



Lisbon School
of Economics
& Management
Universidade de Lisboa

**MASTER OF SCIENCE IN
FINANCE**

**MASTER'S FINAL WORK
DISSERTATION**

**THE ASSOCIATION BETWEEN FINANCIAL LITERACY AND
FINANCIAL MARKET PARTICIPATION**

DIOGO ANDRÉ GONÇALVES SOUSA

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SUPERVISION

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I hereby express that all the errors remain my own.

ABSTRACT, KEYWORDS AND JEL CODES

The present research has the purpose to analyze the main drivers of market participation and to better understand the association between the individual's financial literacy and financial market inclusion. Furthermore, we intend to analyze the effects of financial crisis towards financial market participation, in the context of COVID-19 health crisis that severely affected the Portuguese economy and shaped the investor's financial behaviors. There is literature stating that financial literacy promotes financial market inclusion, but there are only few studies analyzing the effects of financial crises on the main drives of market participation, and the most only specifically refer to stock market participation and not the general market participation. Therefore, we found it important to analyze the differences on the investor's behavior towards different dimensions of market participation and the main drivers that promote financial inclusion.

We use two parallel surveys from CMVM, the 2018 and 2020 Online Investor Survey Results, that were carried out to measure the investing behaviors of Portuguese investors, in which the survey of 2020 was conducted alongside the COVID-19 health crisis. To measure financial literacy, we constructed two different indexes and we explore different dimensions of financial market participation, from its depth and breadth. We found that with respect to financial market inclusion what matters the most is the advanced financial literacy. Demographic characteristics present a positive relationship with any of the dimensions of financial market participation considered in this study. In times of economic and financial growth, what matters the most for participating in the financial markets is the investor's risk perception and its level of income, where any level of the individual's financial literacy is not statistically significant. However, our results suggest that in times of financial recession or economic instability the individual's advanced financial literacy represents an essential role to explain any form of market participation.

**KEYWORDS: FINANCIAL LITERACY; MARKET PARTICIPATION; FINANCIAL CRISIS;
RISK PERCEPTION**

JEL CODES: G01

RESUMO

O presente estudo tem como objetivo analisar os principais impulsionadores da participação nos mercados financeiros e compreender melhor a associação entre a literacia financeira de cada indivíduo e a inclusão no mercado financeiro. Pretendemos também analisar os efeitos de crises financeiras na participação nos mercados financeiros, no contexto da crise pandémica COVID-19, que afetou severamente a economia portuguesa e moldou os comportamentos financeiros dos investidores. Existem evidências na literatura que afirmam que a literacia financeira promove a inclusão no mercado financeiro, mas são poucos os estudos que analisam os efeitos das crises financeiras sobre os principais impulsionadores da participação nos mercados financeiros, e a grande maioria refere-se apenas especificamente à participação no mercado de ações e não à participação geral nos mercados financeiros. Desta forma, achamos importante analisar as diferenças no comportamento do investidor em relação às diferentes dimensões de participação nos mercados financeiros e os principais impulsionadores que promovem a inclusão financeira.

Utilizamos paralelamente dois inquéritos da CMVM, os Resultados do Inquérito ao Investidor Online 2018 e 2020, que foram realizados com o objetivo de avaliar os comportamentos de investimento dos investidores portugueses, na qual o inquérito de 2020 foi realizado durante um período crítico da crise pandémica COVID-19. Para avaliar a literacia financeira dos participantes, construímos dois diferentes índices e explorámos diferentes dimensões da participação dos indivíduos nos mercados financeiros, desde a sua profundidade à sua amplitude. Constatámos que no que diz respeito à inclusão nos mercados financeiros o que mais importa é a literacia financeira avançada de cada indivíduo. As características demográficas apresentam uma relação positiva com qualquer uma das dimensões de participação nos mercados financeiros consideradas neste estudo. Em tempos de crescimento económico e financeiro, o que mais importa para a participação nos mercados financeiros é a perceção de risco do investidor e o seu nível de rendimento, onde qualquer nível de literacia financeira do indivíduo não é estatisticamente significativo. No entanto, os resultados sugerem que em tempos de recessão financeira ou instabilidade económica, a literacia financeira avançada do indivíduo representa um papel essencial para explicar qualquer forma de participação nos mercados financeiros.

PALAVRAS-CHAVE: LITERACIA FINANCEIRA; PARTICIPAÇÃO NOS MERCADOS FINANCEIROS; CRISES FINANCEIRAS; PERCEÇÃO DE RISCO

CÓDIGOS JEL: G01

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GLOSSARY

AFL – Advanced Financial Literacy

BFL – Basic Financial Literacy

CMVM - Portuguese Securities Market Commission

COVID-19 – Coronavirus Disease 2019

FLI – Financial Literacy Index

ISEG – Lisbon School of Economics & Management

MFW – Master Final Work

OECD – Organization for Economic Cooperation and Development

1- INTRODUCTION

In our modern world, it is essential for individuals to improve their financial literacy in order to make optimal financial decisions. This is only possible when individuals are engaged with financial knowledge and abilities to effectively manage its finances, which is the foundation of our economic growth and financial well-being. However, with market liberalization and the expansion of financial markets and due to the lack of hope on the structural reforms that are chronically based on pension and social security that are increasingly not being guaranteed at the end of individuals' working lives, individuals have at their disposal a fully diverse and complex universe of possible investments where they can allocate their savings and make their investments thrive.

Nonetheless, are individuals ready to assume more responsibility for their own financial stability? How willing are individuals to participate in the financial markets and what are the main drivers? And how affected is that participation in the financial markets during financial crisis or economic recessions? There are a few studies assessing these topics indicating that, in general, people display low levels of literacy even in the most basic financial or economical concepts (Lusardi and Mitchell, 2007). There is evidence suggesting that financial illiteracy affects negatively financial market participation (Yoong, 2011; Van Rooij et al., 2011; Zhong et al., 2017) and discourage individuals to invest in complex financial products, reducing financial market participation (Garauv, Cole and Tobacman, 2011). Almenber and Dreber (2015) highlighted the gender differences when it comes to market participation, stating that women do not participate that much in financial markets as men and that men are more willing to take risk, referring that it can be costly for individuals to not participate in financial markets. But when investors are facing financial crisis, Zhou (2020) stated that the overall stock market participation rate decreases significantly after market crashes.

We had access to the CMVM Investor Survey Results from 2018 and 2020, which we gratefully use as a database for this study. The measurement of financial literacy is made through two different financial literacy indexes. The first FLI, named Rooij FLI, is based in the approach of Van Rooij et al., (2011) and it is composed by four questions, in which the first two questions assesses the individual's basic financial literacy (BFL) and the last two questions measures the individual's advanced financial literacy (AFL). In line with Van Rooij et al., (2011), we carried out a Factor Analysis, where each question is connected to a factor loading, in which it was created a score for each level of literacy (BFL and AFL). The second FLI is based in the individual's self-perception about their financial literacy, measured through a question from the survey. Regarding financial

market participation, we computed three different measures of market participation analyzing if the investor participate in the financial markets, the depth of that participation and the representativeness of that participation in the investor's total portfolio.

Our data demonstrates that, comparing the CMVM surveys of 2018 and 2020, the respondents of the survey of 2020 did not perform that well answering correctly to the questions, comparing with the participants of the survey of 2018. Moreover, we observed a significant increase of unanswered questions in the survey of 2020 and we notice that the participants tend to be more pessimistic about their perceived financial knowledge. Overall, the participants display reasonable good levels of basic financial literacy, meaning that, in general, they can perform simple calculations about interests and compounding of interest rates, but when it comes to advanced financial literacy, we observe very low levels of knowledge in advanced financial matters. Moreover, the data reveals that the participants of the survey of 2018 had a higher participation in the financial markets, a higher number of different risky or complex financial assets and, in average, a higher representativeness of financial market participation in the investor's total portfolio.

We found that low levels of financial literacy (BFL) is not statistically significant to explain market participation, and the advanced financial literacy (AFL) is what matters the most when it comes to market inclusion. Both AFL and demographic characteristics present a positive relationship with any form of market inclusion. Investor's perceived financial knowledge and risk perception also display a significantly positive relationship to explain market participation. However, when comparing both results of the surveys of 2018 and 2020, we found that in times of economic and financial growth, what matters the most for participating in the financial markets is the investor's risk perception and its level of income, where any level of the individual's financial literacy is not anymore statistically significant. Nonetheless, the results suggest that in times of financial recession or economic instability the individual's advanced financial literacy represent an essential role to explain any form of market participation.

This research presents several contributions. First of all, we are fortunate to use two very similar surveys that were launched to public in two different moments, in 2018, where Portugal was living a time of economic and financial growth and prosperity and, in 2020, where Portugal was going through a severe worldwide health crisis COVID-19 pandemic that completely stopped the economy for several months. This allow us to differentiate investor's behaviours towards financial market participation in two distinct times, assess the differences in the main drivers of market participation and compared the impact of financial crisis in individual's financial knowledge and risk perception.

Another important contribute is that, to the best of our knowledge, we are using for the first time two different FLI's, in which one of them is measured through the perception of financial knowledge that each individual has about themselves. This is especially important because it enable us to distinguish subjective from objective financial literacy, and therefore, to compare the impact and the differences of these two measures of financial literacy with respect to financial market participation and when investors are facing times of financial contraction. Additionally, another important contribution is that we measured financial market participation according to three dimensions, from its breadth and depth. Accordingly, we are able to differentiate among different levels of financial market participation and across two distinct times, 2018 and 2020.

This study is structured as follows: in section 2 we explore the existing literature about financial literacy and the relationship with financial market participation, macroeconomic crisis, risk and confidence profile and investor's demographic characteristics. Forward, in section 3, we describe the propositions of our study and what we expect from each analysis. In section 4 we expose the data analysis and methodology used in this research to manage our data sample. Finally, in section 4 we present our model results and empirical evidences, and in Section 5 we show our main findings and conclusion achieved in this research.

2- LITERATURE REVIEW

In our financial complex world, individuals can be faced by difficult and diverse financial choices which require some knowledge and financial maturity to undertake those choices. This financial maturity or financial knowledge is entirely related to the concept of financial literacy, which involves not only the way we manage our personal finances but also how we effectively do it to improve our wealthiness and economic well-being (Li, 2020).

The concept became more important over the past few years due to the sophistication of the economy and the financial markets, and due to the globalization, that brought a dynamic and complex environment (Lusardi and Mitchell, 2011). Consequently, the individual investor faces all these complexities and at the same time that is confronted by the economic and political instability and threatened by the latest financial crisis (Rodrigues, L., Oliveira, A., Rodrigues, H., Costa, C., 2019). Therefore, the urge of financial literacy is not only a necessity, but also a fundamental tool to make families thrive.

There are a wide range of views around the concept of financial literacy. Hung, Parker and Yoong (2009) mentioned that the latest literature around the concept can be explained by different

views, and there is not a widely accepted definition for the term. Hung et al., (2009) defends that the term involves the “knowledge of basic economic and financial concepts, as well as the ability to use that knowledge and other financial skills to manage financial resources effectively for a lifetime of financial wellbeing” (p.12). Moreover, some authors defend that the concept should integrate the practical skills to process, synthesize and explore the implied specifics of financial information (Huston, 2010; Atkison and Messy, 2012). In order to promote a more widely accepted and universal concept, OECD (2014) provided a detailed and complete definition of it, as it follows: “Financial literacy is the knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life ” (p.33).

To access the individual’s understanding of the financial knowledge, it is important to choose reliable measures of financial literacy. According to Li (2020), the common measures rely on survey-based measurement, self-assessed measurement and other measurement, such as demographic-based proxy and outcomes-based proxy. Recent studies evidence that the survey-based measurement is the most used methodology to assess the individual’s financial literacy, since it can be adapted to maximize the accurate information collected by the researcher. Normally, this type of methodology combines three different domains (Lusardi, 2012). The first one relates to the individual’s capacity to understand the basics of financial instruments. The second domain concerns to the individual’s knowledge about the fundamentals of financial principals, such as time value of money, nominal and real values, leverage, volatility, risk, etc. The third domain studies the mathematical skills of the individual investor and its competence to do numerical calculations.

Financial literacy is a wide-ranging concept that has several ramifications to other concepts that can be direct or indirectly connected. Many are the drivers of financial literacy according to Ademola et al., (2019) that enable an individual investor to make good investments decision such as the knowledge, education, risk tolerance, risk perception, age, gender, and others. Previous studies presented the evidence that individuals endowed with the abilities and expertise in finance are better prepared to allocate their limited resources to make optimal financing decisions regarding different spheres (Lusardi and Mitchell, 2014), such as investment decisions (Van Rooij et al., 2011; Zhang et al., 2020), debt decisions (Lusardi and Scheresberd, 2013), retirement planning (Lusardi and Mitchell, 2007; Van Rooij et al., 2011), professional advice seeking (Allgood and Walstad, 2016), stock market

participation (Lusardi et al., 2011), cash-flow and credit management (Hilgert et al., 2003), among other domains.

The theory exposed in the literature about the concept of financial literacy proves that someone financially knowledgeable is able to make good investment choices (Van Rooij et al., 2011) and people lacking knowledge in finance can suffer from consequences of their poor decisions, which can lead to unnecessary losses (Lusardi and Mitchell, 2007). Garauv, Cole and Tobacman (2011) defend that poor levels of financial literacy discourage an individual to invest in complex financial products, as well as the absence of experience in dealing with this type of products. Additionally, if an investor is financially well literate, he will be better prepared to take more risk, thus presenting a higher risk tolerance.

Previous studies suggest that men are more financially literate than women and eager to invest in complex products and willing to take higher risk (Bannier and Neubert, 2016). In the same vein, Almenberg and Dreber (2015) demonstrates that women do not participate that much as men in the financial markets mainly due to the poor levels of financial literacy that they display. Thus, Almenberg and Dreber (2015) argue that financial literacy is useful in demonstrating that gender differences in financial markets participation and risk-taking behavior and their studies present evidence that market participation and risk aversion are related. Moreover, Almenberg and Dreber (2015) highlight the importance of financial market inclusion affirming that it can be costly for the investors to not participate in the financial markets, since the equity premium is becoming a vital factor of long run returns to individual investor's savings.

Some studies are in line with this, presenting evidence that financial literacy and risk-taking behavior is positively related (Zhang et al., 2020) and that financial market participation and financial literacy presents a positive correlation (Van Rooij et al., 2011; Zhong et al., 2017). Both authors deepened this analysis stating that age has a u-shaped curve effect on market participation, which means that as age increases investors tend to participate more, but after certain point (around 60 years) the investor's participation in the stock market has a decreasing behavior.

Guiso and Jappelli (2009) demonstrates that the lack of portfolio diversification can be explained by the deficits of financial literacy and Abreu and Mendes (2010) complements this study defending that the number of assets hold by an investor have the tendency to be higher and well diversified when the individual has higher levels of literacy, displaying a positive association. The literature demonstrates that unsophisticated financial investors are more able to incur in long lasting

consequences for wealth accumulation and welfare (Yoong, 2011). The author found out that financial illiteracy (ignorance of financial matters) affects negatively financial market participation, which is in accordance with other studies developed by Van Rooij et al. (2011) and Zhong et al., (2017). The research suggests that the impediments to market participation can be explained by the lack of familiarity with finance and states that risk aversion is a meaningful cause of the lack of wealth accumulation and financial stability.

Cole (2008) is consistent with these results explaining that ability and knowledge acquired in school can increase participation in financial markets and refers that acquired knowledge in finance is important for one investment class, such as bonds, stocks and mutual funds. Moreover, Cole (2008) elucidates the importance of cognitive ability concluding that is associated with the ability to deal with all financial assets and methods of investing. Beliefs and attitudes are also drivers of financial education and consequently can encourage individuals to adhere to the investment markets. Interestingly, his study suggests that investors displaying greater self-control may, as well, participate more in the financial markets.

Regarding advice seeking, Chauhan and Dey (2020) endorses that the higher degree of financial literacy of an individual the greater will be the disposition to pay for suitable advice, being more willing to look for financial advice. When it comes to debt decisions, it is important to highlight the evidence that individuals lacking financial literacy can incur in inadequate financial decisions and, therefore more likely to default and make poor debt management and engage in excessive debt loans (Lusardi and Tufano, 2015). Similarly, Lusardi and Scheresberg (2013) found that individuals financially illiterate can more easily incur in expensive borrowing costs. This demonstrates that financial literacy and over-indebtedness is negatively correlated. Individuals with higher levels of financial literacy are better prepared to involve with complex financial products, to deal with the volatility of the market, to prepare and preserve its investments in financial crisis and to acknowledge the optimal measures when facing financial decisions (Rodrigues et al., 2019). In the same vein, Zhong et al., (2017) point out the evidence of a strong relationship between financial literacy and the engagement in profitable financial practices, such as paying bills on time, budgeting, ability to pay credit card bills in full, managing monthly expenses, diversifying investments, saving for an emergency fund or imposing financial objectives. Thereby, financial literacy is fundamental for an individual to reach financial satisfaction and to prevent from erroneous decision-making (Zhong et al., 2017).

Concerning perceived financial literacy, the recent literature has shown that individuals tend to be more optimistic about their knowledge than they really are (Agnew and Szykman, 2003), meaning that there is a difference between perceived and objective financial literacy. This evidence can be seen in the individual's financial behavior among the different domains mentioned before, such as market participation (Van Rooij et al., 2011), riskier investment participation (Bannier and Neubert, 2016), retirement planning and savings (Parker et al., 2012), among others. Xia et al., (2014) mentioned that individuals tend to overtrade or participate more in financial markets when they are too optimistic, relying more in individual stocks or equities, as compared to other financial instruments (Bailey et al., 2006; Puri and Robinson, 2007). Xia et al. (2014) states that an overconfident person tends to take more risks and jeopardize its actions towards financial decisions. Equally, Graham et al., (2005) found that financially educated investors report greater levels of confidence and are more inclined to invest abroad.

The recent literature has found many evidences about the importance and traits of financial literacy. Kempson et al., (2005) has concluded that it is challenging to choose the most suitable services and financial products for each situation and to prevent from vicious practices for the individuals that lack financial literacy. This is even harder among the elderly and young, where these groups display lower levels of financial knowledge (Rooij et al, 2011). The later author also defends that those who hold only primary education, show very low levels of financial literacy. However, it is not necessarily true that those who hold high education levels are financially literate, hence the author defends that education is not always a perfect proxy of financial literacy. The same study found evidence that professional financial aid is more requested by households that exhibit good degrees of financial literacy and that they do not rely that much in informal sources of information. As a result, the study concludes that financial advice is an important input for financial decision-making and a way to increase financial literacy.

In line with the previously mentioned, Ademola et al., (2019) argues that a crucial way to make efficient investment decisions relies on having access to information about financial literacy, such as stock prices, market returns, macro and micro economic variables, market volatility, among others. In addition, the study also suggests that individuals are better prepared to make sound investment decisions when they acknowledge other factors affecting those decisions besides financial literacy. In fact, if only considering the factor of financial literacy, they claim that has no significant impact on an individual's financial decision (Ademola et al., 2019; Arianti, 2018). Nonetheless, they found that the individuals that present higher risk tolerance (risk perception), high education levels

and elevated degrees of financial literacy are more likely to significantly make sound investment decisions in the future, than only experiencing one of the factors as financial literacy.

It is important as well to put emphasis on the investment preferences of the individual investor. Arena and Zenging (2016) found evidence that investment preferences depend on the level of financial literacy, risk perception, and personality traits, even though they consider that the latter does not have the same importance as the others. The authors concluded that investors embedded with financial literacy tend to rely more in equity investments while investors with low degrees of literacy tend to invest more in bank deposits, due to its simplicity. In the same vein, Arena and Zenging (2016) argue that those presenting high tolerance for risk (risk lovers) are more likely to invest in equities, whilst risk-averse investors prefer to invest in bank deposits. Investors displaying no risk tolerance or no risk appetite tend to participate more in currency and portfolio investments. Interestingly, they suggest that at lower levels of financial literacy there is no difference in gender, this is, men and women normally have the same investment preferences and quite the same levels of financial literacy. However, with respect to advanced levels of financial literacy, Arena and Zenging (2016) found out that the gender differences are quite revealing, where men display higher levels of literacy in finance than women, exhibiting different investment preferences, namely, men tend to present more risk appetite and therefore carry more investments in portfolio, equity and currency than women.

There are inconsistent results in literatures about the impact of financial literacy and market returns. In line with the mentioned before, Bianchi (2018) demonstrates that higher returns are more probable for financially literate individuals than for those investors with lower levels of literacy. Cole (2008) suggests that financial literacy is significant for enhance investment income and Gudecker (2015) pointed out that sophisticated investors can get reasonable investment returns. Accordingly, Zhong et al., (2017) affirmed that sophisticated households are more likely to invest in mutual funds and more able to make positive returns, suggesting that financial literacy is a driver of good financial performance. However, Calvet et al., (2007) states that financially sophisticated individuals invest more aggressively and incur in higher return losses from under-diversification.

Besides, Bianchi (2018) states that it is not true that sophisticated households take more risk. The author argues that it depends on the market conditions insofar as it is expected a greater investment in riskier portfolios when it is more likely to offer greater returns. The present study found evidence that there is more portfolio inertia and lack of diversification when there is absence of financial literacy. Hence, the returns earned by an investor tend to be higher when the portfolio has a constant rebalancing and monitorization, this is, when there is a portfolio dynamic, only possible

when households are financially sophisticated. Thus, only financially literate persons are able to find the most optimal balancing between market returns, risk and diversification (Firli, 2017; Bianchi, 2018), being both authors in accordance with the evidence that financial literacy is crucial for managing the available resources to calibrate risk and market returns.

Leaning on the literature about financial market participation during financial crisis, Zhou (2020) found that, during the great financial crisis¹, the overall stock market participation rate decreased significantly after the market crash. More specifically, the author affirmed that the impact of the crisis was more severe for the less educated and for the poor investors. Similarly, Lusardi (2012) stated that the relationship between financial literacy and the level of unspent income is higher during financial crisis, suggesting a lower participation in the financial markets in times of financial recessions. Gärling et al., (2009) affirmed that investors who choose risky financial products are more likely to be affected by financial crises and recessions and that investors tend to be more risk averse during financial recessions. Similarly, Bucher-Koenen and Ziegelmeyer (2011) defended that for those investor displaying lower levels of financial literacy are less likely to participate in risky asset markets and, therefore, report less frequently losses due to financial crisis when comparing with investors with higher levels of literacy

3- RESEARCH QUESTION AND RESEARCH HYPOTHESIS

The main scope of this research is to study the association between stock market participation and the individuals' financial literacy exposed in the literature, more precisely to study if there is a relation between the individual's financial knowledge and investments in risky or complex financial products, focusing on the investing and personal characteristics of the Portuguese investors in the financial markets.

As shown in the literature review, there are many studies that defend that financial literacy is important to motivate individuals to participate in the financial markets, reducing the barriers to stock market participation (Van Rooij *et al.*, 2011; Yoong, 2011; Zhong *et al.*, 2017) but there is no strong evidence defending a positive relationship between financial literacy and the detention of risky or complex financial products. In fact, even though some authors present evidence of a positive relationship between financial literacy and the investment in complex financial products (Garauf et

¹ Financial crisis of 2007-2008 characterized by a general market decline observed in the entire economies around the world.

al., 2011; Hsiao and Tsai, 2018; Rodrigues et al., 2019), as far explore in the literature, there are only few studies presenting evidence on this association, and therefore there is not enough robustness on this association. Thus, this study will provide more additional evidence about the effects of financial literacy in the investor's predisposition to hold risky or complex financial products.

Additionally, this research will contribute to the academic community by analyzing the impact of financial crisis in the individual's predisposition to hold or invest in risky or complex financial products. The financial literature does not provide a clear answer about the impact of financial recessions on the detention of complex or risky financial assets, only presenting evidence that investors tend to be more risk averse during financial recessions, and that investors who choose risky financial products are more likely to be affected by financial crises and recessions (Gärling et al., 2009). Thus, we intend to assess in this research the influence of financial crisis on the detention of risky or complex financial products in the investor's portfolio and how will it mold the investor's market participation, by comparing and evaluating the information collected on the CMVM survey in 2018 and 2020, considering that the CMVM survey of 2020 will reflect the impact of Covid-19 health crisis and the deep economic and financial crisis that are ahead on the expectations and financial behaviors of the Portuguese investors.

Therefore, the research question that this investigation intends to answer is: "Does financial literacy associates with holding complex or risky financial products?". Answering this question will allow us to understand if the degree of financial literacy motivates an investor to participate more or less in the financial markets, and especially if it promotes the adhesion of complex or risky financial products by the individuals, rather than allocating its income to the traditional saving channels.

It is important to understand how financially literate are the Portuguese investors and their predisposition to participate in the financial market and comprehend if financial literacy is a reliable and robust driver of financial market inclusion. Moreover, it is important to analyze other important drivers of market participation besides financial literacy, such as individual risk profile, investor's wealth, gender, among others. Having this in consideration, we will be able to understand the most important drivers of market participation and, thus, in a near future create conditions to promote programs to enhance those drivers in an early stage of individual's life in order to encourage population's financial stability and economic well-being for a lifetime.

For this research, having in consideration the theory and literature exposed before, we intend to measure and assess three different research hypotheses, covering different measures of market

participation. For the first hypothesis we will test the theory developed by Van Rooij et al., (2011) and Abreu and Mendes (2010), with the purpose of understanding the association of financial literacy with financial market participation and the extension (depth) of that participation in the market measured by the different risky and complex financial assets hold by each investor and the percentage of allocated investments for the financial markets compared to the investor's total portfolio. Thus, we have:

H1: The higher the individual's financial literacy the higher will be the predisposition to participate in the financial markets; the larger will be the depth of market participation; and the higher will be the percentage of investment allocated to financial markets.

Then, we want to pursue and identify other possible drivers of financial market participation besides financial literacy. Therefore, we test whether financial market participation is driven by Personal Characteristics (Demographic Aspects), previously argued in the literature, such as Age (Zhong *et al.*, 2017); Gender (Almenberg and Dreber, 2015); Income and Education level. For this purpose, we have:

H2: Demographic aspects are positively correlated with financial market participation.

Since, this research will have two distinct moments of analysis, where in one perspective we have data from 2018 (before the covid 19 health crises) and data from 2020 (during the covid 19 health crises), it is important to understand the differences on the investor's behavior in times of economic and financial expansion and in times of financial recession. Consequently, our third hypothesis is related with Zhou (2020), stating a reduction of the overall stock market participation. Thus, we have:

H3: In times of financial recession investors do not participate in the financial markets as much as in times of financial expansion and stability.

4- DATA AND METHODOLOGY

4.1- DATA

We collected data from CMVM survey of 2018 and 2020, that was intended to understand, by the time, the investing behaviour and personal characteristics of the Portuguese investors.

The CMVM survey of 2018 was carried out online, in collaboration with CMVM and other financial intermediaries, during a period of 49 days, from 18th of June of 2018 to 6th of August of

2018. The survey was designed to understand the demographic, geographic and social-economic profile of the respondents, its degree of financial literacy, the behaviours towards risk and bias behaviours and, finally, to understand the financial decision process of the participants as well as their investment portfolios. The total number of participants of the survey was 2381 individuals, but due to answers considered invalid (70 answers) the final sample gathers 2311 answers. The number of observations comprises answers from participants categorized as investors (52%) since they have at least one financial asset in their portfolio and the remaining non-investors (48%). The eighteen-minute survey had a completeness rate of 65%, meaning that 7 out of 20 participants only answered part of the questions.

Considering the CMVM survey of 2018 and having a look into the demographic, geographic and socioeconomical environment, we can observe that most of the sample is represented by men (81,8%), where 59,3% of the participants are between 40 and 69 years old and 33,1% of the respondents are either older than 70 years old or younger than 39 years old. When it comes to education, 68,8% of the participants have at least concluded a bachelor's degree and the vast majority are employees, where 22,9% are part of the non-active population (most of them retired). Regarding the geographic features, 49,6% of the respondents are residents in the region of Lisbon and Vale do Tejo, 24,8% are residents of the north of Portugal, and the remaining 15% have their residence in the region of center of Portugal. About 41,7% of the participants refer that their household earn more than 2.500€ and nearly 16,9% of the participants mentioned that their household monthly income is lower than 1.000€.

Regarding the topic of financial literacy, when it comes to subjective financial literacy, around 20,1% of the respondents acknowledge that their degree of financial literacy is null or very low, while 42,1% of respondents consider themselves moderately knowledgeable in finance and about 37,9% of the participants mentioned that their degree of financial literacy is very high. In the other spectrum, the statistics about objective financial literacy reveal that only 14,9% of the respondents answer correctly all the questions, while approximately 1% of the respondents answered incorrectly to all the questions. However, for this research we considered unanswered/blank questions as “Do not Know”, and, consequently, nearly 5,8% of the participants did not know the answer to all the questions. In average, the participants answer correctly to 2,3 questions (Table 1 and 2).

Table 1: Weighted percentage of correct, incorrect and "Do not Know" answers, in 2018 and 2020 CMVM's survey.

	<i>numeracy's question</i>		<i>inflation's question</i>		<i>bonds' question</i>		<i>guaranteed capital's question</i>	
	2018	2020	2018	2020	2018	2020	2018	2020
Correct	0,63	0,49	0,07	0,63	0,12	0,27	0,27	0,16
Incorrect	0,37	0,20	0,93	0,07	0,88	0,41	0,73	0,53
Do not Know	0,00	0,31	0,00	0,31	0,00	0,31	0,00	0,31

Note: Blank/Unanswered questions are considered as "Do not know" questions.

Table 2: Percentage of questions correctly, incorrectly and "Do not Know" answered, in 2018 and 2020 CMVM's survey.

	None		1 question		2 questions		3 questions		All questions		Mean	
	2018	2020	2018	2020	2018	2020	2018	2020	2018	2020	2018	2020
	Correct	0,08	0,32	0,16	0,14	0,28	0,26	0,33	0,22	0,15	0,06	2,32
Incorrect	0,29	0,36	0,36	0,23	0,24	0,27	0,10	0,13	0,01	0,02	1,17	1,22
Do not Know	0,72	0,68	0,16	0,01	0,05	0,01	0,00	0,00	0,06	0,30	0,51	1,23

Note: Blank/Unanswered questions are considered as "Do not know" questions.

Later in 2020, the same survey, with slight changes, was launched to the market to evaluate the same features as the previous survey (2018) but in a particular time. We intend to use this survey of 2020, because we believe that the data might have in consideration the impact of the COVID-19 pandemic and consequently the economic and financial crises that are ahead. Therefore, the Covid-19 crisis' impact might be reflected in the participant's answers of this survey demonstrating the influence of crises in the investing behaviours of the participants, useful to study in this research.

With respect to the CMVM survey of 2020, we denote some changes in the demographic, geographic and socioeconomical environment compared with the CMVM survey of 2018. More than half of this sample is represented by women (55,95%) and 55,30% of the participants have at least a bachelor's degree or a higher degree (38,12% of the participants are still finishing their degrees). Most of the participants are younger than 39 years old (72,89%) and 26,02% have between 40 and 69 years old. When it comes to income, 58,85% of the respondents referred that their household earn a monthly income after taxes lower than 1000€ (36,71% of the participants have a monthly income lower than 500€) and 41.15% of the respondents affirms to have a monthly income higher than 1000€.

Concerning financial literacy, in the CMVM survey of 2020 we verify some changes comparing with 2018. In terms of subjective financial literacy, around 45,26% of the participants admitted that their degree of financial knowledge is very low or null, while 35,62% of the respondents considered that they have moderate knowledge in finance, and only 19,12% stated that they have good or high levels of financial literacy (Table 1 and 2). Through this observation, we can fairly say that the participants of the CMVM 2020 survey tend to be more pessimistic about their perceived financial knowledge. This is not unexpected since in 2020 we were living a deep worldwide health crisis that stopped and destabilized the economy and the financial markets which is reflected in the investor’s perception of financial knowledge.

When comparing with objective financial literacy, according to the statistics, we can observe a decrease in the number of answers positively corrected since only 5,9% of the participants answer correctly to all the questions and 1,9% of the respondents answered incorrectly to all the questions. Moreover, we can observe a substantial increase of “Do not know” answers compared with the CMVM survey of 2018, where around 30% of the participants did not provide an answer to all the questions. In average, the participants answered correctly to 1,54 questions and provided a wrong answer to 1,22 questions (Table 1 and 2).

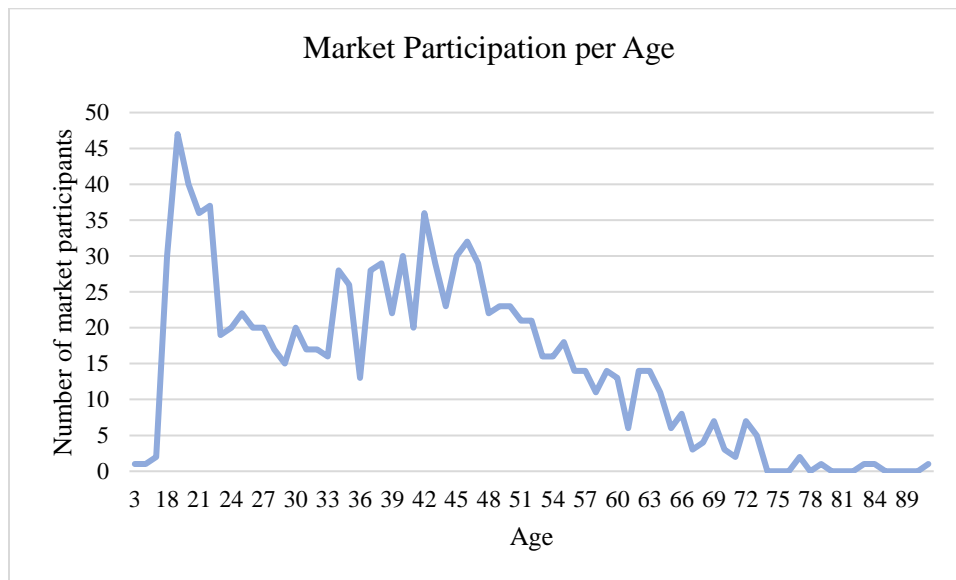
In Table 3, it is possible to see that men answered correctly to all the questions of the survey more than women, which demonstrates that men tend to have higher levels of financial literacy than women, in our data sample, even though the questions that had the most correct answers is consider simple in financial matters (numeracy and inflation). When considering the degree of financial literacy in terms of age (Figure 1), we observed that the participants aged between the age of 18 and 24 are the ones who answered more correctly to all the questions. Thereafter, the participants aged between 25 and 50 presents the second-best results in terms of correct answers, and then we observed a decline of the number of correct answers to the questions after investors over 50 years old.

Table 3: Number and percentage of answers correct and incorrect per question with years aggregated.

Question	Answer		Female	Male	Total
Numeracy	Incorrect	N (%)	600 44%	718 26%	1318
	Correct	N (%)	754 56%	2083 74%	2837
	Total	N (%)	1354 100%	2801 100%	4155

Inflation	Incorrect	N (%)	162 12%	122 4%	284
	Correct	N (%)	1178 88%	2671 96%	3849
	Total	N (%)	1340 100%	2793 100%	4133
Bonds	Incorrect	N (%)	867 67%	1176 44%	2043
	Correct	N (%)	436 33%	1527 56%	1963
	Total	N (%)	1303 100%	2703 100%	4006
Guaranteed Capital	Incorrect	N (%)	958 78%	1603 66%	2561
	Correct	N (%)	274 22%	824 34%	1098
	Total	N (%)	1232 100%	2427 100%	3659

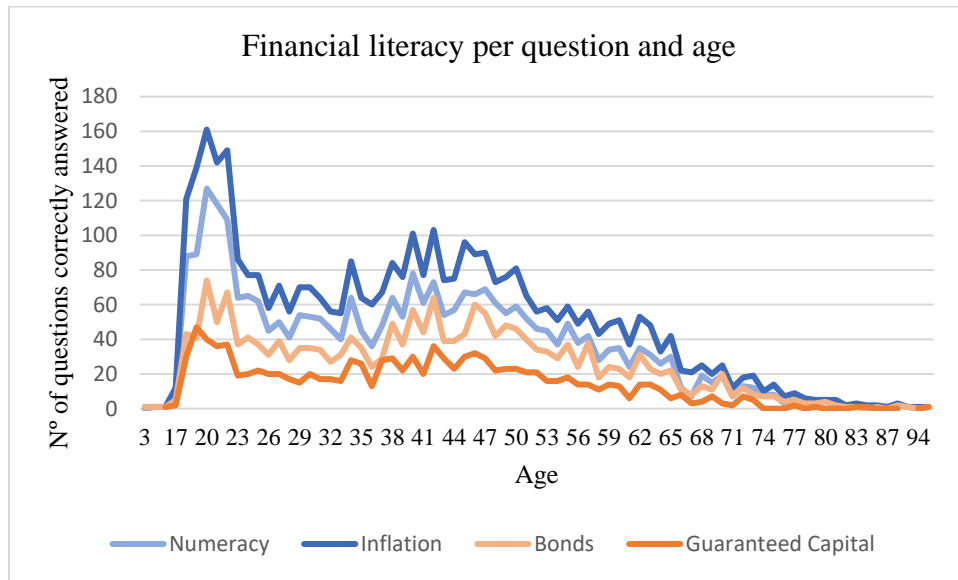
Figure 1: Market participation with years aggregated



We also notice that in terms of market participation, the investors age between 18 and 22 presents the higher participation rates in financial markets. Thereafter, the investor's with age

between 23 and 50 years, presents as well good levels of market participation, but when investors are over 50 years old, the general market participation starts to decline.

Figure 2: Financial literacy with year aggregated



4.2- METHODOLOGY

For this empirical analysis, we will use the variables comprised in the data sample collected from the CMVM survey. Our analysis will be based on the variables investor’s age and gender, their degree of education, investor’s monthly income, investor’s self-risk perception, investor’s degree of financial literacy and, finally, investor’s participation in the market.²

The first two variables to be considered for the analysis are demographic variables. For the first variable, investor’s age (variable *age*), we will consider the age of the respondents that participated in the CMVM survey in 2018 and 2020, and this variable can take any value above zero.

² See Appendix, Table 14.

The next variable to be considered is the investor's gender (variable *gender*) that refers to the respondent's gender and comprehends only two values, 1 for male and 0 for female.

The analysis will also consider the respondent's monthly income (variable *income*) where this variable only have four possible option: if the participants choose 1 it means that its monthly income is below or equal to 500€; if it is 2 then it is between 501€ to 1000€, 3 if the monthly income is between 1001€ and 2500€ and, finally, 4 if the income is higher than 2500€.

Then we will consider the participant's degree of education (variable *education*) that denotes the level of education of the respondents and can display six possible values: if the value is 1, then the respondent has no education's degree; if the value is 2, it means that the participant only attended the primary school; if the value is 3, then the participant only attended until the basic school; if the answer is 4, it means that the participant studied until high school (secondary); if the response is 5, then the respondent has at least an undergraduate or Bachelor's degree or is finishing the degree, and, finally, if the answer is 6, it means that the investor has either a Master's degree, a MBA, a Doctorate degree or an higher degree or it is enrolled in on the mentioned degrees.

Furthermore, other essential variable to analyse is the individual's self-risk perception (*risk_perception*), in which we aim to understand the individual's perception towards financial decisions or the individual's investment behaviour towards risk. This variable can only take five possible values, where 1 is assigned for highly risk averse investors and 5 for low-risk averse investors (risk lovers), increasing the risk tolerance towards 5.

4.2.1- FINANCIAL LITERACY MEASUREMENT

As shown in the previous literature, financial literacy is the capability to understand and effectively manage diverse financial skills, such as personal financial management, budgeting, investing, financial hedging, among others, to “manage financial resources effectively for a lifetime of financial wellbeing” (Hung et al., 2009). Thus, individual's financial literacy, must be measured by a broad knowledge in different financial domains. However, the metrics of financial literacy are difficult to measure. According to Lusardi and Mitchell (2011), the standard set of question should be designed following four principles: questions should be simple, aiming to measure the basic financial concepts; questions must be relevant to the common person's daily financial decisions; the set of question should be short to secure widespread adherence and, finally, questions must have the

capacity to differentiate among different areas of financial knowledge to allow comparisons across individuals.

To measure the degree of financial literacy of the participants, known as the objective financial literacy, we will follow an approach from a study explored in the literature. In order to have a more robust and reliable measure of financial literacy we will perform two different financial literacy indexes, henceforth named FLI, represented by 4 questions measuring different aspects (Lusardi & Michell, 2011). The first question aims to measure the basic financial literacy, i.e., numeracy, by assessing the individual's ability to perform simple calculations about interests and compounding of interest rates. The second question is related to macroeconomic principles and intends to understand the participant's ability to deal with inflation, in the context of simple financial decisions. The last two questions (sophisticated or advanced questions) have the purpose to assess the participants' knowledge about risk diversification and the principles of financial markets, this is, to test the knowledge of the participant about advanced financial literacy.

For the first measure of financial literacy index, we need to have in mind the concepts of basic and advanced financial literacy (Lusardi, 2008). The author classified basic financial literacy (hereafter BFL) as the minimum degree of literacy that everyone must have to manage their daily life, which includes individual's knowledge mainly about numeracy, compound interest, inflation, among others. Advanced financial literacy (hereafter AFL), according to the author includes the individual's knowledge about stock markets, stocks and bonds, mutual funds, risk diversification, among others, this is sophisticated knowledge in finance.

Having in mind these concepts, the second FLI, named Rooij FLI, will follow the approach of Van Rooij et al., (2011). This index is designed dividing the questions into two parts: the first part includes the first two questions (about numeracy and inflation), considered to be the basic financial literacy questions, and the second part will contain the other two sophisticated questions (about bonds and capital guaranteed), considered to be the advanced financial literacy questions (Lusardi, 2008). Moreover, having in mind the findings of Lusardi & Mitchell (2014), the authors concludes that what matters the most is advanced financial knowledge (for example, risk diversification) and the capacity to do calculations.

This factor loadings are obtained through a process called factor analysis. The factor analysis is a statistical technique designed to describe variability among observed and correlated variables in terms of a potentially lower number of unobserved variables named factors. This technique extracts

the maximum common variance from all variables and assign them into a common score, known as factor loadings. These factor loadings quantify the extent to which the variable is associated with a given factor. More specifically in our analysis, we followed the principal component analysis (PCA), design to reduce the dimensionality of the dataset increasing interpretability and at the same time minimizing loss of information. This is made by creating new uncorrelated variables that successively maximize variance.

In our analysis, we did this process twice creating two factors (variables): one factor, called *flisimple*, for the two basic financial literacy questions and other factor, named *fliadvanced*, for the other two advanced financial literacy questions. The first step was to run the factor analysis and estimate the principal-component output that will generate the factor loadings. This factor loadings are the correlations and weights between each variable (the two simple financial literacy questions and the two advanced financial literacy questions) and the factor. In theory, the higher the load the higher will be the relevance in defining the dimensionality of the factor. If there is a load with a negative value, it indicates an inverse impact on the factor. The second step was to rotate the factor loads to get a clearer pattern that produced the orthogonal factors, with the purpose to obtain factors that are not correlated with each other. Finally, the last step was to predict the scores, meaning that it will compute the factor scores for the rotated results of the second step.

Finally, the second area of financial literacy analysis will have in consideration the subjective financial literacy, that measures the perceived financial knowledge that everyone has about themselves. This index (thereafter called Perceived FLI) is based in the approach of Huang (2020) and it is measured by the survey's question about the individual's knowledge in financial products and financial markets, through a scale from 1 to 5, where 1 represents an individual that admits that its financial knowledge is very low and 5 to very high knowledge in finance.

4.2.2- FINANCIAL MARKET PARTICIPATION MEASUREMENT

The participation in the financial market can be measured by different means. In this research we will follow the approach of Huang, Yuan and Chi (2021) for the measurement of financial market participation, from its breadth and depth, through three variables. According to Zhang (2020), the breadth of financial market participation is measured by the investor or participant having or not risky or complex financial assets (variable *market_participation*). This is a dummy variable that can only

take two possible values, one, if the investor participates in the financial market and zero otherwise. In the other hand, the depth aims to capture the number of different risky or complex financial assets hold by each investor (variable *depth_participation*). These last two variables will be measure though different questions present in the survey asking the responds about the detention of some financial assets. For this research, according to the approach of CMVM 2018³, we will consider participation in the financial market those investors who have invested and holds in her portfolio at least one of the following financial products: stocks, corporate bonds, treasury bonds (any means of public debt), commercial paper, complex financial products, mutual funds, retirement saving plans, bitcoins, ICO's or other digital coins and crowdfunding.

Finally, the other variable to be consider is the proportion of risky or complex financial assets hold by each investor in her total portfolio (variable *participation_proportion*). This variable will be measured trough one question made in both CMVM surveys of 2018 and 2020, that can take only four possible values. If the value is one, it means that the participant does not have any risky or complex financial assets in its portfolio. If the value is two it means that 1% to 25% of the participant's portfolio includes at least one or more risky or complex financial products mentioned in the question. If the value is three, it means that 26% to 50% of the investor's total financial assets includes one or more of the mentioned securities. Finally, if the value is four it means that more than half of the respondent's portfolio (>50%) is represented by one or more of the financial securities mentioned in the question.

4.2.3- MODELS

Having all the variables described, in order to test and evaluate our hypothesis and reach conclusions to answer the research hypothesis, we will perform three different regression models to assess the three different dependent variables in our analysis. The reasoning behind the construction of this regression models is to evaluate different dimensions of investor's market participation (*market_participation*, *depth_participation* and *proportion_participation*) not only whether if the investor participates in the financial markets but understand the extent of its participation and the participation's dimension in its total portfolio.

³ See “Resultados do Inquérito Online ao Investidor 2018”, CMVM (<http://www.cmvm.pt/pt/EstatisticasEstudosEPublicacoes/Estudos/Pages/Estudos.aspx?pg>)

For the first variable, *market_participation*, we will test the equation (1) through a Multinomial Logistic Regression in order to model the nominal outcome variables (zero, meaning that the participant do not participate in the market and one otherwise), in which the log odds of the outcomes are modeled as a linear combination of the independent variables. Similarly, we also tested this equation using the Multinomial Probit Regression that tries to explain the relative effect of differing the independent (explanatory) variables on the different possible outcomes. However, since the results were quite similar, we decided to rely on the Multinomial Logistic Regression since it provides the best fit to our model.

$$(1) \text{ Market Participation} = a + \beta_1 \text{Age} + \beta_2 \text{Gender} + \beta_3 \text{Income} + \beta_4 \text{Education} + \beta_5 \text{Risk Perception} + \beta_8 \text{Financial Literacy Index}$$

The second variable, *depth_participation* will follow the Tobit model (known as Censored Regression Model) that is used to estimate the linear relationships between variables when there is either right-censoring or left-censoring in the dependent variable (variable *depth_participation*). In this case the dependent variable can only take integers between 0 and 8. This dependent variable will be test using the following equation:

$$(2) \text{ Depth Participation} = a + \beta_1 \text{Age} + \beta_2 \text{Gender} + \beta_3 \text{Income} + \beta_4 \text{Education} + \beta_5 \text{Risk Perception} + \beta_8 \text{Financial Literacy Index}$$

Finally, for the third variable, *participation_proportion*, we will perform an Ordered Probit Model. Since this dependent variable has ordered categorical outcomes (i.e., the dependent variable has a natural and categorical ordering between 1 and 4) this model is design to explain the variation in an ordered categorical variable as a function of one or more independent variables, relying on the following equation:

$$(3) \text{ Participation Proportion} = a + \beta_1 \text{Age} + \beta_2 \text{Gender} + \beta_3 \text{Income} + \beta_4 \text{Education} + \beta_5 \text{Risk Perception} + \beta_8 \text{Financial Literacy Index}$$

After defining our models, we tested for multicollinearity. It is important to clarify that if the regressors display high values of collinearity (above 0,8), will result in a biased estimation of the corresponding regressors and will inflate the standard errors. To test the multicollinearity of the model, it was computed two types of correlations: the correlation matrix only between nominal

(ordinal) variables and the tetrachoric correlation matrix only between dummy variables⁴. The results obtained are quite encouraging, since that for all correlations the correspondent values are lower than 0,8, which demonstrates no significant correlation between the coefficient regressors, leading to the conclusion of no signals of multicollinearity.

⁴ Firstly, we computed the Correlation Matrix for the nominal/ordinal variables (1) - (9) and then computed the Tetrachoric Correlation Matrix for the dummy/binary variables (10) - (15), in Table 4.

Table 4: Matrix of correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) age	1,00														
(2) education	- 0,08	1,00													
(3) risk_perception	- 0,05	- 0,08	1,00												
(4) depth_participationn	0,44	- 0,01	0,32	1,00											
(5) proportion_participation	0,32	- 0,03	0,33	0,59	1,00										
(6) perceived_fli	0,10	0,09	0,37	0,38	0,32	1,00									
(7) risk_fli	0,11	0,05	0,49	0,36	0,33	0,41	1,00								
(8) flisimple	0,12	0,12	0,12	0,18	0,18	0,25	0,19	1,00							
(9) fliadvanced	0,12	0,08	0,17	0,28	0,24	0,34	0,89	0,19	1,00						
(10) male	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	1,00					
(11) income_2	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	- 0,17	1,00				
(12) income_3	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	0,13	- 1,00	1,00			
(13) income_4	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	0,40	- 1,00	- 1,00	1,00		
(14) market_participation	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	0,55	- 0,23	0,37	0,67	1,00	
(15) year	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	- 0,62	0,24	- 0,16	- 0,64	- 0,90	1,00

Additionally, in order to have more certainty in this matter, the computation of the Variance Inflation Factor (VIF) reaches practically the same conclusion mentioned before, obtaining an average VIF of 1,572 which is way lower than the common agreed cut-off of 10 (if the average VIF value is equal or higher than 10, the coefficients are correlated and considered redundant). Since we also obtain final values of VIF per variable lower than 10, it means that the regressors are not all correlated, displaying low inflation of the variance, this is, no signals of multicollinearity.

Table 5: Variance Inflation Factor

	VIF	1/VIF
income 4	2.554	.391
income 3	2.218	.451
year	1.765	.566
age	1.691	.591
income 2	1.448	.69
perceived fli	1.411	.709
male	1.309	.764
risk perception	1.281	.781
education	1.275	.784
fliadvanced	1.204	.831
fli-simple	1.136	.88
Mean VIF	1.572	

5- EMPIRICAL RESULTS

In this chapter, we will interpret the empirical results comparing each regression computed with the two different financial literacy indexes, Perceived FLI and Rooij FLI, in order to assess the participants’ investing behaviors and provide reliable answers to the research hypothesis and the research question. In a first stage, for our base model, we started the empirical analysis basing on the Rooij FLI, using the factors (variables) *fli-simple* and *fli-advanced* obtained through the factor analysis. With this, we performed three different regressions, one for each of the three dependent variables *market-participation*, *depth-participation* and *proportion-participation*, previously explained in the methodology.

According to the results of Table 6, the variable *fli-simple* (that measures the individual’s basic financial literacy) stands out for not being statistically significant to explain the investor’s market participation, while the variable *fli-advanced* (that measures the individual’s advanced financial knowledge) is statistically significant at a 1% confidence level presenting a positive relationship with the dependent variable, proving that the log-odds of financial market participation increase by 0,16

points for each unit increased in *fliadvanced*. The results seem to suggest that the higher is the investor’s knowledge about advanced financial literacy the higher will be the log odds of an investor to participate in the financial markets. This results are in accordance with the previous studies of Lusardi & Mitchell (2014) since there is evidence that allow us to conclude that when it comes to financial market participation, what matters the most is the advanced financial knowledge and not the basic financial knowledge.

However, simple literacy will have a significant role if we analyze the dependent variables *depth_participation* and *proportion_participation*. For these regressions, the basic financial literacy (*fli-simple*) presents a statistically significant positive correlation with the dependent variables at a confidence level of 5%, insofar that the log-odds of an investor holding different risky or complex financial products (*depth_participation*) and the log-odds of the percentage of risky or complex financial assets in the investor’s total portfolio (*proportion_participation*) is estimated to increase by 0,06 and 0,08 points, respectively, if we increase one unit of *fli-simple*. Nevertheless, when considering the advanced financial literacy (*fliadvanced*) the results suggest also the same but with higher impact in the dependent variables, since if the variable *fliadvanced* is increase by 1 unit, the log-odds of an investor holding different risky or complex financial products will increase by 0,14 points and the log-odds of the percentage of risky or complex financial assets in the investor’s total portfolio will increase by 0,08 points (Table 6)

Therefore, having in mind these evidences, we are able to answer the first research hypothesis. Despite the evidence that the basic financial literacy is statistically significant and positively correlated with the detention of different complex or risky financial products (*depth_participation*) and with the percentage of risky or complex financial assets in the investor’s total portfolio (*proportion_participation*), the results are more significant and have a greater impact when we are considering the advanced financial literacy (*fliadvanced*). Furthermore, when it comes to financial market participation (*market_participation*), only the advanced financial literacy (*fliadvanced*) is statistically significant and positively correlated with the dependent variable. Thus, we can validate the first hypothesis and confirm the studies of Lusardi & Mitchell (2014) that what matters the most is the investor’s advanced financial knowledge.

Table 6: Empirical results aggregated years using Rooij FLI

Multinomial Logistic Regression	Tobit regression	Ordered Probit regression
---------------------------------	------------------	---------------------------

VARIABLES	market_participation	depth_participation	proportion_participation
flisimple	0.0543 (0.0467)	0.0617** (0.0303)	0.0785*** (0.0215)
fliadvanced	0.163*** (0.0549)	0.136*** (0.0291)	0.0833*** (0.0201)
risk_perception	0.397*** (0.0557)	0.409*** (0.0297)	0.290*** (0.0210)
age	0.0388*** (0.00501)	0.0248*** (0.00229)	0.0119*** (0.00160)
male	0.599*** (0.111)	0.481*** (0.0716)	0.377*** (0.0502)
education	0.186** (0.0941)	0.248*** (0.0410)	0.108*** (0.0284)
income_2	0.240 (0.146)	0.379*** (0.102)	0.206*** (0.0721)
income_3	1.042*** (0.151)	0.941*** (0.0911)	0.410*** (0.0654)
income_4	1.562*** (0.237)	1.322*** (0.106)	0.415*** (0.0759)
year	-3.282*** (0.216)	-1.715*** (0.0735)	-0.748*** (0.0511)
Constant	-0.969* (0.518)	-2.044*** (0.254)	
Sigma		1.589*** (0.0239)	
Constant cut1			1.739*** (0.176)
Constant cut2			2.882*** (0.180)
Constant cut3			3.483*** (0.181)
Observations	3,489	3,489	3,469

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Having a look to other variables considered in the regressions (Table 6), it is possible to observe that the demographic variables *age*, *male*, *education*, *income_3* and *income_4* are all statistically significant at a confidence level of 1% (except the variable *education* that is statistically significant at a confidence level of 5%) and presents a positive association with all three dependent variables considered in this analysis. In fact, the results suggest that one unit increase in the investor's *age*, *education*, and the last two categories of income (*income_3* and *income_4*), the log-odds of market participation will increase by 0,04; 0,186; 1,04 and 1,56 units, respectively, and if the investor is male the log-odds of financial market participation will increase 0,6 units. These evidences enable us to validate the second hypothesis, since the results present statistical evidence to conclude that demographic variables have indeed a positive correlation with financial market participation, meaning that as an investor ages and the higher is the investor's education and monthly gross income

as well as if it is a male investor, the higher will be the predisposition of an investor to participate in the financial markets. However, it is also important to refer that the variable *income_2* is not statistically significant to explain financial market participation, while the last two categories of income (*income_3* and *income_4*) are statistically significant. Therefore, according to the results, it is reasonable to conclude that there will be a higher predisposition to participate in the financial market if the investor displays higher levels of gross income.

If we consider the other dependent variables, *depth_participation* and *proportion_participation* the results are very similar, since all the demographic variables (*age*, *male*, *education*, *income_3* and *income_4*) are statistically significant at a confidence level of 1% and present a positive relationship with both dependent variables. However, in these regressions, the variable *education_2* is statistically significant at a confidence level of 1% and is positively associated with the dependent variable, meaning that 1 unit increase of the second category of income (*income_2*) will cause a 0,38 increase on the different risky or complex financial assets hold by an investor, as well as, will promote a 0,21 increase on the percentage of risky or complex financial assets in the investor's total portfolio (Table 6). Thus, there is evidence that suggest that, in general, investor's gross income is important for an investor to hold more than one risky or complex financial product and to have a greater percentage of risky or complex financial products in the its total portfolio.

Having in consideration the explanatory variable *year*, the results are quite interesting. The variable is statistically significant at a confidence level of 1%, presenting a negative relationship with the dependent variable *market_participation*, insofar that the log-odds of an investor participating in the market is predict to be 3.28 points lower when the investor is a respondent of the survey of 2020. Accordingly, there is evidence that suggest that the respondents of the survey of 2020 tend to be less participative in the financial markets than the respondents of the survey of 2018, and if we look back at the country's macro-economic and financial situation that year, it is not difficult to see why. The year of 2020 was strongly affected by an economic and financial contraction and recession caused by the pandemic COVID-19, whose effects are still felt. Consideration that in 2020 we were living a worldwide health crisis, with the proliferation of the COVID-19 pandemic across the world affecting and destabilizing the economic and financial systems, the investors were also affected which shaped their expectations, attitudes towards risk and their investment behaviors. Therefore, the respondents' answers of the survey of 2020 reflect the economic and financial instability and overall uncertainty caused by the pandemic, which affected negatively their participation in the financial markets. Having

all of this in consideration, it is possible to say that in times of financial and economic recession or instability, investors tend not to adhere to financial markets as much as in times of economic and financial expansion. Thus, we are able to validate the third hypothesis, affirming that investors tend to participate less in the financial markets when they are living in times of economic or financial recession.

Furthermore, if we consider the dependent variables *depth_participation* and *proportion_participation* we have other interesting conclusions. The variable *year* is statistically significant and is negatively correlated with both dependent variables, suggesting that if it is an investor from the survey of 2020, it is expected a decrease of 1,72 points in the different risky or financial products hold by the investor and a decrease of 0,75 points in the percentage of risky or complex financial products in the investor’s total portfolio. Moreover, as far we observe the empirical results, there is statistical evidence that points out that as the investor ages there will be a higher probability for the investor to hold more risky or complex financial products and the higher will be the percentage of risky or complex financial products hold by an investor in its total portfolio.

Table 7: Empirical results aggregated years using Perceived FLI

VARIABLES	Multinomial Logistic Regression	Tobit regression	Ordered Probit regression
	market_participation	depth_proportion	proportion_participation
perceived_fli	1.577*** (0.234)	1.146*** (0.132)	0.622*** (0.0915)
risk_perception	0.300*** (0.0570)	0.341*** (0.0306)	0.257*** (0.0214)
age	0.0394*** (0.00495)	0.0260*** (0.00229)	0.0127*** (0.00159)
male	0.546*** (0.107)	0.457*** (0.0700)	0.389*** (0.0490)
education	0.189** (0.0932)	0.221*** (0.0404)	0.114*** (0.0280)
income_2	0.233 (0.144)	0.355*** (0.101)	0.182** (0.0711)
income_3	1.028*** (0.148)	0.927*** (0.0903)	0.391*** (0.0645)
income_4	1.466*** (0.232)	1.260*** (0.106)	0.374*** (0.0751)
year	-3.166*** (0.212)	-1.649*** (0.0733)	-0.720*** (0.0508)
Constant	-1.530*** (0.505)	-2.331*** (0.244)	
Sigma		1.588*** (0.0237)	
Constant cut1			2.020*** (0.170)

Constant cut2			3.158*** (0.173)
Constant cut3			3.769*** (0.175)
Observations	3,556	3,556	3,540

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In the other spectrum, we tested the regressions using a different financial literacy index, the Perceived FLI. As previously explained, this index aims to capture the perceived financial knowledge that each individual has about themselves. The results are exposed in Table 7, and are quite consistent with the previous analysis using the index Rooij FLI (Table 6), where the same variables in study (besides *perceived_fli*) are statistically significant (almost of them at a confidence level of 1% and a few of them at a confidence level of 5%) and present the same correlation with the three dependent variables, which provides more robustness and reliability to the base model and to the empirical research.

Having a look to the variable of interest, *perceived_fli*, it is clear that it is statistically significant at a confidence level of 1% to explain all the three dependent variables (*market_participation*, *depth_participation*, *proportion_participation*) presenting a positive association with each of the three dependent variables. More precisely, the results indicate that for each unit increase in the *perceived_fli* it will lead to an increase of the log-odds of the variable *market_participation* of 1,58 units, and 1,15 unit increase in the log-odds of the variable *depth_participation* and an increase of 0,62 units in the log-odds of the variable *proportion_participation*. In other words, this means that the more confident each investor is about their financial knowledge, this is, the higher is the perceived financial knowledge that each individual has about themselves, the higher will be the predisposition of each investor to participate in the financial markets and to hold more different risky or complex financial assets and to hold an higher percentage of risky or complex financial assets in the investor’s total portfolio. Accordingly, the results are in line with the previous studies of Graham *et al.*, (2005), which stated that individuals more confident about their financial knowledge are more inclined to invest in the financial markets.

Furthermore, we found it interesting to wonder what would be the changes if we tested the regressions separating the sample into two parts: the sample from the CMVM survey of 2018 and the other sample from the CMVM survey of 2020. For that purpose, we computed again the regressions separating the two data samples. The results are displayed in Table 8 and 9, and as expected, it is possible to see some interesting differences between the two samples. The results obtained through

the investors’ answers to the CMVM survey of 2020 are very similar to the ones obtained in our base model, but when comparing these between the two data samples, the differences are quite revealing.

First of all, looking to the results of the sample of 2018 (Table 8) there is one variable that clearly stands out, since the variable *fliadvanced* is no longer statistically significant to explain the dependent variables *market_participation*, *depth_participation*⁵ and *proportion_participation*. In contrast, if we consider the results of the sample of 2020 (Table 9) it is possible to see that the variable *fliadvanced* is statistically significant at a 1% confidence level to explain our three dependent variables, similar to our base model (Table 6). This is quite an important evidence because the surveys were launched in two distinct moments, as previously explained: in 2018 we were living times of economic and financial expansion and prosperity, in a country fully recovered from the Subprime crisis of 2008 and in 2020, we were living a worldwide health crisis that stopped entire economies and caused a deep economic and financial contraction that created financial uncertainty and instability. Having this in mind, the results suggest that advanced financial literacy (*fliadvanced*) is only statistically significant to explain the investor’s market participation (*market_participation*) when investors are facing times of financial or economic recession, and this is understandable. In times of financial or economic crisis only investors with high levels of advanced financial literacy are capable to invest in the financial markets, even though the vast majority of the ordinary people (that display medium or lower levels of financial literacy) may think that financial crisis is associated with financial losses, and for that reason they are reluctant to participate in the financial markets. The financial literature has shown us throughout history that investors are able to earn fairest returns in the financial markets when facing financial crisis (Gonçalves, Gaio & Lélis, 2020), and only the advanced financial literate investors are capable to understand this and financially knowledgeable and skilled to invest in those times. We argue that it justifies the variable *fliadvanced* is only statistically significant for the CMVM results of 2020 and not for the CMVM results of 2018. The same applies for the other two dependent variables *depth_participation* and *proportion_participation*.

Table 8: Empirical results of 2018 using Rooij FLI

VARIABLES	Multinomial Logistic Regression	Tobit regression	Ordered Probit regression
	market_participation	depth_participation	proportion_participation
fli-simple	0.110	0.0347	0.110***

⁵ In our analysis, we only consider a variable to be statistically significant at a 5% confidence level or lower. Accordingly, since in the results of the Table 8, the variable *depth_participation* is only statistically significant at a 10% confidence level, we do not consider the variable statistically significant for our analysis.

	(0.183)	(0.0410)	(0.0331)
<i>fliadvanced</i>	-0.0954	0.0654*	0.0225
	(0.195)	(0.0341)	(0.0270)
<i>risk_perception</i>	0.632***	0.411***	0.343***
	(0.201)	(0.0351)	(0.0288)
<i>age</i>	0.0286*	0.00916***	0.00910***
	(0.0157)	(0.00272)	(0.00218)
<i>male</i>	-0.246	0.117	0.142*
	(0.497)	(0.101)	(0.0816)
<i>education</i>	-0.0978	0.133***	0.0950***
	(0.234)	(0.0439)	(0.0349)
<i>income_2</i>	0.474	0.106	0.0979
	(0.482)	(0.159)	(0.135)
<i>income_3</i>	2.239***	0.494***	0.357***
	(0.562)	(0.133)	(0.114)
<i>income_4</i>	2.705***	0.930***	0.299***
	(0.676)	(0.134)	(0.116)
Constant	0.357	-0.0558	
	(1.645)	(0.325)	
Sigma		1.391***	
		(0.0248)	
Constant cut1			1.204***
			(0.263)
Constant cut2			2.615***
			(0.269)
Constant cut3			3.294***
			(0.270)
Observations	1,612	1,612	1,574

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Additionally, in the same line, since the variable *fliadvanced* is not statistically significant to explain the three dependent variables for the results of the CMVM of 2018, this might suggest that in times of financial expansion, the investor’s advanced financial literacy is not a sufficient driver of any form of market participation, due to the fact that in times of financial prosperity, people tend to be more confident about obtaining financial profits and, therefore are more willing to invest in the financial markets, even for those investors that do not display high levels of financial literacy. In fact, for the sample of 2018 (Table 8) there is statistical evidence demonstrating that only the investor’s risk perception (*risk_perception*) and high levels of income (*income_3* and *income_4*) are statistically significant for an investor to participate in the financial markets. This is another important conclusion from this analysis, since the results are suggesting that in times of economic and financial growth, what matters the most for participating in the financial markets is the investor’s risk perception and its level of income, insofar that if an investor earns a high monthly income and is more prone to risk, the higher will be the predisposition to adhere to financial markets.

In the same vein, another interesting difference is that the variable *male* is no longer statistically significant to explain the investor’s market participation (*market_participation*), to

explain the depth of investor participation in financial markets (*depth_participation*) and to explain the percentage of risky or complex financial assets hold by each investor in its total portfolio, if we consider the sample of 2018 (Table 8), meaning that gender is not a driver of market participation or a sufficient variable to explain the different risk or complex financial assets hold by each investor and as well it is not a good proxy to explain the percentage of risky or complex financial assets in the investor’s total portfolio. But if we observe the results obtained through the sample of 2020, the variable male is statistically significant at a 1% confidence level to explain the three different dependent variables. This evidence seems to suggest that the investor’s gender is an important proxy of any form of market participation, only when investors are facing financial crisis or economic recessions, insofar that it is expected a higher participation in the financial markets when the investor is a male.

As previously explained, the results indicate that during times of financial contraction and economic recession (as the year of 2020), even if the economic and financial situation is not favorable, men tend to participate more in the financial markets than women. In fact, the descriptive statistics demonstrates that even though men are in minority, representing 44,17% of the sample of CMVM survey of 2020, about 56,78% of the financial markets’ participants of that year were males. In conclusion, there is evidence that allow us to conclude that in times of financial expansion or growth, the investor’s gender is not a sufficient driver of any form of market participation, because people are more confident about obtaining financial returns, and, consequently, more inclined to participate in the financial markets, independently on the gender. However, if we are living times of financial crisis or in times of financial uncertainty or instability, it is more than reasonable to affirm that gender matters and plays an important role as a driver of market participation, given that men are more willing to participate than women in those times. Therefore, gender is only a good proxy of any form of market participation during times of financial crisis or financial instability.

Table 9: Empirical results of 2020 using Rooij FLI

VARIABLES	Multinomial Logistic Regression	Tobit regression	Ordered Probit regression
	market_participation	depth_participation	proportion_participation
flisimple	0.0518 (0.0484)	0.0883* (0.0503)	0.0528* (0.0291)
fliadvanced	0.185*** (0.0572)	0.218*** (0.0550)	0.138*** (0.0308)
risk_perception	0.372*** (0.0579)	0.510*** (0.0564)	0.266*** (0.0318)
age	0.0404***	0.0411***	0.0138***

	(0.00545)	(0.00513)	(0.00286)
male	0.642***	0.733***	0.468***
	(0.114)	(0.116)	(0.0658)
education	0.236**	0.281***	0.0810
	(0.105)	(0.105)	(0.0587)
income_2	0.203	0.328**	0.196**
	(0.152)	(0.161)	(0.0903)
income_3	0.913***	1.059***	0.353***
	(0.159)	(0.164)	(0.0931)
income_4	1.372***	1.605***	0.538***
	(0.255)	(0.229)	(0.128)
Constant	-4.457***	-5.150***	
	(0.565)	(0.562)	
Sigma		1.950***	
		(0.0528)	
Constant cut1			2.481***
			(0.311)
Constant cut2			3.359***
			(0.315)
Constant cut3			3.798***
			(0.317)
Observations	1,877	1,877	1,895

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Moreover, when it comes to investor's education (*education*) we observe some differences between the two samples and between our base model. The results obtained using the sample of 2018, suggest that the investor's education (variable *education*) is not statistically significant to explain the participation of the investor's in the financial markets (Table 8). These results suggest that education is not a sufficiently important driver of market participation, however, since the variable *education* is statistically significant for the other two dependent variables (*depth_participation* and *proportion_participation*) the results lead us to wonder that the investor's education might not be a sufficient factor for an investor to take the initiative to participate in the financial markets, but it is an important driver for an investor to expand its participation in the financial markets holding more risky or complex financial assets (*depth_participation*), as well as to have an higher percentage of risky or complex financial assets in its total portfolio (*proportion_participation*).

In contrast, observing the results of the sample of 2020 (Table 9) we notice that the variable *education* is statistically significant to explain the dependent variables *market_participation* and *depth_participation* presenting a positive correlation, but it is not statistically significant to explain the percentage of risky or complex financial assets in the investor's total portfolio (*proportion_participation*). Having this in consideration, the results show us that, in times of financial distress, if an investor aims to have a higher percentage of risky or complex financial assets it takes

more than its level of education to achieve that goal. Furthermore, in the same line we observe that the variable *flisimple* is not statistically significant to explain any of the tree dependent variables in the sample of 2020 (Table 9) while if we consider the sample of 2018 (Table 8), the individual’s basic financial knowledge is statistically significant to explain the variable *proportion_participation*. This is also another important conclusion, since the results suggest that even in times of financial distress, the basic financial knowledge does not matter for any form of market participation, being at the same time in line with the previous studies of Lusardi & Mitchell (2014).

Finally, we also found it interesting to see what would be the changes in the two samples of 2018 and 2020 using the Perceived FLI. The results can be seen in Tables 10 and 11. When we look at the outcomes obtained, it is possible to see that they are very similar to the ones obtained using the Rooij FLI in separated samples, in the sense that the results of the sample 2018 using the Perceived FLI are exactly similar with the ones obtained in the same sample but using the Rooij FLI, in terms of variable significance and the type of correlation with the three dependent variables. The same applies for the results of the sample of 2020. Likewise, the same statistical evidences and conclusions mentioned before using the Rooij FLI with separated samples stands for the results obtained using the Perceived FLI with separated samples, which implies more robustness and reliability to our model.

Table 10: Empirical results of 2018 using Perceived FLI

VARIABLES	Multinomial Logistic Regression	Tobit regression	Ordered Probit regression
	market_participation	depth_participation	proportion_participation
perceived_fli	1.145 (0.838)	0.428** (0.166)	0.0701 (0.131)
risk_perception	0.518*** (0.200)	0.392*** (0.0364)	0.348*** (0.0296)
age	0.0312** (0.0156)	0.00982*** (0.00275)	0.00932*** (0.00219)
male	-0.372 (0.490)	0.133 (0.101)	0.196** (0.0804)
education	-0.0776 (0.214)	0.128*** (0.0433)	0.126*** (0.0344)
income_2	0.420 (0.458)	0.0777 (0.159)	0.0533 (0.133)
income_3	2.265*** (0.556)	0.494*** (0.132)	0.343*** (0.113)
income_4	2.664*** (0.674)	0.913*** (0.135)	0.281** (0.114)
Constant	-0.0969 (1.547)	-0.236 (0.314)	
Sigma		1.396*** (0.0249)	
Constant cut1			1.438*** (0.254)

Constant cut2			2.836*** (0.261)
Constant cut3			3.528*** (0.262)
Observations	1,620	1,620	1,585

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

If we observe the variable interest *perceived_fli* it is possible to conclude that the variable is statistically significant for all the three dependent variables in the sample of 2020, but it not statistically significant to explain the dependent variables *market_participation* and *proportion_participation* considered in the sample of 2018. It is quite an interesting evidence, given that the results are suggesting that in times of financial distress or instability, the perceived financial knowledge that each investor has about themselves display an important role as a driver of any form of market participation (*market_participation*, *depth_participation* and *proportion_participation*), as it is possible to see in Table 11.

Table 11: Empirical results of 2020 using Perceived fli

VARIABLES	Multinomial Logistic Regression	Tobit regression	Ordered Probit regression
	market_participation	depth_participation	proportion_participation
perceived_fli	1.602*** (0.243)	1.843*** (0.229)	1.016*** (0.131)
risk_perception	0.275*** (0.0594)	0.380*** (0.0570)	0.200*** (0.0325)
age	0.0410*** (0.00542)	0.0413*** (0.00500)	0.0141*** (0.00282)
male	0.595*** (0.111)	0.657*** (0.111)	0.443*** (0.0635)
education	0.242** (0.107)	0.253** (0.103)	0.0848 (0.0582)
income_2	0.206 (0.150)	0.322** (0.156)	0.191** (0.0889)
income_3	0.896*** (0.157)	1.028*** (0.159)	0.335*** (0.0913)
income_4	1.264*** (0.252)	1.462*** (0.223)	0.470*** (0.126)
Constant	-4.934*** (0.567)	-5.445*** (0.544)	
Sigma		1.927*** (0.0513)	
Constant cut1			2.785*** (0.305)
Constant cut2			3.675*** (0.309)
Constant cut3			4.123*** (0.311)

Observations	1,936	1,936	1,955
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

In contrast, in times of financial growth and stability it is not expected any impact of the perceived financial literacy on the investor’s predisposition to participate in the financial markets or in the percentage of risky or complex financial assets in the investor’s total portfolio. But, there is statistical evidence suggesting that even in times of financial growth (Table 10) the individual’s perceived financial literacy is statistically significant to explain the dependent variable *depth_participation*, since that if the perceived financial literacy increases by 1 unit, it is expected an increase of 0,42 units in the different risky or complex financial assets hold by an investor.

6- CONCLUSION

The aim of this research was to analyze what are the main drivers of financial market participation and better understand the relationship between the individual’s level of financial literacy and financial market inclusion and evaluate the implications of financial recessions on this relationship.

Regarding financial literacy we stated that men display higher levels of financial literacy and tend to participate much more in financial markets than women (Almenberg and Dreber, 2015). Additionally, we found that in times of financial prosperity and economic growth, as in 2018, the individuals display higher levels of financial literacy than in times of financial recession or contraction, such as 2020. In fact, we concluded that even considering the perceived financial literacy, investors are more confident about their financial knowledge in 2018 than 2020. The investor’ age also has an impact in the levels of financial literacy, since we found that age has an u-shaped curve effect on the levels of financial literacy and on market participation (Van Rooij *et al.*, 2011; Zhong *et al.*, 2017).

With respect to market participation, our results suggest that demographics, such as investor’s age, gender, income and education, presents a statistically significant positive correlation with financial market participation, which is in line with the previous literature (Zhong *et al.*, 2017; Almenberg and Dreber, 2015; Lusardi, 2012). However, we found that low levels of investor’s wealth, although positively correlated, is not statistically significant to explain financial market inclusion. This research provides evidence as well that investor’s risk perception displays an important role for an individual participates in financial markets, being positively correlated.

Additionally, when considering the extent of financial market participation, this is the number of different risky or complex financial assets hold by an investor, the significance and relationship with this variable remain the same, meaning that demographics are positively correlated with an higher number of different risky or complex financial products hold by an investor.

But if we consider our variable of interest, financial literacy, we found that only the individual's advanced financial literacy is statistically significant and positively correlated to explain financial market participation, which is in line with literature of Lusardi & Mitchell (2014), stating what matters the most is the individual's advanced financial literacy. Nonetheless, with respect to the depth and breadth of the investor's participation in the financial market, the results are quite different, since the they suggest that the individual's basic financial literacy is statistically significant and presents a positive correlation with these two variables, same as the individual's advanced financial literacy, which means that both basic and advanced financial literacy is associated with a higher number of different risky or complex financial products and a higher percentage of marketable securities in the investor's total portfolio.

However, there was empirical evidence suggesting that if the investor was a participant of the survey of 2020, the investor's market participation would decrease substantially by 3,28 points, and the number of different risky or complex financial assets hold by an investor would decrease by 1,72 points, happening the same with the percentage of different risky or complex financial products in the investor's total portfolio, that is estimated to decrease 0,76 points.

We found that, in the results of 2018, either the basic financial literacy and the advanced financial literacy, although positively correlated, are no longer statistically significant to explain the three dimensions of market participation that we considered for this analysis. This lead us to conclude that in times of financial expansion, the investor's financial literacy is not a sufficient driver of any form of market participation, due to the fact that in times of financial prosperity, people tend to be more confident about obtaining financial profits and, therefore are more willing to invest in the financial markets, even for those investors that do not display high levels of financial literacy. However, through the results of 2020, we found that only the advanced financial literacy is statistically significant and positively correlated to explain the three dimensions of market participation considered through this analysis, which made us conclude that, in times of financial or economic crisis only investors with high levels of advanced financial literacy are capable to invest in the financial markets and increase the depth and breadth of that participation.

We also conclude that in times of financial prosperity and economic growth, such as 2018, what matters the most for participating in the financial markets is the demographic characteristics, such as the investor's risk perception and its level of income, insofar that if an investor earns a high monthly income and is more prone to risk, the higher will be the predisposition to adhere to financial markets. When considering the other two dimensions of market participation, depth and breadth of market inclusion, we observed that also only the demographics characteristics, such as investor's risk perception, age, education and income are statistically significant and presents a positive correlation, insofar that if we increase any of the demographic characteristics mentioned above, there will be a higher probability for an investor to increase the number of different risky or complex financial products (depth of market participation) and a higher percentage of risky or complex financial assets in the investor's total portfolio (breadth of market participation).

With respect to perceived financial literacy, we observed that the more confident each investor is about their financial knowledge, the higher will be the predisposition of each investor to participate in the financial markets and to hold more different risky or complex financial assets and to hold an higher percentage of risky or complex financial assets in the investor's total portfolio. We also found that, in 2020, in times of financial distress or instability, the perceived financial knowledge that each investor has about themselves display an important role as a driver of the three dimensions of market participation considered in the analysis. In contrast, we observed that in times of financial growth, such as 2018, the perceived financial literacy is only statistically significant to explain the depth of financial market participation, but we do not estimate any impact of the investor's perceived financial knowledge to explain market participation or the depth of that participation.

This research contributes to the extant literature by demonstrating how financial literacy and other important drivers, such as the demographic characteristics, affects different dimensions of market participation, not only in times of financial growth and stability, but especially in times of financial or economic contraction. We were able to perceive these effects since our sample was collected in two distinct moments through almost identical surveys. We consider it important this work for further investigations, by exploring different dimensions of investor's behavior given the financial and economic environment changes. Our results highlight the importance for regulators to promote measures to improve the general society's financial literacy, which is the foundation of our economic and financial well-being, and especially to promote measures for crisis preparedness, in order for the general society to be better prepared for future economic or financial crisis.

REFERENCES

- Abreu, M. & Mendes, V. (2010) Financial literacy and portfolio diversification, *Quantitative Finance*, 10:5, 515-528, DOI: 10.1080/14697680902878105.
- Ademola, S. A., Musa, A. S., Innocent, O. I. (2019) Moderating Effect of Risk Perception on Financial Knowledge, Literacy and Investment Decision. *American International Journal of Economics and Finance Research*. 1. 1.
- Agnew, J., Szykman, L., 2005. Asset allocation and information overload: the influence of information display, asset choice and investor experience. *Journal of Behavioral Finance* 6, 57–70.
- Allgood, S. & Walstad, W. B. (2016). The effects of perceived and actual financial literacy on financial behaviors. 54 (1), 675-697.
- Almenberg, J., Dreber, A., (2015) Gender, stock market participation and financial literacy. *Economic Letters*. 137, 140-142.
- Arena, S., Zengin, A. (2016) Influence of Financial Literacy and Risk Perception on Choice of Investment. *Procedia – Social and Behavior Sciences*. 235. 656-663.
- Arianti, B. F. (2018) The influence of financial literacy, financial behavior and income on investment decision. *Economics and Accounting Journal*. 1 (1).
- Atkinson, A. and Messy, F. (2012). *Measuring Financial Literacy: Results of the OECD/International Network on Financial Education (INFE) Pilot Study*. OECD Working Papers on Finance, Insurance and Private Pensions, 15, OECD Publishing.
- Bailey, W., Kumar, A., Ng, D., (2006). Why do individual investors hold stocks and high expense funds instead of index funds? Johnson Graduate School of Management, Cornell University, Working Paper.
- Balasubramnian B., Sargent C. S. (2020) Impact of inflated perceptions of financial literacy on financial decision making. *Journal of Economic Psychology*. 80, 102306.
- Bannier, C. E., Neubert, M., (2016). Gender differences in financial risk taking: The role of financial. *Economics Letters*. 145. 130–135.
- Bianchi, M. (2018) Financial Literacy and Portfolio Dynamics. *The Journal of Finance*. 73. 2.
- Bucher-Koenen, A., & Ziegelmeyer, M., (2011) Who lost the most? Financial literacy, cognitive abilities, and the financial crisis. European Central Bank. working paper series.1299.
- Calvet, L., Campbell J., Sodini P., (2007). Down or out: Assessing the welfare costs of household investment mistakes, *Journal of Political Economy* 115, 707–747.
- Chauhan, Y. and Dey, D. K. (2020). Does financial literacy affect the value of financial advice? A contingent valuation approach. *Journal of Behavioral and Experimental Finance*. 25(C).

Chu, Z., Wang, Z., Xiao, J.J., (2017). Financial Literacy, Portfolio Choice and Financial Well-Being. *Social Indicators Research*. 132, 799-820.

Cole, S., Shastri, G., (2008) If you are so smart, why aren't you rich? The effects of education, financial literacy and cognitive ability on financial market participation. Working Paper. Harvard Business School, Wellesley College (unpublished).

Firli, A., (2017) Factors that influence literacy: A Conceptual Framework. *IOP Conference Series: Mater. Sci. Eng.*, 180, 012254.

Gärling, T., Kirchler, E., Lewis, A., Raaij, F., (2009). Psychology, Financial Decision Making, and Financial Crises. *Psychological Science in the Public Interest*. 10 (1). 1-47.

Gaudecker, H. M., V., (2015). How does household portfolio diversification vary with financial literacy and financial advice? *The Journal of Finance*, 70 (2).

Gaurav, S., Cole, S., Tobacman, J., (2011) Marketing complex financial products in emerging markets: Evidence from rainfall insurance in India. *Journal of Marketing Research*. 48 (SPL), 150-162.

Graham, John R., Campbell R. Harvey, Huang, H., (2005). Investor Competence, Trading Frequency, and Home Bias, Manuscript.

Guiso, L. & Jappelli, T., (2009). Financial Literacy and Portfolio Diversification. *Economics Working Papers*, European University Institute. No ECO2008/31.

Gonçalves, T., Gaio, C., & Lélis, C. (2020). Accrual mispricing: Evidence from European sovereign debt crisis. *Research in International Business and Finance*, 52, 101111.

Hilgert, M. A., & Jeanne M. H., (2003) Household financial management: The connection between knowledge and behavior. *Federal Reserve Bulletin*.

Hsiao, Y., Tsai, W., (2018) Financial literacy and participation in the derivatives markets. *Journal of Banking & Finance*. 88.15-29.

Huang, H., Yuan, J., Chi, G., (2021) Underestimation of financial literacy and financial market participation. *Journal of the Asia Pacific Economy*, DOI: 10.1080/13547860.2020.1865249.

Huston, S. J., (2010) Measuring Financial Literacy. *The Journal of Consumer Affairs*, 44 (2).

Hung, A., Parker A., Yoong, J., (2009). Defining and Measuring Financial Literacy. *RAND Working Paper Series WR-708*.

Kempson, E., Collard, S., Moore, N., (2005). Measuring Financial Capability: an exploratory study. *Financial Services Authority Report*. 37.

Li, X., (2020). When financial literacy meets textual analysis: A conceptual review. *Journal of Behavioral and Experimental Finance*. 28. 100402.

- Lusardi, A., & Mitchell, O. (2007). Financial Literacy and Retirement Planning: New Evidence from the Rand American Life Panel. Michigan Retirement Research Center Research Paper No. WP 2007-157.
- Lusardi, A., & Mitchell, O. (2011). Financial Literacy Around the World: an overview. National Bureau of Economic Research. 17107, 1–14.
- Lusardi, A., Mitchell, O. (2011). Financial Literacy: Implication for Retirement Wellbeing. Wharton School, University of Pennsylvania, Pension Research Council Working. Paper n. 1.
- Lusardi, A. (2012) Numeracy, Financial Literacy, and Financial Decision-Making. Numeracy 5. 1. 2.
- Lusardi, A., Scheresberg, C., (2013). Financial Literacy and High-Cost Borrowing in the United States. NBER Working Papers 18969, National Bureau of Economic Research, Inc.
- Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*. 52(1), 5–44.
- Lusardi, A., & Tufano, P., (2015). Debt literacy, financial experiences, and over indebtedness. *Journal of Pension Economics and Finance*, 14(4), 332-368. doi:10.1017/S1474747215000232.
- Parker, A. M., Bruin, W.B., Yoong, J. and Willis, R. (2012). Inappropriate confidence and retirement planning: four studies with a national sample' *Journal of Behavior Decision Making*, 25, 382-389.
- Puri, M., & Robinson, D., (2005). Optimism and Economic Choice. *Journal of Financial Economics*. 86. 10.2139/ssrn.686240.
- Rodrigues, L. F., Oliveira A., Rodrigues, H., Costa C. J. (2019). Assessing consumer literacy on financial complex products. *Journal of Behavioral and Experimental Finance*. 22, 93-104.
- Rooij, M. V., Lusardi, A., Alessie, R. (2011). Financial literacy and stock market participation. *Journal of Financial Economics*. 101, 449-472.
- Xia, T., Wang, Z., Li, K., (2014). Financial Literacy Overconfidence and Stock Market Participation. *Social indicators research*. 119:1233–1245.
- Yoong, J., (2011). Financial illiteracy and stock market participation: Evidence from the RAND American life panel. In: Mitchell, O.S., Lusardi, A. (Eds.), *Financial Literacy: Implications for Retirement Security and the Financial Marketplace*. OUP, Oxford.
- Zhang, Y., Jia, Q., Chen, C., (2020). Risk attitude, financial literacy and household consumption: Evidence from stock market crash in China. *Economic Modelling*. 94, 995-1006.
- Zhong, C., Wang, Z., Xiao, J., (2017). Financial Literacy, Portfolio Choice and Financial. Well-Being. *Social indicators research* 132:799–820.
- Zhou, J., (2020). Household stock market participation during the great financial crisis. *The Quarterly Review of Economics and Finance*. 75. 265–275.

APPENDIX

Appendix A1 - Variables Construction

Variable's name	Variable's designation	Survey's question
Age	<i>age</i>	Por favor indique a sua idade: _____ anos
Gender	<i>gender</i>	Por favor indique o seu género: 1- Feminino 2- Masculino
Education	<i>education</i>	Qual o seu nível máximo de escolaridade? 1 - Não tem instrução primária 2 - Tem instrução primária completa (4º ano/4ª classe) 3 - Tem ensino básico completo (9º ano) 4 - Tem ensino secundário completo (12º ano) 5 - Tem ensino superior (politécnico ou universitário) completo ou a terminar 6 - Tem Mestrado/MBA/Doutoramento ou a terminar
Income	<i>income</i>	Qual o rendimento mensal disponível (isto é, depois de impostos) do seu agregado familiar? Ou seja, quanto dinheiro (aproximadamente) tem o seu agregado familiar, por mês, à disposição ANTES de qualquer despesa? 1 - Até 500€ 2 - Entre 501€ e 1000€ 3 - Entre 1001€ e 2500€ 4 - Mais de 2500€
Advisement	<i>pay_advice</i>	Por favor, indique o quanto concorda ou discorda com a seguinte afirmação: "Eu pagaria para ter aconselhamento financeiro sobre investimentos". 1- Concordo totalmente 2 - Concordo um pouco 3 - Não concordo nem discordo (sou indiferente) 4 - Discordo um pouco
Risk Perception	<i>risk_perception</i>	Como se classificaria quanto ao seu grau de risco quando investe em valores mobiliários? 1 - Muito avesso ao risco / Não gosto mesmo nada de arriscar 2 - Avesso ao risco / Não gosto de arriscar 3 - Neutro face ao risco / Não gosto, nem desgosto de arriscar 4 - Propenso ao risco / Gosto de arriscar 5 - Muito propenso ao risco / Gosto muito de arriscar

Subjective financial literacy	<i>perceived_literacy</i>	<p>Como classifica os seus conhecimentos sobre produtos e mercados financeiros?</p> <p>1 - Nada conhecedor 2 - Pouco conhecedor 3 - Moderadamente conhecedor 4 - conhecedor 5 - Muito conhecedor</p>
Objective Financial literacy	<i>financial_literacy</i>	<p>Suponha que tem €100 numa conta bancária cuja taxa de juro é 1% ao ano. Após 5 anos, quanto será o saldo da conta se não retirar de lá nenhum dinheiro, nem existirem comissões ou impostos associados (ou seja, no fim de cada ano deixa o valor dos juros ficar nessa mesma conta bancária)?</p> <p>1 - Mais de €105 2 - Exatamente €105 3 - Menos do que €105</p> <hr/> <p>Suponha que tem €100 numa conta bancária cuja taxa de juro é de 1% ao ano e que a inflação é 2% ao ano. Daqui a um ano o que acha que conseguiria comprar com o dinheiro dessa conta?</p> <p>1 - Compraria mais coisas do que hoje. 2 - Compraria exatamente as mesmas coisas do que hoje. 3 - Compraria menos coisas do que hoje. 4 - Depende do que iria comprar</p> <hr/> <p>Investiu numa obrigação que paga uma taxa de juro fixa. Entretanto as taxas de juro do mercado diminuíram. Se vender essa obrigação após esta diminuição, o preço desta obrigação deve ser:</p> <p>1 - Menor do que o preço a que a comprou 2 - Igual ao preço a que a comprou 3 - Maior do que o preço a que a comprou</p> <hr/> <p>O que significa um valor mobiliário ter capital garantido na data de vencimento?</p> <p>1 - Tenho direito a receber o dinheiro investido, em qualquer momento 2 - Na data de vencimento recebo sempre o dinheiro investido 3 - O emitente do valor mobiliário reembolsa o dinheiro investido na data de vencimento, desde que tenha condições financeiras para o fazer</p>
Stock market participation	<i>market_participation</i>	<p>A sua carteira atual de valores mobiliários (ou seja, ações, obrigações de empresas, obrigações do tesouro, unidades de participação em fundos de investimento, futuros, opções, CFD/contracts for differences, outros produtos derivados, produtos financeiros complexos, entre outros) representa aproximadamente que percentagem do seu património total?</p> <p>1 - Não tenho valores mobiliários 2 - Entre 1% a 25% 3 - Entre 26% a 50% 4 - Mais do que 50%</p>

Appendix A2 - Demographic Characteristics

Variables		2018	2020
Number of observations		2311	2897
Gender	Male	1867	1272
	Female	415	1608
Age	<= 30 years old	285	1791
	31-40 years old	575	302
	41-50 years old	599	380
	51-60 years old	396	223
	> 60 years old	406	94
Educational level	No education level	2	2
	Primary education	26	0
	Basic education	154	6
	Secondary education	536	182
	Bachelor's degree / Undergraduation degree	1005	1799
	Master's / MBA / PhD	573	897
Market Participation	Participate in Financial Markets	1562	1136
	Do not participate in Financial Markets	33	1732
Number of risky or complex financial assets hold by investor	0	33	1732
	1	300	577
	2	367	290
	3	415	139
	4	312	82
	5	162	28
	6	77	11
	7	14	3
	8	5	6
Percentage of risky or complex financial assets in the investor's total portfolio	No market securities	254	2098
	<25%	719	521
	26% - 50%	361	152
	>50%	307	126
Income Level of Household	Up to 500€	90	985
	Between 501€ and 1000€	184	594

	Between 1001€ and 2500€	673	876
	More than 2500€	677	228
Investments Hold	Savings/ Treasury certificates	1182	416
	Stocks	925	424
	Corporate Bonds / Commercial Paper	363	101
	Investment funds	850	414
	Complex financial products	347	103
	Retirement savings plans	940	531
	Crowdfunding Investments	181	66
	Investments in Bitcoins, ICOs, and other digital currencies	149	122
Advanced FLI	0	473	925
	1	782	843
	2	473	208
	Median	1	0
	Mean	0,79	0,44
	(Std. Deviation)	(0,73)	(0,62)
Basic FLI	0	62	99
	1	667	608
	2	1425	1290
	Median	2	1
	Mean	1,53	1,11
	(Std. Deviation)	(0,65)	(0,88)
Perceived FLI	Nothing knowledgeable	113	199
	Little knowledgeable	342	731
	Average knowledgeable	954	732
	knowledgeable	648	308
	Very knowledgeable	211	85

Appendix A3 - Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
market_participation	4553	.612	.487	0	1
depth_participation	4553	1.562	1.699	0	8
proportion_participation	4538	1.786	.983	1	4
age	5051	37.667	15.835	3	99
male	5162	.608	.488	0	1
education	5182	5.065	.774	1	6
income 2	5208	.149	.357	0	1
income 3	5208	.297	.457	0	1
income 4	5208	.174	.379	0	1
risk_perception	3672	2.677	1.055	1	5
flisimple	4151	0	1.07	-3.644	.673
fliadvanced	3650	0	1.052	-1.153	1.8
perceived_fli	4323	.491	.254	0	1
year	5208	.556	.497	0	1
risk_fli	3672	2.216	2.374	0	10

Appendix A4 - Descriptive statistics per gender

Female	N	mean	sd	min	max
Female					
market_participation	1847	.395	.489	0	1
depth_participation	1847	.774	1.243	0	8
proportion_participation	1852	1.359	.728	1	4
age	1966	32.343	14.204	16	91
male	2023	0	0	0	0
education	2019	5.168	.63	2	6
income 2	2023	.195	.396	0	1
income 3	2023	.27	.444	0	1
income 4	2023	.088	.284	0	1
risk perception	1223	2.207	.948	1	5
flisimple	1334	-.336	1.244	-3.644	.673
fliadvanced	1215	-.341	.948	-1.153	1.8
perceived_fli	1424	.393	.246	0	1
year	2023	.795	.404	0	1
Male					
market_participation	2672	.76	.427	0	1
depth_participation	2672	2.101	1.757	0	8
proportion_participation	2651	2.08	1.029	1	4
age	3067	41.013	15.87	3	99
male	3139	1	0	1	1
education	3132	5.001	.844	1	6
income_2	3139	.122	.327	0	1
income_3	3139	.315	.465	0	1
income_4	3139	.229	.42	0	1

risk_perception	2419	2.916	1.027	1	5
flisimple	2787	.161	.935	-3.644	.673
fliadvanced	2409	.171	1.06	-1.153	1.8
perceived_fli	2868	.541	.243	0	1
year	3139	.405	.491	0	1

Appendix A5 - Descriptive statistics per year

	N	mean	sd	min	max
Year:2018					
market participation	1685	.98	0.139	0	1
depth participation	1685	2.93	1.514	0	8
proportion partici~n	1641	2.439	0.965	1	4
age	2261	46.453	14.014	3	94
male	2282	.818	0.386	0	1
education	2296	4.845	0.918	1	6
income 2	2311	.08	0.271	0	1
income 3	2311	.291	0.454	0	1
income 4	2311	.293	0.455	0	1
risk perception	1692	2.938	1.051	1	5
flisimple	2154	.058	0.979	-3.644	.673
fliadvanced	1674	.263	1.077	-1.153	1.8
perceived fli	2268	.555	0.245	0	1
Year: 2020					
market participation	2868	.396	0.489	0	1
depth participation	2868	.759	1.221	0	8
proportion participation	2897	1.415	0.780	1	4
age	2790	30.547	13.476	17	99
male	2880	.442	0.497	0	1
education	2886	5.241	0.579	1	6
income 2	2897	.205	0.404	0	1
income 3	2897	.302	0.459	0	1
income 4	2897	.079	0.269	0	1
risk perception	1980	2.455	1.008	1	5
flisimple	1997	-.062	1.157	-3.644	.673
fliadvanced	1976	-.223	0.977	-1.153	1.8
perceived fli	2055	.421	0.245	0	1