coefficient of the independent variable X, X is the independent variable and ε is the error term.

***4.1.2 Test for asymmetry, autocorrelation, heteroscedasticity and multicollinearity***

***Jarque-Bera test for Asymmetry***

The **Jarque-Bera** test is a normality distribution test. This test examines the difference of asymmetry and kurtosis between the examined distribution and a normal distribution. This is estimated through the following test:

http://www.mathworks.com/help/stats/eqn11510682102.png

The null hypothesis of the test assumes that there is normal distribution. The alternative hypothesis implicates that there is not a normal distribution. The null hypothesis is rejected when the probability is below 5% (confidence interval 95%).

***4.1.3 Autocorrelation***

Autocorrelation refers to the correlation of a time series with its own past and future values. (Dawdy, Matalas (1964)) It is also referred to as “lagged correlation” or “serial correlation”. With this mathematical tool, we examine the existence or non-existence of a repeating pattern at different points in time. Positive autocorrelation would suggest a sign of “persistence”, a trend for the same outcome from the one observation to the next. An autocorrelated model, has incorrect parameter estimates and overrated R2values, making our model being also overrated when it comes to credibility, and most likely mistaken.

***4.1.4 Heteroscedasticity***

We are also going to check for the existence of Heteroscedasticity. In case that our error terms vary across our observations, we are facing the problem of heteroscedasticity, which can once again cancel the validity of our statistical tests of significance.

***4.1.5 Multicollinearity***

Last, we are going to test for Multicollinearity, which implies that more than one of the independent variables is highly correlated. Although the existence of multicollinearity does not affect the reliability of the model itself, it does affect the individual predictors of the model, making it hard to examine how the individual independent variables contribute to the understanding of the dependent variable. (investopedia)

***4.2 Empirical Part***

***4.2.1 Regression***

Moving forward with our empirical analysis, we are going to present the five regressions that have been executed (one multiple and four simple).

The first multiple regression contains the four independent variables we are examining. In particular:

***EqAll= C + β1 PDI + β2 IDV + β3 UAI + β4 MASC+ εi, (1)***

Where:

* EqAll is the ratio of Equity to Total investments and is the independent variable (Yi)
* PDI stands for the scores on Power Distance
* IDV stands for scores in Individualism
* UAI stands for Uncertainty Avoidance scores
* MASC is the fourth cultural dimension, Masculinity
* β1, β2, β3 andβ4  are the coefficients
* C is the constant
* ει the standard error

We used the Ordinary Least Square (OLS) method in order to discover if there are any possible statistically significant relationships between the examined variables. We have already controlled for normality issues in our regression with the Jarque-Beta test before. Moreover, we should mention that we checked for autocorrelation, heteroscedasticity and multicollinearity. Using the Breusch-Godfrey Serial Correlation LM test, we found that all of our models had an autocorrelation problem. The autocorrelation problem was eliminated by adding an AR(1) at the model. Moreover, heteroscedasticity problem was detected by using Breusch-Pagan-Godfrey heteroscedasticity test. The heteroscedasticity was solved using the White-Correction method. Last, we found no multicollinearity problems occurred between the models. We used the following correlation matrix in order to discover it. (table below)

***4.2.2 No multicollinearity problem- Correlation Matrix***

**Table 4.1 Correlation matrix for all variables in use.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **EqAll** | **IDV** | **MASC** | **PDI** | **UAI** |
| **EqAll** | 1.000 | 0.085 | -0.052 | -0.058 | -0.066 |
| **IDV** | 0.085 | 1.000 | 0.111 | -0.533 | -0.375 |
| **MASC** | -0.052 | 0.111 | 1.000 | 0.166 | -0.002 |
| **PDI** | -0.058 | -0.533 | 0.166 | 1.000 | 0.391 |
| **UAI** | -0.066 | -0.375 | -0.002 | 0.391 | 1.000 |

Correlation matrix for the four independent variables (The cultural dimensions: Power Distance (PDI), Individualism(IDV), Uncertainty avoidance (UAI) and Masculinity (MASC)) and the dependent variable (Percentage of equity investments relatively to total investments held by pension funds (EqAll)).

From the table above we can make the following conclusions: Our dependent variable, equity allocation of investments, is positively correlated with three of the four cultural dimensions, Masculinity, Power distance and Individualism, while it is negatively correlated with the Uncertainty avoidance. The strongest correlation is found between Equity allocation and Masculinity (0.194).

***4.2.3 Multiple and single regressions.***

After correcting for the above problems, we continued with our first regression, which includes the following variables: Equity to Total Investments as a dependent variable, and Individualism (IDV), Masculinity (MASC), Power Distance (PDI) and Uncertainty Avoidance (UAI) as independent variables. The results are presented below.

**Table 4.2 Regression results for the multiple and Single models.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Data |  | Regression models | | | | | |
| *Variables* | ***Expected sign*** | ***Multiple regression (1)*** | ***Single regression (2)*** | ***Single regression (3)*** | ***Single regression (4)*** | ***Single regression (5)*** |  |
|  |  |  |  |  |  |  |  |
| IDV | + | 0.084 | 0.084 |  |  |  |  |
|  |  | (0.133) | (0.116) |  |  |  |  |
| PDI | + | 0.060 |  | -0.028 |  |  |  |
|  |  | (0.146) |  | (0.111) |  |  |  |
| MASC | + | -0.020 |  |  | -0.008 |  |  |
|  |  | (0.093) |  |  | (0.088) |  |  |
| UAI | - | -0.074 |  |  |  | -0.083 |  |
|  |  | (0.131) |  |  |  | (0.104) |  |
|  |  |  |  |  |  |  |  |
| R2 |  | 0.042 | 0.032 | 0.019 | 0.018 | 0.032 |  |
|  |  |  |  |  |  |  |  |
| Number of observations |  | 49 | 48 | 48 | 48 | 48 |  |

Regression results for the multiple and four single models, where the independent variables are the following: Power Distance (PDI), Individualism(IDV), Uncertainty avoidance (UAI) and Masculinity (MASC)) .

*\*95% confidence interval*

The results of the regression analysis show that there is no relationship between the dependent and the independent variables. A coefficient is not statistically significant when the probability of the variable is above 5% (95% confidence interval), which is the case for all the above variables. Therefore, we may claim that the dependent variable is not influenced by any of the independent variables. Also, the value of the R-square is 4, 2%. Thus, our regression may be considered as low successful.

Because we were unsuccessful in proving a relationship with the above regression, we also tried to examine the relationship between our dependent variable and the cultural dimensions one by one, separately. In particular:

***EqAll= C + β1 PDI + εi, (2)***

***EqAll= C + β2 IDV + εi, (3)***

***EqAll= C + β3 UAI + εi, (4)***

***EqAll= C + β4 MASC+ εi, ` (5)***

Where once again:

* EqAll is the ratio of Equity to Total investments and is the independent variable (Yi)
* PDI stands for the scores on Power Distance
* IDV stands for scores in Individualism
* UAI stands for Uncertainty Avoidance scores
* MASC is the score for the fourth cultural dimension, Masculinity
* β1, β2, β3 andβ4  are the coefficients
* C is the constant
* ει the standard error

The results can also be found at the above table (Table 4.2 ). We can see that once again we could not establish a relationship between the equity investments and the cultural dimensions.

Either testing the relationship between the cultural dimensions and the equity allocations one by one, or all in the same time, does not give us any statistically significant result. The probabilities are really high and the R2 indicate a very low success of the models. Even the coefficients have very small numbers suggesting that cultural differences do not play an important role in determining the risk appetite of pension funds.

***4.3 Dividing our sample***

Moving forward, we decided to make a distinction within our sample, and see how this will affect our results. Our sample is consisted from 49 countries, of which 30 are members of OECD. We decided to divide them into Developing and Developed countries, and then follow the same analysis as above for both samples.

The distinction between the two groups was made according to the International Trade Center, which provides a list with all the developing and developed countries, easily accessible in their website. Our sample is now formed as follows:

**Table 4.3 List of Developed and Developing countries.**

|  |  |
| --- | --- |
| Developed countries | Developing countries |
| |  |  | | --- | --- | | 1 | Australia | | 2 | Austria | | | 3 | Belgium | | | 4 | Bulgaria | | | 5 | Canada | | | 6 | Czech Republic | | | 7 | Denmark | | | 8 | Estonia | | | 9 | Finland | | | 10 | Germany | | | 11 | Great Britain | | | 12 | Greece | | | 13 | Hungary | | | 14 | Ireland | | | 15 | Italy | | | 16 | Japan | | | 17 | Latvia | | | 18 | Luxembourg | | | 19 | Malta | | | 20 | Netherlands | | | 21 | Norway | | | 22 | Poland | | | 23 | Portugal | | | 24 | Romania | | | 25 | Slovakia | | | 26 | Slovenia | | | 27 | Spain | | | 28 | Sweden | | | 29 | Switzerland | | | 30 | United States | | | |  |  | | --- | --- | | 1 | Africa S(wte) | | 2 | Brazil | | 3 | Chile | | 4 | Colombia | | 5 | Costa Rica | | 6 | Hong kong | | 7 | India | | 8 | Indonesia | | 9 | Israel | | 10 | Jamaica | | 11 | Mexico | | 12 | Pakistan | | 13 | Peru | | 14 | Serbia | | 15 | S Korea | | 16 | Suriname | | 17 | Thailand | | 18 | Trinidad | | 19 | Turkey | |

List of developing and developed countries according to the International Trade Centre (<http://www.trademap.org/stdevelopingcountries.aspx>)

***4.3.1 Developed countries***

Our first part of the sample includes 30 out of the 49 countries in total. In comparison to the total sample that we analyzed in the beginning, this new sample has higher mean and median values, but lower maximum regarding to the equity allocation. We can say that EqAll fluctuates less than in the original sample, having a mean of 0.176, 0.02 higher than before. The higher equity holdings belong to Australia, which keeps 49, 7% of its total assets in equity.

**Table 4.4 Descriptive statistics for Developed countries.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **EqAll** | **IDV** | **MASC** | **PDI** | **UAI** | **AGEDR** | **LEQINV** | **LNGDP** | **LNMARCAP** | **DB** |
| **Mean** | 0.176 | 0.621 | 0.499 | 0.481 | 0.679 | 0.488 | 0.706 | 9.660 | 3.580 | 0.187 |
| **Median** | 0.128 | 0.650 | 0.530 | 0.420 | 0.675 | 0.484 | 0.850 | 10.082 | 3.805 | 0.000 |
| **Maximum** | 0.497 | 0.910 | 1.100 | 1.040 | 1.120 | 0.644 | 1.000 | 11.648 | 5.880 | 1.000 |
| **Minimum** | 0.000 | 0.270 | 0.050 | 0.110 | 0.230 | 0.319 | 0.100 | 0.000 | 0.000 | 0.000 |
| **Std. Dev.** | 0.153 | 0.185 | 0.266 | 0.202 | 0.233 | 0.058 | 0.325 | 2.104 | 1.218 | 0.352 |
|  |  |  |  |  |  |  |  |  |  |  |
| **Observations** | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |

Descriptive statistics for all the variables used in the sub-sample of Developed countries:

the percentage of equity investments relatively to the total investments of pension funds (EqAll), Power Distance (PDI), Individualism(IDV), Uncertainty avoidance (UAI), Masculinity (MASC), the equity limits as a proportion of investments (LEQINV), the natural logarithm (LN) of the GDP per capital (LNGDP), the natural logarithm (LN) of the market capitalization as a percentage of GDP (LNMARCAP), the age dependency ratio as a percentage of working-age population (AGEDR) and the relative share of total assets held by Defined Benefit plans (DB).

Individualism and masculinity scores are higher for the Developed countries on average, with United States having the higher score for Individualism, 91, and Slovakia for Masculinity with 101. On the other hand, Portugal and Slovenia with 27 and Sweden with 5 show the lower scores for each dimension respectively. Power Distance has a mean of 48 relevant to 53 for our total sample, with a maximum of 104 for Slovakia and a minimum of 11 for Austria, which are exactly the same as the total sample.

The picture does not change much regarding the control variables. The average values for our control variables remain almost the same; therefore we do not expect great differences in the results around the control variables for the developed countries.

Moving on with the analysis of the new sample, we can see in the table below the results of the multiple regression between our independent variable and the four cultural dimensions for the Developed countries.

**Table 4.5 Regression results for the multiple and single regression models: Developed countries.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Variables* | *Expected sign* | *Multiple regression (1)* | *Single regression (2)* | *Single regression (3)* | *Single regression (4)* | *Single regression (5)* |
|  |  |  |  |  |  |  |
| IDV | + | 0.447\* | 0.247 |  |  |  |
|  |  | (0.122) | (0.126) |  |  |  |
| PDI | + | -0.096 |  | -0.092 |  |  |
|  |  | (0.102) |  | (0.113) |  |  |
| MASC | + | -0.076 |  |  | -0.008 |  |
|  |  | (0.089) |  |  | (0.088) |  |
| UAI | - | 0.267\* |  |  |  | -0.005 |
|  |  | (0.072) |  |  |  | (0.090) |
|  |  |  |  |  |  |  |
| R2 |  | 0.343 | 0.032 | 0.133 | 0.119 | 0.119 |
|  |  |  |  |  |  |  |
| Number of observations |  | 29 | 29 | 29 | 29 | 29 |

Regression results for multiple and simple models. This is regarding our new sub-sample: Developed countries. Here we can see the relationship between equity investments relatively to the total investments of pension funds (EqAll) and: Power Distance (PDI), Individualism(IDV), Uncertainty avoidance (UAI), Masculinity (MASC).

\*95% confidence interval

For the 30 developed countries, regressing the cultural dimension scores against the equity allocation of the pension funds in 2011, lead us to some interesting results. As we can see in the table above, in the multiple model, Individualism and Uncertainty Avoidance, seem to have a positive effect on the risk appetite of pension funds.

In particular, we can see that in the Developed countries, a higher level of individualism in the society, would lead to riskier investments and higher equity holdings from the pension funds. This findings support our initial hypothesis regarding individualism. In numbers, if individualism score increases per one unit, the equity holdings of this country will also rise 44%.

The results for the Uncertainty avoidance and Masculinity dimensions, contradict our initial hypothesis. We were expecting a negative relationship between UAI and risk appetite. From the table above we see that UAI and equity allocation of pension funds are positively correlated, and that a unit increase in the UAI score would increase the equity holding almost 27%. We were also anticipating a positive effect for Masculinity, which turned out to be negative, although statistically insignificant.

In the same table we also can see the results for the four single regressions. Here every cultural dimension is examined separately in relationship with the equity allocation. The above findngs disappear when we control for each cultural dimensions separately. Only PDI could be partly verified, only for the 90% confidence level.

Finally, we are going to examine the effect of our five control variables. In order to do that we are going to test our control variables with each cultural dimension, using five models for each dimension, and adding one control variable at a time. Below we can see the regression results in the four tables, each one of them corresponding to one cultural dimension.

***EqAll= C + β1 (Cultural Dimension)+ β1,1 LNEQINV + εi, (1)***

***EqAll= C + β2 (Cultural Dimension)+ β2, 1 LNEQINV + β2,2 LNGDP + εi,  (2)***

***EqAll= C + β3 (Cultural Dimension)+ β3, 1 LNEQINV + β3,2 LNGDP + β3,3 LNMARCAP+ εi,, (3)***

***EqAll= C + β4 (Cultural Dimension)+ β4,1 LNEQINV + β4,2 LNGDP +***

***β4,3 LNMARCAP+ β4,4 AGEDR + εi, (4)***

***EqAll= C + β5 (Cultural Dimension)+ β5,1 LNEQINV + β5,2 LNGDP +***

***β5,3 LNMARCAP+ β5,4 AGEDR + β5.5 DB + ,εi, (5)***

Where once again:

* EqAll is the ratio of Equity to Total investments and is the independent variable (Yi)
* As “Cultural Dimension” we use :

PDI for the scores on Power Distance

IDV for scores in Individualism

UAI for Uncertainty Avoidance scores

MASC for the score for the fourth cultural dimension, Masculinity

* βi are the coefficients
* ***εi,*** is the standard error
* And the Control variables:

LEQINV is the equity limits as a proportion of investments.

LNGDP is the natural logarithm (LN) of the GDP per capital

LNMARCAP is the natural logarithm (LN) of the market capitalization as a percentage of GDP

AGEDR is the age dependency ratio as a percentage of working-age population

and DB is the relative share of total assets held by Defined Benefit plans.

**Table 4.6 Summary of regression results for the five control variables: Developed countries.**

1. **Individualism**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Variable* | *Expected sign* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* |
|  |  |  |  |  |  |  |
| IDV | + | 0,259 | 0,256 | 0,286 | 0,228 | 0,230 |
|  |  | (0,158) | (0,164) | (0,171) | (0,189) | (0,213) |
| LEQINV | - | 0,063 | 0,065 | 0,052 | 0,093 | 0,093 |
|  |  | (0,095) | (0,102) | (0,111) | (0,120) | (0,125) |
| LNGDP | + |  | 0,001 | 0,006 | 0,007 | 0,007 |
|  |  |  | (0,009) | (0,014) | (0,014) | (0,015) |
| LNMARCAP | + |  |  | -0,018 | -0,006 | -0,006 |
|  |  |  |  | (0,033) | (0,032) | (0,038) |
| AGEDR | - |  |  |  | 0,558 | 0,556 |
|  |  |  |  |  | (0,564) | (0,585) |
| DB | - |  |  |  |  | -0,001 |
|  |  |  |  |  |  | (0,022) |
| R2 |  | 0,1497 | 0,1499 | 0,1608 | 0,1941 | 0,194 |
|  |  |  |  |  |  |  |
| Number of observations |  | 30 | 30 | 30 | 30 | 30 |

1. **Power Distance**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Variable* | *Expected sign* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* |
|  |  |  |  |  |  |  |
| PDI | + | -0,116 | -0,106 | -0,107 | -0,080 | 0,074 |
|  |  | (0,010) | (0,106) | (0,113) | (0,123) | (0,141) |
| LEQINV | - | 0,010 | 0,104 | 0,104382 | 0,145 | 0,145 |
|  |  | (0,09) | (0,101) | (0,104) | (0,106) | (0,109) |
| LNGDP | + |  | 0,004 | 0,003 | 0,005 | 0,005 |
|  |  |  | (0,009) | (0,015) | (0,015) | (0,015) |
| LNMARCAP | + |  |  | 0,001 | 0,012 | 0,013 |
|  |  |  |  | (0,033) | (0,029) | (0,032) |
| AGEDR | - |  |  |  | 0,733 | 0,737 |
|  |  |  |  |  | (0,505) | (0,519) |
| DB | - |  |  |  |  | 0,004 |
|  |  |  |  |  |  | (0,020) |
| R2 |  | 0,089 | 0,091 | 0,091 | 0,154 | 0,154 |
|  |  |  |  |  |  |  |
| Number of observations |  | 30 | 30 | 30 | 30 | 30 |

1. **Masculinity**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Variable* | *Expected sign* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* |
|  |  |  |  |  |  |  |
| MASC | + | -0,089 | -0,087 | -0,087 | -0,082 | -0,081 |
|  |  | (0,084) | (0,087) | (0,092) | (0,092) | (0,101) |
| LEQINV | - | 0,134 | 0,137 | 0,137 | 0,173 | 0,172 |
|  |  | (0,093) | (0,097) | (0,101) | (0,103) | (0,106) |
| LNGDP | + |  | 0,005 | 0,005 | 0,006 | 0,006 |
|  |  |  | (0,010) | (0,015) | (0,014) | (0,015) |
| LNMARCAP | + |  |  | 0,0004 | 0,012 | 0,012 |
|  |  |  |  | (0,030) | (0,028) | (0,031) |
| AGEDR | - |  |  |  | 0,754 | 0,754 |
|  |  |  |  |  | (0,475) | (0,486) |
| DB | - |  |  |  |  | 0,001 |
|  |  |  |  |  |  | (0,018) |
| R2 |  | 0,091 | 0,097 | 0,097 | 0,164 | 0,164 |
|  |  |  |  |  |  |  |
| Number of observations |  | 30 | 30 | 30 | 30 | 30 |

1. **Uncertainty Avoidance**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Variable* | *Expected sign* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* |
|  |  |  |  |  |  |  |
| UAI | - | 0,006 | 0,023 | 0,022 | 0,070 | 0,138 |
|  |  | (0,120) | (0,127) | (0,130) | (0,128) | (0,195) |
| LEQINV | - | 0,123 | 0,130 | 0,129 | 0,178 | 0,189 |
|  |  | (0,088) | (0,094) | (0,097) | (0,097) | (0,099) |
| LNGDP | + |  | 0,007 | 0,007 | 0,008 | 0,007 |
|  |  |  | (0,009) | (0,015) | (0,015) | (0,015) |
| LNMARCAP | + |  |  | -0,001 | 0,015 | 0,028 |
|  |  |  |  | (0,032) | (0,032) | (0,045) |
| AGEDR | - |  |  |  | 0,831 | 0,903 |
|  |  |  |  |  | (0,538) | (0,590) |
| DB | - |  |  |  |  | 0,023 |
|  |  |  |  |  |  | (0,031) |
| R2 |  | 0,068 | 0,076 | 0,076 | 0,153 | 0,170 |
|  |  |  |  |  |  |  |
| Number of observations |  | 30 | 30 | 30 | 30 | 30 |

The four tables above present the regression results for the multiple and single models, each table for one of the dimensions, particularly for the Developed countries. No statistically significant results could be found.

As we can conclude from the tables above, no control variable can influence the risk appetite of pension funds when it comes to the Developed countries. The only control variable that seems to follow a pattern is the GDP, which for all the four cultural dimensions seems to be positively correlated with equity allocation. The relative shares of Defined benefit plans, although not statistically significant, gives a negative outcome in relation with the equity holdings for all four dimensions as well.

***4.3.2 Developing countries***

In our second sample, Hong Kong holds the higher equity holdings among the 19 countries, with 54, 1% of its total assets invested in equity. In comparison to the Developed countries, Developing appear to have much lower scores in Individualism, with a mean of 29 in comparison with 62 for the Developed countries. On the contrary, Power Distance is much higher here, fluctuating around 62, compared to only 48 for the Developed. Uncertainty Avoidance and Masculinity do not show great differences between the two sub-samples.

Regarding to the control variables, we can see that Limits in Equity Investments (EQINV) are much lower in the Developing countries, allowing for a riskier appetite, according to our theory.

**Table 4.7 Descriptive statistics for the Developing countries.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **EqAll** | **IDV** | **MASC** | **PDI** | **UAI** | **AGEDR** | **LEQINV** | **LNGDP** | **LNMARCAP** | **DB** |
| **Mean** | 0.164 | 0.293 | 0.482 | 0.617 | 0.684 | 0.480 | 0.474 | 9.695 | 3.522 | 0.128 |
| **Median** | 0.121 | 0.250 | 0.470 | 0.649 | 0.800 | 0.485 | 0.400 | 9.778 | 3.912 | 0.000 |
| **Maximum** | 0.541 | 0.650 | 0.690 | 0.869 | 0.920 | 0.602 | 1.000 | 11.018 | 4.777 | 0.895 |
| **Minimum** | 0.000 | 0.130 | 0.210 | 0.130 | 0.130 | 0.375 | 0.000 | 7.306 | 1.262 | 0.000 |
| **Std. Dev.** | 0.173 | 0.156 | 0.133 | 0.182 | 0.231 | 0.069 | 0.383 | 0.978 | 0.996 | 0.289 |
|  |  |  |  |  |  |  |  |  |  |  |
| **Observations** 19 | | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 |

The table presents the descriptive statistics for all variables in use for the sub-sample: Developing Countries.

Below we can see the results from the multiple and simple regressions for the Developing countries.

**Table 4.8 Regression results for the multiple and single regression models- Developing countries.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Variables* | *Expected sign* | *Multiple regression (1)* | *Single regression (2)* | *Single regression (3)* | *Single regression (4)* | *Single regression (5)* |
|  |  |  |  |  |  |  |
| IDV | + | -0.463 | -0.429 |  |  |  |
|  |  | (0.281) | (0.240) |  |  |  |
| PDI | + | 0.149 |  | 0.175 |  |  |
|  |  | (0.178) |  | (0.175) |  |  |
| MASC | + | 0.190 |  |  | 0.212 |  |
|  |  | (0.348) |  |  | (0.307) |  |
| UAI | - | -0.091 |  |  |  | -0.108 |
|  |  | (0.217) |  |  |  | (0.213) |
|  |  |  |  |  |  |  |
| R2 |  | 0.190 | 0.111 | 0.036 | 0.028 | 0.022 |
|  |  |  |  |  |  |  |
| Number of observations |  | 18 | 18 | 18 | 18 | 18 |

The table above presents the regression results for the multiple and single models for the Developing countries. No statistically significant results could be found.

When it comes to the Developing countries the results are still statistically insignificant, but the sign of the coefficients seem it be more in line with our expectations than for the Developed countries. Power distance, Masculinity and Uncertainty avoidance follow the expectations with regards to their effect on risk appetite.

**Table 4.9 Summary of regression results for the four control variables-Developing countries.**

1. **Individualism**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Variable* | *Expected sign* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* |
|  |  |  |  |  |  |  |
| IDV | + | -0,444 | -0,159 | -0,237 | -0,213 | -0,285 |
|  |  | (0,174) | (0,238) | (0,240) | (0,222) | (0,158) |
| LEQINV | - | 0,004 | -0,060 | -0,102 | -0,118 | -0,121 |
|  |  | (0,084) | (0,066) | (0,063) | (0,086) | (0,078) |
| LNGDP | + |  | -0,108\* | -0,116\* | -0,122\* | -0,100\* |
|  |  |  | (0,035) | (0,028) | (0,026) | (0,019) |
| LNMARCAP | + |  |  | 0,052 | 0,061 | 0,063 |
|  |  |  |  | (0,032) | (0,045) | (0,036) |
| AGEDR | - |  |  |  | -0,271 | 0,394 |
|  |  |  |  |  | (0,480) | (0,447) |
| DB | - |  |  |  |  | -0,229\* |
|  |  |  |  |  |  | (0,050) |
| R2 |  | 0,157 | 0,467 | 0,534 | 0,542 | 0,73 |
|  |  |  |  |  |  |  |
| Number of observations |  | 19 | 19 | 19 | 19 | 19 |

1. **Power Distance**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Variable* | *Expected sign* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* |
|  |  |  |  |  |  |  |
| PDI | + | 0,222\* | 0,482\* | 0,480\* | 0,483\* | 0,381\* |
|  |  | (0,173) | (0,143) | (0,142) | (0,135) | (0,133) |
| LEQINV | - | 0,011 | 0,040 | -0,005 | -0,023 | -0,057 |
|  |  | (0,106) | (0,059) | (0,067) | (0,080) | (0,083) |
| LNGDP | + |  | -0,140\* | -0,150\* | -0,158\* | -0,139\* |
|  |  |  | (0,017) | (0,016) | (0,020) | (0,021) |
| LNMARCAP | + |  |  | 0,042 | 0,058 | 0,058 |
|  |  |  |  | (0,032) | (0,043) | (0,040) |
| AGEDR | - |  |  |  | -0,390 | 0,088 |
|  |  |  |  |  | (0,504) | (0,507) |
| DB | - |  |  |  |  | -0,17152\* |
|  |  |  |  |  |  | (0,040) |
| R2 |  | 0,049 | 0,614 | 0,6623 | 0,680 | 0,780 |
|  |  |  |  |  |  |  |
| Number of observations |  | 19 | 19 | 19 | 19 | 19 |

1. **Masculinity**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Variable* | *Expected sign* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* |
|  |  |  |  |  |  |  |
| MASC | + | 0,160 | 0,223 | 0,243 | 0,276 | 0,194 |
|  |  | (0,316) | (0,213) | (0,196) | (0,216) | (0,208) |
| LEQINV | - | -0,060 | -0,098 | -0,147 | -0,172 | -0,174 |
|  |  | (0,096) | (0,077) | (0,074) | (0,098) | (0,085) |
| LNGDP | + |  | -0,120\* | -0,132\* | -0,140\* | -0,123\* |
|  |  |  | (0,024) | (0,024) | (0,024) | (0,027) |
| LNMARCAP | + |  |  | 0,045 | 0,064 | 0,062 |
|  |  |  |  | (0,028) | (0,039) | (0,036) |
| AGEDR | - |  |  |  | -0,460 | 0,130 |
|  |  |  |  |  | (0,541) | (0,453) |
| DB | - |  |  |  |  | -0,204\* |
|  |  |  |  |  |  | (0,062) |
| R2 |  | 0,025 | 0,479 | 0,534 | 0,55 | 0,705 |
|  |  |  |  |  |  |  |
| Number of observations |  | 19 | 19 | 19 | 19 | 19 |

1. **Uncertainty Avoidance**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Variable* | *Expected sign* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* |
|  |  |  |  |  |  |  |
| UAI | - | -0,091 | -0,057 | -0,0126 | -0,005 | 0,055 |
|  |  | (0,213) | (0,115) | (0,122) | (0,115) | (0,105) |
| LEQINV | - | -0,059 | -0,088 | -0,126 | -0,143 | -0,152 |
|  |  | (0,103) | (0,080) | (0,080) | (0,104) | (0,090) |
| LNGDP | + |  | -0,117\* | -0,128\* | -0,135\* | -0,120\* |
|  |  |  | (0,025) | (0,025) | (0,023) | (0,022) |
| LNMARCAP | + |  |  | 0,042 | 0,057 | 0,062 |
|  |  |  |  | (0,037) | (0,050) | (0,043) |
| AGEDR | - |  |  |  | -0,366 | 0,224 |
|  |  |  |  |  | (0,578) | (0,491) |
| DB | - |  |  |  |  | -0,221\* |
|  |  |  |  |  |  | (0,050) |
| R2 |  | 0,025 | 0,457 | 0,501 | 0,517 | 0,690 |
|  |  |  |  |  |  |  |
| Number of observations |  | 19 | 19 | 19 | 19 | 19 |

The four tables above present the regression results for the multiple and single models, each table for one of the dimensions, particularly for the Developing countries. No statistically significant results could be found.

For the Developing countries the results have some more interest than the ones for the Developed. As we can see from the tables above, national wealth (GDP) and the relative shares of Defined Benefit plans give statistically significant results. For all four cultural dimensions, GDP is negatively correlated with equity allocation of pension funds. With values from -0.09957 for Individualism to a maximum of -0,15759 for Power distance, GDP has a small but stable negative effect on risk appetite. We can say that for the Developing countries, a higher GDP would lead to a lower risk appetite.

As for the DB control variable, our expectations are verified, and Developing countries with higher relative shares in Defined Benefit plans seem to have a lower risk appetite as predicted. On average, an increase of the power of DB plans, would lead to a decrease of equity allocation of 0,205.

The rest of the control variables do not show any important effect on equity holdings for the Developing countries.

**5 Results and conclusions**

In this section we are going to present the outcome of the methodology and the results of our analysis. We will try to justify our conclusions by taking into consideration the theory and any kind of limitations that this thesis project is subjected to.

Having no success in establishing a statistical significant relationship between the cultural differences and the risk appetite of pension funds in the total sample, we tried to test whether the outcome would be different if we examined the Developed countries separately from the Developing. We can argue depending on the results from the previous chapter that the results can be slightly different between these two.

We have assumed in our hypothesis that Power distance is positively related to the risk appetite displayed by pension funds. High PDI scores were linked in our previous literature with market financing, higher upper limits in equity investments and therefore we suggested a positive relationship between Power distance and risk appetite. However, in the sub-sample of Developed countries, the hypothesis is rejected. Looking into the numbers of our statistical analysis, the estimated coefficient of PDI has a negative value for both multiple and single models. This negative value suggests a negative relationship between risk appetite and Power distance dimension. Also, our null hypothesis is rejected, since the p-value is very high, and therefore statistically insignificant in the 95% confidence level. For the Developing countries, we succeeded in predicting the trend but the result is still not significant in statistical terms.

Our second hypothesis assumed that Uncertainty avoidance is negatively related to the risk appetite of pension funds. High uncertainty avoiding countries, show signs of risk aversion since they feel threatened by ambiguous situations, and therefore we would expect lower levels of risky investments from their side. According to our results, we do find a negative relationship between UAI and risk appetite of pension funds for the Single model of Developed countries and for all models in Developing, however, when we see the probability values, we have to reject our hypothesis. A reason why we found opposite results for Uncertainty Avoidance is because, as we said before, uncertainty avoidance is not equivalent to risk avoidance. It is possible that societies with clear laws and procedures can bear a higher risk. We can suspect that in Developed countries, such rules exist, and therefore risk taking is not that stressful for its members.

Individualism was supposed to be positive correlated with the equity investments of the pension funds according to our third Hypothesis. People from highly individualistic countries are interested in their own benefit and are willing to take riskier strategies. In general, we could not verify most of our hypotheses in none of the two sub-samples and our hypothesis is again rejected with 95% confidence. However, we find some evidence for Individualism. In the developed countries, this dimension has a positive effect on the risk appetite of pension funds. This means that the more individualistic a society is, and the higher the uncertainty avoidance level, the more risky they become in their investments. This result comes into agreement with our expectations regarding Individualism.

Last, the final hypothesis of our research, suggests that Masculinity is positively associated with pension funds' appetite for risk. Although we find a slightly positive relationship between the coefficient of MASC and asset allocation for the Developing countries our hypothesis is again rejected because of the very high p-value we have found.

We also controlled for the influence of some other variables, namely Gross Domestic Product, Limits in equity investments, Age dependency ratio, Market capitalization and relative shares of Defined Benefit plans. According to our results none of the above determinants affect the risk appetite of pension funds when it comes to the Developed countries. However, we do have some interesting findings for the Developing.

Apparently, national wealth and the power of Defined benefit plans, have a significant negative effect on the equity holdings of pension funds in Developing countries. It seems that when the national wealth, when counted n terms of GDP, is increasing, pension funds lose their interest in risky investments in Developing countries. Apparently, in these countries the level of GDP can affect the risk appetite of pension funds; the lower the GDP, the more risk seeking they become. Also, when Defined benefit plans have the biggest share of assets among other types of plans, and especially in comparison to Defined Contribution plans, the risk appetite is relatively lower, as expected by theory.

Having rejected all of our secondary hypothesis, we can conclude that our main hypothesis is rejected as well. This means that there is no significant relationship between Hofstede's cultural dimensions and the risk appetite of pension funds.

All in all, we have tried in this thesis to investigate the relationship between culture and risk appetite of pension funds. Despite the fact that we could not establish a strong relationship between these two, we believe that we set the grounds for future research, giving a direction that could be of great use for governments and pension funds.

**6 Limitations and recommendations for future research**

The first limitation that we should take into consideration is the size of our sample. Hofstede's study involves cultural scores for 76 countries. However, because of data unavailability for all of the 76, we were able to make use of 49 of them. Our sample size is relatively small, which probably contributes to the extremely low significance levels that we have found for our tests.

Another factor that could possibly affect the outcome of our results is the time period of our data. In 2011, crisis is still taking its toll. In this year, there is still intense pressure for pension funds, both public and private, to reduce the intake of risk in their portfolio in order to keep volatility low and maintain the funding ratios more secure in comparison to the previous years. This could affect their risk appetite, heading for a safer asset portfolio with lower equity investments.

Moreover, we had limited data for some of the control variables (e.g. relative shares of DB). As we saw, the DB control variable is somehow correlated with Developing countries. It would be suggested for future research to extend their focus in this variable, when more data will be available for use.

Culture is found to have an impact in many aspects of economics and finance. Pension funds’ assets allocation is a topic that will have an augmenting interest, especially with the aging problem that countries are facing nowadays. Therefore it would be helpful to have a better understanding of how pension funds investment behavior works within a cultural frame. In our research we noticed that there are differences between Developing and Developed counties in respect of risk appetite and the factors that can affect it. Therefore, it would be of great interest o get in more depth regarding the sources of these differences, and see hoe pension funds vary their risk taking strategies and pension products in those two different country categories. Future research could try to examine specific types of pension funds, gathering a bigger sample of funds from different countries, or even a more detailed research between a developed and a developing country.

**REFERENCES**

* Amirhosseini Z., V.O. Okere 2012, "Effect of cultural dimensions on stock exchange investment decision in Iran", *Clute Institute International Conference.*
* Andy CW Chui and Chuck CY Kwok. (2008) "National culture and life insurance consumption".
* Bodie, Z., and J. Treussard. 2007. “Making Investment Choices as Simple as Possible, But Not Simpler.” *Financial Analysts Journal* 63 (3): 42–47.
* Booth, L. 2004. “Formulating Retirement Targets and the Impact of Time Horizon on Asset Allocation.” *Financial Services Review* 13 (1): 1–17.
* Brooks C., (2009). Introductory Econometrics for Finance (4 ed.). *Campridge: Campridge University Press.*
* Christopher W. Anderson, Mark Fedenia, Mark Hirschey, Hilla Skiba, "Cultural influences on home bias and international diversification by institutional investors", *Journal of Banking & Finance*, Volume 35, Issue 4, April 2011
* Chuck CY Kwok and Solomon Tadesse. (2006). National culture and financial systems (Vol. 37, pp. 227-247). n.p. Journal Of International Business Studies.
* D R Dawdy, N C Matalas. (1964) “Statistical and probability analysis of hydrologic data, part III: Analysis of variance, covariance and time series”
* David Blake, Bruce, N. Lehmann and llan Timmerman. (1999). "Asset Allocation Dynamics and Pension Fund Performance" (Vol. 72, pp. 429-461). *The Journal Of Business.*
* Deborah, J. Luca and tephen, P. Zeldes. (2009). " How Should Public Pension Plans Invest? "(Vol. 99, pp. 527-532).  *The American Economic Review*
* Dimitri Vittas. (1998). "Regulatory Controversies of Private Pension Funds". *Development Research Group The World Bank.*
* Dodor, Jean Baptiste K., Rana, Dharam S. 2007. "Culture and economic development: an investigation using Hofstede cultural dimensions.", *International Journal of Business Research 7( 2).*
* Előd Takáts, August 2010, "Ageing and asset prices", *BIS Working Papers* No 318.
* Fieke Van Der Lecq Jairo Rivera-Rozo, Onno Steenbeek. (2013). "Cultural determinants of regulation and supervision of pension funds". *Erasmus School Of Economics (ESE).*
* Geert Hofstede. (2002). "Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations across Nations" (Vol. 27, pp. 460-462). *The Academy Of Management Review.*
* Hempel. (1998). "Designing Multinational Benefits Programs: The Role of National Culture".
* Hofstede, G., G.J. Hofstede, and M. Minkov 2010. "Cultures and organizations: software of the mind "(3rd ed.). *New York: McGraw-Hill*.
* Hofstede, G. (2011). "Dimensionalizing Cultures: The Hofstede Model in Context", Online Readings in Psychology and Culture, 2(1). <http://dx.doi.org/10.9707/2307-0919.1014>
* Karen, S. Craven and lizabeth Goad Olivery. (2000). "The Influence of Culture on Pension Plans "(Vol. 35, p. 521±537). *The International Journal Of Accounting.*
* Kiridaran Kanagaretnam, Chee Yeow Lim and Gerald J. Lobo, (2011) "Effects of National Culture on Bank Risk Taking"
* Laurence Booth and Bin Chang, 2011, "The Global Financial Crisis and the Performance of Target-Date Funds in the United States", *Rotman International Journal of Pension Management,* Volume 4, Issue 2.
* Liang Shao, Chuck C Y and Kwok and Ran Zhang. (2013) "National culture and corporate investment" Vol. 44, 745–763 *Journal of International Business Studies*
* OECD website: <http://www.oecd.org/>
* OECD GUIDELINES ON PENSION FUND ASSET MANAGEMENT (2006). n.p. OECD.
* Phillip G. Scott, 1991, Strategic Asset Allocation of Pension Funds.
* Raj Aggarwal, John W. Goodell, "Financial markets versus institutions in European countries: Influence of culture and other national characteristics", International Business Review, Volume 19, Issue 5, October 2010, Pages 502-520
* Reginald Deschepper, Larissa Grigoryan, Cecilia Stålsby Lundborg, Geert Hofstede, Joachim Cohen, Greta Van Der Kelen, Luc Delien and lora, M. Haaijer-Ruskamp. (2008).Are cultural dimensions relevant for explaining cross-national differences in antibiotic use in Europe n.p. BMC Health Services Research.
* Ross Levine and Sara Zervos. (1998) " Stock Markets, Banks, and Economic Growth" Vol. 88, No. 3, pp. 537-558 *The American Economic Review*.
* Sjoerd Beugelsdijk A, Bart Frijns B. (2010). A cultural explanation of the foreign bias in international asset allocation.
* Stephen, G. Dimmock, Roy Kouwenberg, Olivia, S. Mitchell, and Kim Peijnenburg. (2013). Ambiguity Attitudes and Economic Behavior
* Stewart, F. (2010), "Pension Funds’ Risk-Management Framework: Regulation and Supervisory Oversight", OECD Working Papers on Insurance and Private Pensions, No. 40, OECD publishing, © OECD
* Viceira, L.M. 2007. “Life-Cycle Funds.”Working paper, *Harvard Business School.*
* Zahra Amirhosseini, Shahr-e-Qods Branch, Iran Vivian, O. Okere. (2012). Effect Of Cultural Dimensions On Stock Exchange Investment Decisions In Iran (Vol. 10). n.p. Journal Of Business & Economics Research
* <http://www.milliondollarjourney.com/defined-benefit-pension-vs-defined-contribution-pension.htm#rFkWmcmVXG3kdjoM.99>

# APPENDIX A

Data for all the variables in use for Developed and Developing countries:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | eq all | PDI | IDV | UAI | Masc | LEqInv | Ln(GDP) | ln(MarCAP) | AgeDR | DBU |
| Africa S(wte) | 0 | 0.49 | 0.65 | 0.49 | 0.63 | 0.75 | 11.0182853 | 4.464324456 | 0.484561879 | 0 |
| Brazil | 0.298 | 0.69 | 0.38 | 0.76 | 0.49 | 0.6 | 8.876007806 | 2.735815616 | 0.461816766 | 0 |
| Chile | 0.406 | 0.63 | 0.23 | 0.86 | 0.28 | 0.41 | 8.86841821 | 4.100685366 | 0.518432549 | 0 |
| Colombia | 0.331 | 0.67 | 0.13 | 0.8 | 0.64 | 0.4 | 9.064945074 | 1.261539761 | 0.451032653 | 0 |
| Costa Rica | 0 | 0.35 | 0.15 | 0.86 | 0.21 | 0.1 | 9.932028351 | 2.871965888 | 0.414706492 | 0 |
| Hong kong | 0.541 | 0.68 | 0.25 | 0.29 | 0.57 | 0.1 | 7.30553282 | 4.006331873 | 0.543377138 | 0 |
| India | 0 | 0.77 | 0.48 | 0.4 | 0.56 | 0.325 | 10.78773456 | 2.789662231 | 0.497773595 | 0 |
| Indonesia | 0.174 | 0.78 | 0.14 | 0.48 | 0.46 | 0 | 10.35080679 | 4.088925944 | 0.608220427 | 0 |
| Israel | 0.005 | 0.13 | 0.54 | 0.81 | 0.47 | 1 | 8.58102081 | 3.912443093 | 0.57071331 | 0.805 |
| Jamaica | 0.16 | 0.45 | 0.39 | 0.13 | 0.68 | 1 | 10.01788987 | 4.489483102 | 0.378805479 | 0 |
| Mexico | 0.176 | 0.81 | 0.3 | 0.82 | 0.69 | 0.23 | 10.82130277 | 4.264563802 | 0.499192457 | 0.163 |
| Pakistan | 0.287 | 0.55 | 0.14 | 0.7 | 0.5 | 1 | 8.702494676 | 3.803049472 | 0.556644555 | 0 |
| Peru | 0.439 | 0.64 | 0.16 | 0.87 | 0.42 | 0.2 | 9.507689671 | 3.291017969 | 0.398620834 | 0 |
| Serbia | 0.054 | 0.86 | 0.25 | 0.92 | 0.43 | 0 | 9.778263448 | 1.596150595 | 0.374605914 | 0 |
| S Korea | 0 | 0.6 | 0.18 | 0.85 | 0.39 | 0.3 | 10.09170606 | 2.547015956 | 0.442256228 | 0.895 |
| Suriname | 0 | 0.85 | 0.47 | 0.92 | 0.37 | 0 | 10.95240258 | 4.467183169 | 0.541953235 | 0 |
| Thailand | 0.118 | 0.64 | 0.2 | 0.64 | 0.34 | 1 | 9.723122674 | 4.181963157 | 0.382228263 | 0 |
| Trinidad | 0 | 0.47 | 0.16 | 0.55 | 0.58 | 0.6 | 9.261414042 | 3.25969156 | 0.471802065 | 0 |
| Turkey | 0.121 | 0.66 | 0.37 | 0.85 | 0.45 | 1 | 10.57230255 | 4.776764178 | 0.51874655 | 0.584 |
|  |  |  |  |  |  |  |  |  |  |  |
| Developed |  |  |  |  |  |  |  |  |  |  |
|  | eq all | PDI | IDV | UAI | Masc | LEqInv | Ln(GDP) | ln(MarCAP) | AgeDR | DBD |
| Australia | 0.497 | 0.36 | 0.9 | 0.51 | 0.61 | 1 | 10.81192274 | 2.981778851 | 0.479093335 | 0.114 |
| Austria | 0.26 | 0.11 | 0.55 | 0.7 | 0.79 | 0.7 | 10.75069673 | 3.801233236 | 0.526606524 | 0 |
| Belgium | 0.348 | 0.65 | 0.75 | 0.94 | 0.54 | 1 | 9.440967287 | 3.904438207 | 0.474490816 | 0 |
| Bulgaria | 0.127 | 0.7 | 0.3 | 0.85 | 0.4 | 0.2 | 10.82666323 | 4.698873388 | 0.443793232 | 0 |
| Canada | 0.309 | 0.39 | 0.8 | 0.48 | 0.52 | 1 | 9.574598742 | 4.688875462 | 0.453788059 | 0.92 |
| Czech Republic | 0.004 | 0.57 | 0.58 | 0.74 | 0.57 | 0.375 | 10.99963303 | 3.985514942 | 0.531880438 | 0 |
| Denmark | 0.128 | 0.18 | 0.74 | 0.23 | 0.16 | 0.7 | 9.713136332 | 1.984099374 | 0.489668737 | 0.063 |
| Estonia | 0.077 | 0.4 | 0.6 | 0.6 | 0.3 | 0.375 | 10.79596291 | 3.996382751 | 0.520412655 | 0 |
| Finland | 0.413 | 0.33 | 0.63 | 0.59 | 0.26 | 1 | 10.69330367 | 3.493290705 | 0.51406361 | 1 |
| Germany | 0.0037 | 0.35 | 0.67 | 0.65 | 0.66 | 0.35 | 10.15119377 | 2.452534096 | 0.499620159 | 0 |
| Great Britain | 0 | 0.35 | 0.89 | 0.35 | 0.66 | 1 | 10.46756155 | 5.880045278 | 0.319389029 | 0 |
| Greece | 0.005 | 0.6 | 0.35 | 1.12 | 0.57 | 0.7 | 9.549926403 | 2.595735801 | 0.457098837 | 0 |
| Hungary | 0.086 | 0.46 | 0.8 | 0.82 | 0.88 | 1 | 8.158975508 | 3.830088239 | 0.478333297 | 0 |
| Ireland | 0 | 0.28 | 0.7 | 0.35 | 0.68 | 1 | 10.49412748 | 2.978901478 | 0.530501019 | 0.16 |
| Italy | 0.153 | 0.5 | 0.76 | 0.75 | 0.7 | 1 | 10.7342786 | 4.100120522 | 0.578995948 | 0.1 |
| Japan | 0.087 | 0.54 | 0.46 | 0.92 | 0.95 | 1 | 9.451429992 | 1.337535582 | 0.467758484 | 0 |
| Latvia | 0.009 | 0.44 | 0.7 | 0.63 | 0.09 | 0.2 | 11.6484033 | 4.738213003 | 0.458975831 | 0 |
| Luxembourg | 0.134 | 0.4 | 0.6 | 0.7 | 0.5 | 1 | 9.962181028 | 3.651511914 | 0.412497845 | 0.703 |
| Malta | 0.348 | 0.56 | 0.59 | 0.96 | 0.47 | 0.1 | 9.215041823 | 3.5677103 | 0.542685631 | 0 |
| Netherlands | 0.335 | 0.38 | 0.8 | 0.53 | 0.14 | 1 | 11.49376774 | 3.809557931 | 0.505569861 | 0 |
| Norway | 0.29 | 0.31 | 0.69 | 0.5 | 0.08 | 0.35 | 7.081181719 | 2.746354948 | 0.643901177 | 1 |
| Poland | 0.307 | 0.68 | 0.6 | 0.93 | 0.64 | 0.4 | 10.01305211 | 3.257619823 | 0.496580228 | 0 |
| Portugal | 0.245 | 0.63 | 0.27 | 1.04 | 0.31 | 1 | 9.036640795 | 2.467207506 | 0.43210093 | 0.935 |
| Romania | 0.119 | 0.9 | 0.3 | 0.9 | 0.42 | 0.5 | 8.749948815 | 2.904494455 | 0.467498242 | 0 |
| Slovakia | 0.013 | 1.04 | 0.52 | 0.51 | 1.1 | 0.43 | 8.995912738 | 5.345256014 | 0.530122892 | 0 |
| Slovenia | 0.015 | 0.71 | 0.27 | 0.88 | 0.19 | 0.3 | 10.37170654 | 4.245719189 | 0.475455768 | 0 |
| Spain | 0.099 | 0.57 | 0.51 | 0.86 | 0.42 | 1 | 0 | 0 | 0.531247198 | 0.005 |
| Sweden | 0.114 | 0.31 | 0.71 | 0.29 | 0.05 | 1 | 11.33119752 | 4.951534668 | 0.472758317 | 0 |
| Switzerland | 0.26 | 0.34 | 0.68 | 0.58 | 0.7 | 0.5 | 8.511652604 | 4.35248844 | 0.413857933 | 0 |
| United States | 0.48 | 0.4 | 0.91 | 0.46 | 0.62 | 1 | 10.78128622 | 4.647577098 | 0.50065379 | 0.624 |