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The impact of culture on risk aversion in financial decisions: evidence from a TV show

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Abstract

The impact that risk aversion has on the behaviour of financial agents, makes this particular characteristic an important factor to understand some of the phenomena present in financial markets. This leads to the need to embrace in a deeper understanding about factors that determine risk aversion.

Thus, the purpose of this work is to test whether or not culture has an impact on risk aversion in financial decisions. To test this relationship, it was used data from 111 episodes with a sample period referring to 2013 and 2022 from the Portuguese version and 113 episodes with a sample period referring to 2012, 2013, 2015, 2017, 2019, 2020, 2021 and 2022 from the American version of the Tv show- "The Price is Right" more specifically the Wheel game. Taking into account Hofstede's cultural dimensions and after analysing the behaviour of 332 Portuguese contestants and the behaviour of 338 American contestants it was reached the conclusion that the Portuguese more often took decisions that deviated from what was predicted by the USPNE (Unique Subgame Perfect Nash Equilibrium) and the reason is attributed to cultural factors. In this case, it was concluded that the uncertainty avoidance effect is stronger than the individualism effect and thus people from countries that present an uncertainty intolerant culture like Portugal tend to be more reluctant to engage in unpredictable situations and thus more risk averse relative to people from more individualistic countries, like the United States.

Thus, culture is an important factor to take into account in future studies that intend to study cross-country differences in equity investments as well as for financial advisors that often need to assess risk aversion when performing their advisory task.

Keywords: Culture; Risk aversion; Equilibrium; Countries; Financial decisions; TV shows; Biases; Emotions

JEL Codes: G02; G11; C90

Resumo

O impacto da aversão ao risco no comportamento dos agentes financeiros, torna esta característica um fator importante para perceber alguns dos fenómenos presentes nos mercados financeiros. Isto leva à necessidade de estudar e perceber melhor quais os fatores que determinam a aversão ao risco.

Assim, o objetivo deste trabalho é testar se a cultura tem impacto na aversão ao risco nas decisões financeiras. Para testar esta relação, vai ser usado dados de 111 episódios com um período amostral referente a 2013 e 2022 da versão Portuguesa e 113 episódios com um período amostral referente a 2012, 2013, 2015, 2017, 3019, 2020, 2021 e 2022 da versão Americana do programa de televisão- "O Preço Certo", mais especificamente o jogo da roda. Tendo em consideração as dimensões culturais de Hofstede e depois de analisar o comportamento de 332 concorrentes Portugueses e 338 concorrentes Americanos, foi concluído que os Portugueses tomam mais vezes decisões que se desviam daquilo que é previsto pelo *USPNE* e a causa é atribuída a razões de natureza cultural. Neste caso, foi concluído que o efeito da *uncertainty avoidance* é mais forte que o efeito do individualismo e, portanto, as pessoas de países que apresentem uma cultura mais intolerante à incerteza como Portugal são mais relutantes a situações imprevisíveis e, portanto, mais avessas ao risco em relação a pessoas de países mais individualistas como os Estados Unidos.

Assim, a cultura é um fator importante a ter em conta em estudos futuros que pretendam estudar diferenças entre países na temática de investimentos em capital, bem como para consultores financeiros que muitas vezes necessitam de avaliar a aversão ao risco para realizar a sua tarefa de consultoria.

Palavras-chave: Cultura; Aversão ao risco; Equilíbrio; Países; Decisões financeiras; Programas de TV; Enviesamentos; Emoções

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1. Introduction

The behavioural finance field emerged due to the finding that there was a significant deviation between the way people decide and what was predicted by standard finance. Most of these deviations are due to the fact that rational finance presupposes the existence of a fully rational economic agent, the Homo Economicus characterized by always seeking to maximize his individual economic welfare (Perfect Rationality), always looking to maximize solutions by using all available information (Perfect Information) and always decide in isolation without taking into consideration the social values of the group it belongs to nor the impact of its actions on the well-being of others (Perfect self-interest) (Fromlet, 2001).

So, when behavioural finance first emerged, it started to criticize these assumptions. Particularly, it stated that the human thought is not a pure machine of rationality, it is instead a biological adaptation. Additionally, it stated that investors cannot fully process all the information and they cannot control all the variables of the environment they are inserted in and that is why there are no fully rational economic agents on the market, but investors with bounded rationality instead. Finally, behavioural finance criticized the notion that individuals decide in isolation by stating that individuals care about the well-being of those around them and that they perform altruistic acts (Tversky and Kahneman, 1986).

Most of the traditional finance models are built based on these assumptions and that is why they often fail to predict and describe the way people decide as they are very simple representations of reality (Tversky and Kahneman, 1985). In fact, investors, in their decision-making process, are affected by their emotions and external factors that can result from something intrinsic like their own characteristics or something that is related to the environment under which the investor is inserted in, like the culture (Lucey and Dowling, 2005).

In fact, there are more and more studies that show that cultural factors have implications on financial decisions. One of the first studies on this matter was the one by Weber and Hsee (2000). The authors intended to review the relationship between culture and judgement and decision making but in four particular areas: risk preference and perception, probability judgement and decision-making modes. They document that the usage of cultural factors to explain cross-country differences in behaviour and decision making has been a trend.

Since then, several studies have come up to prove that culture can be used as a factor to understand why sometimes people from different countries make different financial decisions. A lot of studies recur to Hofstede's cultural dimensions to fundament their findings. According to Hofstede (2011) cultures can be characterized by 6 dimensions: power distance, indulgence, individualism, long-term orientation, masculinity and uncertainty avoidance. For example, in the matter of cash holdings, Chang and Noorbakhsh (2009) conclude that national cultures impact the behaviour of cash holding managers stating that corporate managers from countries that present a higher score in the dimension of uncertainty avoidance, masculinity and long-term orientation tend to hold assets that are more liquid. Additionally, Anderson et al. (2011) document that the way institutional investors decide to make their portfolio allocations is influenced directly by cultural factors. They conclude that portfolios tend to be more diversified in countries that display a higher level of masculinity and long-term orientation and investment funds from countries that display a higher uncertainty avoidance tend to hold less diversified portfolios.

So, our purpose is to test if the cultural factor can affect financial decisions particularly by investigating the relationship between culture and risk aversion, that is, the investors willingness to accept or not riskier outcomes. To test this relationship, it was used data from the American and Portuguese versions of the TV show- "The Price is Right", more specifically, the Wheel game. The sample was obtained from a total of 224 episodes, in which 111 episodes are from the Portuguese version with a time period referring to 2013 and 2022 and 113 episodes from the American version from 2012, 2013, 2015, 2017, 2019, 2020, 2021 and 2022.

The Wheel has 20 divisions from 5 to 100 with numbers displaced in a random order and in intervals of 5. Because each contestant has the right to spin the Wheel two times, in the original sample there are a total of 483 observations (229 observation from the Portuguese version and 254 observations from the American version).

Among the six Hofstede's cultural dimensions, Portugal and the United States present extreme cultural differences in the dimensions of individualism and uncertainty avoidance. These two cultural features were used to study the contestant's choices in the Wheel game and, consequently, assess the impact of culture on risk aversion.

Taking this into account and after analysing the behaviour of 332 Portuguese contestants and the behaviour of 338 American contestants, it was possible to verify that the Portuguese took decisions that more often deviated from what was predicted by the USPNE. Because of this, we concluded that the uncertainty avoidance effect is stronger than the individualism effect and, thus, the Portuguese are more averse to unpredictable and uncertain environments as Portugal is considered to have a culture characterized by being more intolerant to uncertainty relative to United States that have a more individualistic culture. The differences observed in the aversion to risk were attributed to these cultural differences between the two countries.

The study of the impact of culture on risk aversion in financial decisions can be a support to the financial literature that looks to study and understand investors behaviour. Risk aversion is considered in the literature to have a predictive power of some financial decisions like asset allocation and portfolio choice (Guiso and Paiella, 2004). This means that the better the knowledge about the risk aversion factor and its determinants the better the understanding about financial phenomena and more easily financial advisors can perform their advisory task in the best way possible. So, the study of the relationship between culture and risk aversion can be useful in predicting what should be people's decisions regarding possible investment decisions and investments in equities across countries (Breuer et al., 2014).

This dissertation is organized as follows. In chapter 2 it is going to be presented a literature review related with the relationship that exists between culture and risk aversion. In chapter 3 the main research question is going to be presented as well as the methodology and data that is going to be used to study the impact that culture has on risk aversion in financial decisions. Finally, the main empirical results and final conclusions are going to be shown in chapters 4 and 5, respectively.

2. Literature Review

People have different ways of dealing with risk that translates into different decisions and behaviours. The reason for these differences is said to be dependent on the particular situation that the individual is facing, the individual itself and the factors that result from the interaction of the individual and the situation (Figner and Weber, 2011).

People are said to be risk averse, risk neutral or risk tolerant according to their attitudes towards risk. If one is willing to engage in uncertain environments that provide considerable outcomes but with a high degree of volatility, they are considered to be risk tolerant. On the other hand, the individual is risk averse if it is more willing to engage in a more stable and predictable environment that provides a more certain although lower outcome (Faff et al., 2008). Menezes et al. (1970) define risk aversion by stating that "an individual is risk averter if for any arbitrary risk he prefers the sure amount equal to the expected value of the risk to the risk itself "(p. 3).

Risk aversion has a predictive power that is useful to understand any type of decisions made by economic agents that can go from simple decisions like professional choices to more complex financial decisions like the assets to include in a portfolio and insurance decisions (Guiso and Paiella, 2004). Thus, risk aversion is an important concept in finance as it helps to predict what will be individual's position towards an investment strategy ant it helps to explain some of the financial phenomena observed on financial markets (Corter and Chen, 2006).

There are studies that show that risk aversion has an impact on banks loan pricing. It is consensual within the literature that whenever banks face risk, they pass that risk to the customers by means of higher lending rates. However, Camba-Mendez and Mongelli (2021) separated this effect from the risk that banks face and by studying the loan pricing of banks in the eurozone between October 2008 and October 2013, they were able to conclude that differences in loan pricing between banks are a result of differences in bank's risk aversion and not just a reflection of different exposures to financial risks. Furthermore, there are studies that establish a positive link between CEO risk aversion and the dividend policy. By measuring CEO's risk aversion with inside debt like pensions and the sensitivity of CEO's to changes in stock prices, Caliskan and Doukas (2015) conclude that more inside debt

induces CEOs to pay more dividends. Additionally, risk aversion can be, alongside with other factors such as financial literacy and experience, the reason as to why individuals choose different types of mortgages where typically less risk averse households tend to choose an interest-only mortgage (Cox et al., 2015).

So, the literature is consensual on the importance of risk aversion to explain some of the financial phenomena present in the financial markets as well as some of the investment decisions made by financial decision-makers. Because of this, the knowledge of the determinants of risk aversion is something crucial in the behavioural finance field that seeks to understand the link between psychology/individual attributes and human behaviour (Outreville, 2014).

The idea that people are risk averse began with the emergence of the literature directed to explain human decision-making (Corter and Chen, 2006). Since then, attempts have been made to identify factors that help to explain why some people are risk averse than others. One of the factors that were identified was financial wealth. The literature points that the wealthier an individual is, the more propensity to take financial risks (Bernoulli, 1738/1954, cited in Corter & Chen, 2006). This finding is corroborated in the literature. For example, Shaw (1996) document that an individual's preference towards risk is positively impacted by the wage growth and several other studies were able to corroborate this result. For example, Guiso and Paiella (2008) used household survey data to measure absolute risk aversion according to the maximum price that someone is willing to pay for a security with a high level of risk and found that risk aversion is related with consumer's endowments and that the level of aversion to risk is higher when consumers face more volatility with their income or when they face liquidity constraints. Finally, Guiso et al. (2018) tested if an investor's propensity to avoid risks increased after the global 2008 financial crisis. They documented that following the crisis, the level of risk aversion of investors increased, and they attributed the causes to, alongside with other factors, wealth changes as well as changes in the expected income.

More recently other factors have been attributed to these differences. Gender is a very common factor associated with risk aversion as studies usually point out that women tend to be more risk averse than men. Jianakoplos and Bernasek (1998) assessed gender differences in the propensity to take risks and by examining the holdings of risky assets by households, the authors determined that women tend to be more risk averse than men when making

financial decisions. Borghans et al. (2009) also reached the same conclusion that women display greater levels of risk aversion relatively to men. Not also the authors document this but they also conclude that the gender differences in risk taking tend to be more expressive for higher levels of ambiguity.

This gender differences on risk aversion have an impact on investment strategies used and consequent returns. For example, as women are more risk averse than men, their investment decisions tend to be more conservative which can, consequently, lead to lower profits (Watson and McNaughton, 2007). Gender differences in financial risk taking also have an impact on the assets women choose to allocate in their portfolio (Sebai, 2014).

Another important factor with an impact on risk aversion is related with the individual's attributes. For example, age is said to be a factor with an influence on the financial agent propensity to take risks (Sebai, 2014). Typically risk aversion tends to be an increasing function of age, that is, as age increases the margin required by financial agents to take financial risks increases as well (Morin and Suarez, 1983; Pålsson, 1996).

Additionally, financial literacy is a factor that more and more is included in studies that intend to study differences in risk aversion. Arrondel et al. (2012) studied if there is any relationship between the level of stock holdings and financial literacy. The authors document that the results obtained point that there is a strong link between financial culture and stock holdings. Additionally, Aren and Zengin (2016) document that financial literacy and an individual's position towards risk can impact the way financial investors make their investment decisions. Also, the authors found that the way a financial agent sees risk can be impacted by its financial literacy and gender. Finally, Hsiao and Tsai (2018) found a link between financial literacy and risk aversion and documented that the level of financial knowledge has a positive impact since it lowers the barriers for individuals to enter in financial markets to buy complex financial products.

Other factors impacting risk aversion are related to some of the cognitive and emotional biases that individuals naturally exhibit. For example, some individuals exhibit loss aversion, meaning that losses have a greater impact than gains, and mental accounting bias which is the propensity for individuals to label outcomes and put them into different accounts (Corter and Chen, 2006). Furthermore, individuals suffer from the regret aversion bias which is the

reluctance of individuals to avoid feeling that they have made a bad investment or done something that caused them a huge loss (Albaity and Rahman, 2012).

When studying the impact that individual characteristics have on investors financial decisions, the results were mixed and the reason for this is that people's behaviour are impacted not only by the individual itself but also by the context under which they are inserted. Thus, for example, two individuals that belong to two different countries with two totally different cultures will behave differently (Guiso and Paiella, 2003; Albaity and Rahman, 2012). This fact led subsequent studies to start to include cultural factors to understand human decision making (Gaenslen, 1986; Yates and Oliveira, 2016; Lobão, 2020;)

According to Guiso et al. (2006) culture can be defined as "those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation "(p. 1). National cultures are a factor that can impact decisions made by any type of economic agent, like financial analysts, investors, hedge fund managers, corporate managers, among others. The consequences of those decisions can be felt on firms or on financial markets, depending on the type of financial decision-maker.

According to Hofstede (2011), cultures can be characterized by 6 dimensions: power distance, individualism, masculinity, uncertainty avoidance, long-term orientation and indulgence. Each one of these dimensions will define a culture and impact the way an individual makes financial decisions. As a result, culture becomes an important input to understand some phenomena present in financial markets (Albaity and Rahman, 2012).

For example, the momentum effect, a very common phenomena studied in the financial literature, is the finding that stocks that have recently outperformed the market continue to outperform the market in the future. The differences in the returns of momentum strategies internationally, led Chui et al. (2010) to seek an explanation in behavioural factors. In that sense, the authors tried to study if culture has an impact on the returns of momentum strategies and they found that there is in fact an impact of culture and that investors in more individualistic cultures are more overconfident and tend to make investment decisions that provide them with returns as they put more weight on their own judgments and less on the information that they get from those around them.

Within financial markets, Graham and Pirouz (2010) tried to find a link between culture and the volatility of stock prices. They tried to study the price volatility in 50 global stock markets

and by using linguistic structure and culture values as a way to "measure culture", the authors document that cultural factors have an impact on stock price volatility, but the linguistic dimension was found to have a direct impact while the cultural values have a more indirect impact as it depends, according to the authors, on the level of globalization of each country. Additionally, De Jong and Semenov (2002) try to find a reason for the cross-country differences in the stock market activity and they document that the reasons are linked to the culture of each society represented by its norms and values. By making use of Hofstede's cultural dimensions, the authors conclude that countries that display higher levels of uncertainty avoidance and masculinity tend to attribute more importance to the stock market. Looking at Egalitarianism, which is another dimension of culture that is characterized by prioritizing social equality and condemn abuses in the market, Siegel et al. (2011) find a link with international investments particularly, mergers and acquisitions, issues of bond and equity and syndicated loans.

When looking at the corporate side, there is evidence that culture plays a role on the relationship between CEO's overconfidence and merger activity, specifically, the frequency of offers proposed by CEO's, the diversification level and the means of financing the merger either through equity or debt. Culture plays a role on this relationship because CEO's operating in more individualistic countries tend to be more overconfident (Ferris et al., 2013).

From an individual point of view, culture can also help to explain investor's decisions. There is evidence that investors prefer to include in their portfolio stocks from firms that are culturally close to them (Grinblatt and Keloharju, 2001). Additionally, culture can also explain the foreign bias in asset allocation (Beugelsdijk and Frijns, 2010). Beckmann et al. (2008) took advantage of Hofstede's cultural dimensions to explain that culture influences individual's behaviours and it can explain differences across countries that rational reasoning cannot explain. For example, the authors document that individualism explains less herding behaviour, which is the propensity for individuals to imitate and decide according to others rather than act independently based on their values. Additionally, masculinity explains why men are in top positions and have more responsibility in asset management; higher levels of power distance explain why there are less experienced managers in the top hierarchy and uncertainty avoidance can explain why there are more and higher safety margins and more effort to search more in order to make fewer mistakes.

One of the first papers that studied the relationship between individual's risk preferences and culture was the one by Hsee and Weber (1999). The authors proposed to study this relationship using American and Chinese population and they concluded that Chinese people, generally, are more risk seeking than Americans particularly in terms of investment decisions. Hsee and Weber (1999) explain this using the cushion hypothesis, which is the idea that people from countries that have a more individualistic culture, like the United States are more risk averse and thus less likely to take risks because they feel that if they lose, they will bear the consequences of their losses all by themselves whereas people from more collectivistic countries, like China, tend to be more risk seeking because the consequences of their losses are shared with the network of people that support them.

Subsequently to the study by Hsee and Weber (1999) there were several studies that after that were able to obtain similar results. Some of them confirmed the results using the same sample, American and Chinese population, and attributed the results also to the cushion hypothesis developed by the authors. However, some introduced additional explanations for these results, like, for example, the lack of financial literacy (Fan and Xiao, 2005). Others linked the risk aversion to cultural factors only partially and some find no evidence that an individual that is risk averse will reflect that in the financial decisions they make (Pyles et al., 2016). This result contradicts the findings by Breuer et al. (2014) that conclude that culture affects individuals' behaviour, particularly the choice of asset allocation in the portfolio construction. Because of that, the authors concluded that culture is an important predictor of equity investments held globally.

Additionally, Rieger et al. (2015) studied if culture can be an explanation for the differences in risk preferences between multiple countries. However, and contrary to the study conducted by Hsee and Weber (1999), these authors considered a larger sample of 53 countries because in their point of view a larger sample allows them to obtain more robust results about whether or not culture is correlated with differences in an individual's willingness to take risk. Their conclusion was that there is in fact an impact of culture on risk preferences and so international differences in the risk appetite can be explained by economic and cultural factors. Rieger et al. (2015) not only found the impact of culture on risk preferences, but they also find that prospect theory, that is, the finding that people are risk averse in the domain of gains and risk seeking in the domain of losses, tends to hold globally.

Within the domain of larger samples, Statman (2010) proved this relation between culture and risk preferences by conducting a survey in 23 countries. The author found that countries with a high degree of uncertainty avoidance and individualism tend to be more risk averse. Additionally, Statman (2010) was able to find an indirect relationship between culture and wealth. In that sense, people living in countries that are wealthier tend to be more individualistic and thus more risk averse.

The impact of culture on risky attitudes can be an explanation not only for individual decisions but it can also be a factor of explanation for corporations' behaviour. Risky behaviour taken by firms can be explained by cultural factors more specifically individualism, uncertainty avoidance and harmony (Griffin et al., 2009). For example, Li et al. (2013) found that individualism positively impacts the propensity to take risks while uncertainty avoidance has a negative impact on corporate risk-taking.

Looking at the banking industry, Ashraf et al. (2016) used a sample of 75 countries to study the effects of culture on the propensity of banks to take financial risks. The authors measured national culture through Hofstede's four cultural dimensions: uncertainty avoidance, individualism, power distance and masculinity. They concluded that banks located in countries that display higher levels of individualism and lower levels of uncertainty avoidance and power distance tend to be less risk averse and take more financial risks. The same conclusion was reached by Kanagaretnam et al. (2014) and Mourouzidou-Damtsa et al. (2019).

In the insurance industry it is also consensual that there is a relationship between national cultures and risk-taking. Gaganis et al. (2019) found a strong link between risk taking by insurance firms and national cultures measured by individualism, uncertainty avoidance and power distance.

Among the several studies that seek to study the relationship between culture and risky behaviour, there is always differences in the way risk aversion is measured. In fact, there are several ways to measure risk aversion that can go from the observation of the investment decisions made by individuals either in a real or experimental context, to the usage of questionnaires to assess individual choices (Faff et al., 2008). A stream of recent papers analyses human behaviour through TV game shows that in the literature are pointed to be one of the best ways to study individual decision making because of the well-defined rules

and the fact that the outcomes are more substantial (Lobão, 2020). For example, Lobão (2020), by describing what should be the rational decisions that are in accordance with the rules of logic, uses data from 130 episodes of the French and Vietnamese version of the first bidding game of the TV show- "The Price is Right", to see what are the effective decisions made by the contestants and assess if they are different from what was stated by the rules of governance. Lobão (2020) concludes that players deviate from what is predicted by the rational reasoning and this fact is more evident in the French population. The deviations are attributed to the cultural factors as more individualistic countries, like France are less likely to engage in strategic bidding relatively to more collectivistic countries.

Another important paper in this area, is the one from Tenorio and Cason (2002). The authors developed a unique equilibrium, the USPNE, and used it to predict what should be the decisions of players. Then, by using data from the TV show- "The Price is Right" and also data from the laboratory experiments, they were able to conclude that players decisions on the Wheel game deviate from the USPNE and the deviations tend to increase the harder the decisions they have to make. The final conclusion is that there are differences among players in terms of biases and computational ability that are important to take into consideration in the building of future theoretical models.

Additionally, Brooks et al. (2009) used data from the TV show- "Deal or No deal" and show that the degree of risk aversion tends to increase with stakes and within the domain of higher stakes people's risk aversion tend to differ. Additionally, the authors find that gender, age and the framing effect have an impact on individual's risk aversion. The authors finding that high stakes impact people's risk aversion is confirmed by Hopland et al. (2016) that perform a similar analysis using data from a Norwegian game show. Besides this finding, the authors also conclude that wealthier individuals tend to be willing to bear more risk.

The usefulness of this type of studies can be large and with globalization, it became even more important to understand people's risk preferences (Hsee and Weber, 1999). For example, these studies can help international organizations in their day-to-day business. These types of institutions are known for offering insurance and investment services worldwide, and the different positions that individuals have towards risk might serve as an explanation for the different premiums and cost of capital observed among different countries (Rieger et al., 2015).

Besides that, these types of studies are said to be very useful because the decision that contestants have to make on Wheel game mirrors the type of problems that real economic agents face in real life. For example, just like the contestant on the TV game show must decide whether to spin or not the second time, a business manager must decide whether to keep or not pursing an investment upon the emergence of new information (Tenorio and Cason, 2002).

Additionally, it can also be important for financial advisors to understand that they should take into consideration cultural values as they provide a lot of information about the client's risk aversion which is a crucial factor that portfolio managers have to assess when performing their task of advising clients. So, if they want to do it in the best way possible, they should consider in their analysis cultural factors (Corter and Chen, 2006; Matters, 2008).

So, the finding that culture impacts risk aversion in financial decisions can be very useful among the finance field above all to realize that standard finance assumptions are unrealistic, that is, in fact individuals are not fully rational and do not always decide optimally because in their decision-making process, financial agents are affected by their emotions and external factors like the environment under which they are inserted in as well as the culture of their home countries. Because of these, cultural values should be considered when assessing investor's behaviour (Li et al, 2013).

3. Research Questions and Methodology

In this dissertation we try to test if there is an impact of culture on risk aversion in financial decisions. So, the main research question that ensembles this study is whether or not an individual's risk preference depends on the culture of its home country. If in fact, there is evidence that culture impacts risk aversion in financial decisions, then this could be an important input for economic agents to understand some patterns and behaviours present in financial markets.

3.1. Data

To test the impact of culture on risk aversion in financial decisions, we used data from the Portuguese and American version of the TV show- "The Price is Right", more specifically the Wheel game. The data is publicly available on the online platform YouTube, Dailymotion and RTP play. It was viewed and manually transcribed the results of 224 episodes divided by the Portuguese version (111 episodes from 2013 and 2022) and the American version (113 episodes from 2012, 2013, 2015, 2017, 2019, 2020, 2021 and 2022).

The choice of these two particular countries has to do with the fact that, among the six cultural dimensions identified by Hofstede (2011), Portugal and the United States present extreme cultural differences that are concentrated in the dimensions of individualism and uncertainty avoidance. The dimension of individualism has to do with the way people behave in a society. So, in more individualistic countries people tend to think more of themselves as individuals, as entities that are independent of other people, whereas in more collectivistic countries, people tend to pay more attention to other people, they tend to look at themselves not as an isolated entity, but as part of a group of friends or family. Relatively to the dimension of uncertainty avoidance it has to do with the way people deal with unpredictable and uncertain situations. So, people from countries with a culture that is characterized by being more intolerant to uncertainty tend to be reluctant to engage in unpredictable and uncertain environments.

Figure 1 shows the different scores that Portugal and United States exhibit among the 6 Hofstede's cultural dimensions.

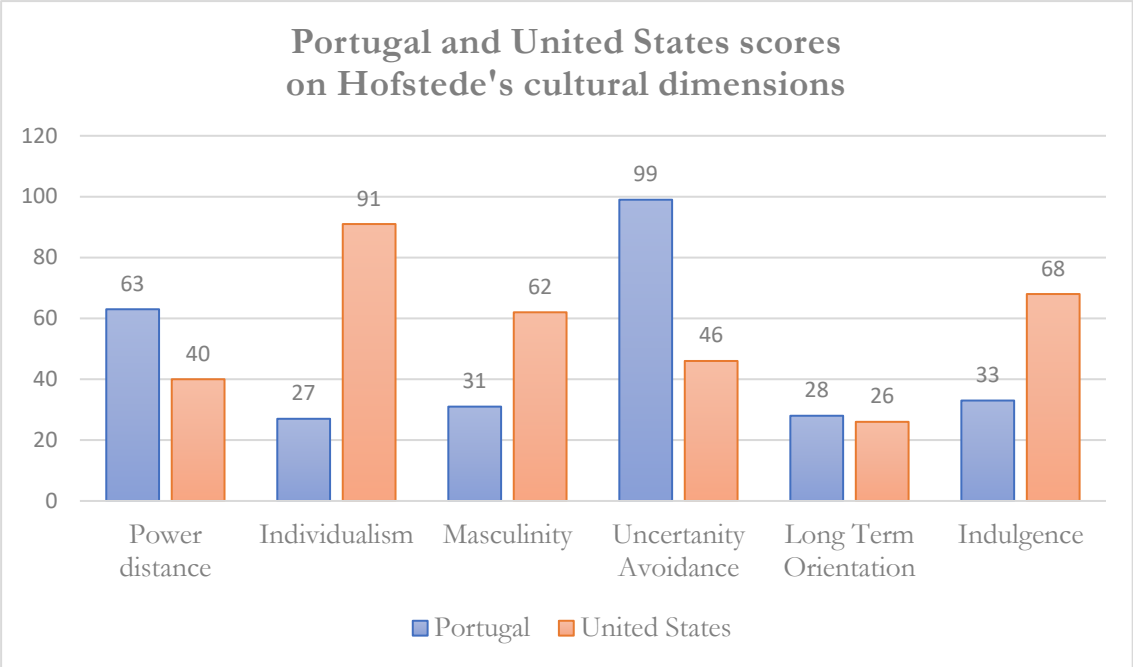

Figure 1. Portugal and United States scores on Hofstede's cultural dimension

Source: Hofstede Insights (2022)

As a result of that study, United States can be characterized as a more individualistic country as it presented a higher score in the individualism dimension relative to Portugal that presented a lower score. Additionally, Portugal got a higher score in uncertainty avoidance, which means that Portuguese people typically do not see in a positive way the uncertainty and tend to become more anxious whenever they have to deal with unpredictable situations. By turn, United States in the study got a lower score in this dimension which means that American people accept very well unstable and uncertain environments. (Hofstede Insights, 2022).

3.2. The Wheel Game

The Wheel game is one of the several games played in the TV show- "The Price is Right". At the beginning of the program four people previously selected are called to participate in the first game of the show, the bidding game. In this game, the contestants have to give their bets on the price of a certain product and the one whose bet is closed to but not higher than the real price of the product has the opportunity to participate in the next game, The Wheel game.

The Wheel has 20 divisions from 5 to 100 with the numbers displayed in a non-sequential order and in intervals of 5. The rules of this game are similar for both the Portuguese and American versions of the program. So, three contestants that have won the bidding game have the right to spin the Wheel, starting with the contestant that got a higher return in the intermediate games that took place before the Wheel game and after the bidding game. Each contestant has the right to spin the Wheel two times. However, it is not mandatory to spin the Wheel again if after the first spin the contestant is satisfied with its score. The winner of the game is the one that gets a score closer to 100 without surpassing it. In case of a tie, the contestants have to each spin the Wheel only once in the same initial order, starting from the value 100.

3.3. Theoretical model

To test the impact of culture on risk aversion in financial decisions, we used the approach followed by Tenorio and Cason (2002). The authors developed a USPNE that determines the optimal and rational behaviour an individual should have in the game.

They started by assuming that the players of the game understand the rules, are capable of assessing the multiple strategies available and display neutrality to risk. The fact that each contestant only receives points if the Wheel completes a turn and the Wheel itself has points that are displayed in a non-systematic way, makes manipulative behaviour a very unlikely event.

The authors started by defining a_i to be the score received in the first spin, b_i the score received in the second spin and t_i the total points received by contestant i where $i = \{1,2,3\}$. Furthermore, the authors defined x_i to be the point each contestant should have in order to maximize the chance of winning the game and proceed to the *Showcase Showdown* which is the final game of the TV show where the winner will be known. Additionally, z_i^* sets the minimum point for each it is not optimal for the contestant to use the second spin.

Therefore, according to Tenorio and Cason (2002) the USPNE is the following: contestant 1, because it is the first to spin, should get in order to maximize the probability of winning the game a point such that $x_i = 0$. Nevertheless, the authors state that, considering the strategies of the other two contestants, the first player should spin again if $a_1 \leq 65$ in order to increase the probability of going to the next round. So, in this case $z_1^* = 70$. Contestant ,

by turn, should spin again if in its first spin gets a point that is lower than 50, $a_2 \leq 50$, or lower than 65, $a_2 \leq 65$, in case it gets the same point as contestant 1. Finally, contestant 3, should spin again whenever it gets, in the first spin, a score lower than 50, $a_3 \leq 50$, in case it gets a score that equals the score obtained by one of the other two contestants, or lower than 65, $a_3 \leq 65$, in case it gets a score that equals the one obtained by the other two contestants. Both contestants 2 and 3 should always guarantee that they do not lose when opting to not spin the Wheel the second time.

Thus, three hypotheses can be formulated such that:

H1: Player 1 spins the second time if in the first spin it gets a score equal or lower than 65.

H2: Player 2 spins the second time if in the first spin it gets a score equal or lower than 50, equal or lower than 65 in case its score equals Player's 1 score, or whenever necessary to avoid losing.

H3: Player 3 spins the second time if in the first spin it gets a score equal or lower than 50 and its score equals one of the two other players, equal or lower than 65 and its score equals the other two players, or whenever necessary to avoid losing.

4. Empirical Results

4.1. Data analysis

Before starting with the analysis, it is important to mention that in the data collection process it was taken into account the data distributed by the two countries in order to make the comparison as reliable as possible. That is, in the scores that were critical for the comparison, care was taken to ensure that the number of observations were equal for both countries.

Additionally, it is important to analyse the data collected and make an empirical analysis in order to extract some important conclusions. For example, table 1 exhibits the number and percentage of winner players from Portugal and United States depending on the order in which they played the game.

Table 1: Number and percentage of winning players according to the order in which they played the game

	Portugal			*United States*	
	Nº of winners	% Winners		Nº of winners	% Winners
1st players	35	31.5	1st players	31	27.4
2nd players	36	32.4	2nd players	37	32.7
3rd players	40	36.0	3rd players	45	39.8

As table 1 shows, the number and percentage of winning players according to the order in which they played the game is very similar. In this sample, in the Wheel game the players playing in 3rd place won more often than the players playing in the first and second place. This fact holds for both countries. In Portugal, 3rd players won 36% of the time while in the United States 3rd players won 39.8% of the time.

Additionally, the players playing in first place in both countries were the ones that won less often. In Portugal, 35 first players out of the 111 have won while 31 American first players

out of the 113 winners have won. In both countries, second players are the second that more often win.

Table 2: Percentage of results in the first spin in each of the 20 numbers of the Wheel for Portugal and United States

Portugal				*United States*			
First Spin	**Frequency (%)**	**First Spin**	**Frequency (%)**	**First Spin**	**Frequency (%)**	**First Spin**	**Frequency (%)**
5	4.22 %	55	8.13 %	5	3.25 %	55	5.33 %
10	3.92 %	60	6.33 %	10	5.62 %	60	8.28 %
15	6.63 %	65	7.53 %	0	5.03 %	65	7.10 %
20	3.31 %	70	4.52 %	20	5.33 %	70	4.14 %
25	5.72 %	75	3.01 %	25	3.55 %	75	5.62 %
30	3.31 %	80	4.22 %	30	6.80 %	80	5.33 %
35	5.72 %	85	3.61 %	35	5.62 %	85	5.03 %
40	5.42 %	90	2.41 %	40	7.10 %	90	0.89 %
45	6.93 %	95	4.22 %	45	4.14 %	95	5.03 %
50	4.82 %	100	6.02 %	50	4.44 %	100	2.37 %

In table 2 it is demonstrated the frequency of each result in the first spin in each of the 20 numbers of the Wheel for Portugal and the United States, that is, the frequency that each number is attained for the 670 first spins (332 first spins for Portugal and 338 first spins for the United States).

With this, it is possible to make a statistical test in order to assess if the Wheel is fair, or not, that is if the frequency of results in each section of the Wheel is approximately equal in statistical terms.

For that, a null hypothesis can be formulated:

H_0: The distribution of results follows a discrete uniform distribution

For Portugal, the hypothesis cannot be rejected at the 97% significance level as for Portugal $\chi^2_{19\,dF}$.= 31.976. On the other hand, in the case of United States for a significance level of 99.5%, the null hypothesis cannot be rejected ($\chi^2_{19\,dF}$= 38.582).

This means that, as the null hypothesis cannot be rejected, it is possible to assume that the distribution of results follows a discrete uniform distribution which means that the distribution of results is symmetric and the frequency of results in each section of the Wheel is approximately equal in statistical terms. This fact is important because this means that the Wheel is "fair" which allows us to avoid any bias in the results and makes any conclusions drawn from the data collected to be considered truthful and reliable.

4.2. Results

So, starting with the analysis of the consistency of the decisions of contestants 1 and 2 with the decisions implied in the first hypothesis, table 2 shows for both countries the percentage of times each contestant made decisions that were aligned with what was determined by the USPNE. Panel A displays the decisions of the first two contestants from Portugal and Panel B displays the decisions of the first two contestants from the United States.

Table 3: Contestant's 1 and 2 decisions from Portugal and United States

Panel A: Portugal

Contestant 1

First Spin	Freq	Correct use of the second spin	Correct use of the second spin (%)
[5, …, 30]	25	25	100%
35	6	6	100%
40	10	10	100%
45	10	10	100%
50	5	4	80%
55	9	7	78%
60	11	8	73%
65	12	3	25%
[70, …, 100]	23	23	100%
Total	111	96	86%

Panel B: United States

Contestant 1

First Spin	Freq	Correct use of the second spin	Correct use of the second spin (%)
[5, …, 30]	27	27	100%
35	7	7	100%
40	10	10	100%
45	9	9	100%
50	5	5	100%
55	9	8	89%
60	11	9	82%
65	12	6	50%
[70, …, 100]	23	23	100%
Total	113	104	92%

Panel A: Portugal

Contestant 2

First Spin	Freq	Correct use of the second spin	Correct use of the second spin (%)
[5, …, 30]	30	30	100%
35	9	9	100%
40	4	4	100%
45	5	5	100%
50	6	6	100%
55	13	9	69%
60	6	4	67%
65	8	7	88%
[70, …, 100]	30	30	100%
Total	111	104	94%

Panel B: United States

Contestant 2

First Spin	Freq	Correct use of the second spin	Correct use of the second spin (%)
[5, …, 30]	36	36	100%
35	8	8	100%
40	5	5	100%
45	2	1	50%
50	5	5	100%
55	5	4	80%
60	8	5	63%
65	10	8	80%
[70, …, 100]	34	34	100%
Total	113	106	94%

In both countries, the first to spin seems to make decisions that are aligned with what was predicted by the USPNE when the Wheel hits any number between [5, …, 45, 70, …,100]. In this sense, the differences seem to exist when the Wheel hits any number that falls out of that range. For example, when the Wheel is first turned and hits 50, American contestants make decisions that are aligned with the first hypothesis. However, Portuguese contestants only used the second spin correctly 80% of the time. When $a_1 \epsilon$ [55, 60, 65] both American and Portuguese contestants do not make decisions fully consistent with the USPNE. However, the percentage of correct use of the second spin seems to be lower for Portuguese first players. When $a_1 \epsilon$ [55, 60], Portuguese first contestants decide correctly, respectively, only 78% and 73% of the time as opposed to American first contestants, 89% and 82% respectively. Yet, the major difference seems to exist when the Wheel hits 65, as only 3 out of 12 Portuguese contestants made the correct decision that was consistent with the USPNE as opposed to American first players where 6 out of 12 made the right decision.

To what concerns the second player's actions, when the Wheel hits any number between $a_2 \epsilon$ [5, …, 40, 50, 70, …,100], both Portuguese and American second players used the second spin correctly. When $a_2 = [55]$, American second players decisions are more accurate than the Portuguese ones as American contestants correctly used the second spin 80% of the time while Portuguese contestants only used it correctly 69% of the time. When $a_2 \epsilon\ [60, 65]$ Portuguese second players were more consistent with the equilibrium as they took more correct decisions, 67% and 88% respectively, compared to Americans second players actions, despite not being a major difference

Table 4: Contestant's 3 decisions from Portugal and United States

Panel A: Portugal

Contestant 3

First Spin	Freq	Correct use of the second spin	Correct use of the second spin (%)
[5, …, 30]	35	35	100%
35	4	4	100%
40	4	4	100%
45	8	8	100%
50	5	5	100%
55	5	5	100%
60	4	4	100%
65	5	5	100%
[70, …, 100]	40	40	100%
Total	110	110	100%

Panel B: United States

Contestant 3

First Spin	Freq	Correct use of the second spin	Correct use of the second spin (%)
[5, …, 30]	37	37	100%
35	4	4	100%
40	9	9	100%
45	3	3	100%
50	5	5	100%
55	4	4	100%
60	9	9	100%
65	2	2	100%
[70, …, 100]	39	39	100%
Total	112	112	94%

The third contestant to spin the Wheel always use the second spin correctly whatever is the number the Wheel hits on, and this holds for both countries. Because it is the last player to spin the Wheel, the margin of choice it has is lower, so typically third contestants tend to decide always in line with the USPNE.

In the beginning of this chapter 4 we made an analysis to assess the number and percentage of winner players in Portugal and the United States according to the order in which they spin the Wheel, and we documented that 3rd players won more often when compared to the two first players. Now, the analysis of the decisions made by American and Portuguese players indicated that 3rd contestants are the ones that more often decide in equilibrium which can indicate that deciding in accordance with the USPNE is more profitable.

Table 5: Differences in decisions made by Female and Male contestants

Portugal			*United States*		
First Spin	**Incorrect use of the second spin (Female)**	**Incorrect use of the second spin (Male)**	**First Spin**	**Incorrect use of the second spin (Female)**	**Incorrect use of the second spin (Male)**
[5, …, 30]	0	0	[5, …, 30]	0	0
35	0	0	35	0	0
40	0	0	40	0	0
45	0	0	45	0	1
50	1	0	50	0	0
55	0	5	55	2	0
60	3	2	60	4	1
65	7	3	65	6	2
[70, …, 100]	0	0	[70, …, 100]	0	0
Total	11	10	**Total**	12	4

In table 5 it is shown how decisions made by female and male contestants diverge. When faced with the decision to spin or not the second time the decisions made by men are different from the decisions made by women.

It is possible to see that in both countries women tend to more often use incorrectly the second spin. However, it seems that in the United States this fact is more expressive as in total terms, men only used the second spin incorrectly 4 times while women used incorrectly 12 times. In Portugal women made more incorrect decisions but the differences relatively to men are less expressive.

The incorrect use of the second spin more often by women may indicate that both Portuguese and American women are more risk averse when compared to men, that is, in this case, women are less likely to engage in an environment or accept something that has an uncertain return.

4.3. Interpretation

The extreme cultural differences between both countries, in the dimensions of individualism and uncertainty avoidance identified by Hofstede, indicate that, typically, Portuguese people tend to be more reluctant to engage in uncertain and unpredictable environments while American contestants tend to me more individualistic. The greater the score obtained in the dimension of individualism and uncertainty avoidance the greater the risk aversion factor.

Because both countries presented a higher score in each dimension, it is necessary, in order to obtain a result, to reconcile with the empirical results. So, because overall Portuguese contestants used the second spin incorrectly more often it can be concluded that, in this case, the dimension of uncertainty avoidance is stronger compared with the dimension of individualism which means that the Portuguese are more risk averse than the Americans.

With this, it was possible to prove that, in fact, culture has an impact on risk aversion which means that culture has an impact on financial decisions and from now on it can be used as a factor to study, understand and predict decisions with a financial impact.

Therefore, we can state that the first two hypothesis that were previously formulated can be rejected because they were not verified both for Portuguese and American contestants. The first hypothesis indicated that the first player to spin the Wheel should use the second chance to spin again if in the first spin it gets a score that equals 65 or fewer points. This was not verified since 15 out of the 111 first Portuguese players and 9 out of the 113 first American players incorrectly used the second spin. Additionally, the second hypothesis stated that the second player to spin the Wheel should spin the second time when in the first spin it gets a score equal than 50, equal or lower than 65 in case its score equals player's 1 score, or whenever it is necessary to avoid losing. Once again, this was not verified because 7 Portuguese players out of the 111 contestants that spin the Wheel the second time and 7 American players out of 113 American second players choose to spin the Wheel the second time when they should not according to the equilibrium.

On the other hand, the third hypothesis was the only one that was verified. This hypothesis indicated that the third contestant to spin the Wheel should only spin the second time when in the first spin it gets a score equal or lower than 50 and its score equals one of the two other players, equal or lower than 65 and its score equals the other two players or whenever

it is necessary to avoid losing. In the empirical analysis it is possible to verify that all 110 and 112 Portuguese and American contestants, respectively, correctly used the second spin and thus acted according to equilibrium.

Thus, we can affirm that the first two hypothesis previously formulated can be rejected and the third hypothesis is not rejected. Also, comparing our results with the ones obtained by Tenorio and Cason (2002) that conducted a similar study using a large sample from the Wheel and data from a laboratory experiment, we can conclude that the results are similar as the authors also concluded that players do not always decide according to equilibrium and that the probability to make incorrect decisions tends to grow the harder the decisions they have to make. Furthermore, the authors consider that this behaviour is explained by player's computational thinking and the biases that individuals exhibit, and that these factors have more impact on the decision-making process than the stakes that are linked to these games. Thus, the authors grow awareness for the need to include these types of factors on theoretical models.

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5. Conclusion

The rational paradigm has some weaknesses because it has unrealistic assumptions. It assumes that the economic agent is perfectly rational, that it perfectly uses all available information and always decide in isolation without taking into consideration the impact on others when in reality that is not what happens. In fact, people are affected by emotions and external factors and the decisions they make are going to be affected by that.

In this work, we try to test if the cultural factor can affect financial decisions particularly by investigating the relationship between culture and risk aversion. To test this relationship, we used data from the American and Portuguese versions of the TV show- "The Price is Right", more specifically, the Wheel game. A total of 224 episodes were watched, in which 111 episodes are from the Portuguese version with a time period referring to 2013 and 2022 and 113 episodes from the American version from 2012 to 2022.

In total we analysed 483 observations (229 of the Portuguese version and 254 of the American version) and the behaviour of 332 Portuguese contestants and 338 American contestants. After a careful analysis, we concluded that the uncertainty avoidance dimension was stronger than the dimension of individualism and because of that it is possible to infer that the Portuguese are more risk averse than the Americans. In fact, in the game American players, in general, correctly used the second spin more often than Portuguese players which means that the Portuguese are more reluctant to use the second spin and thus are considered to be more risk averse. For example, on the first round when the Wheel hists the numbers 55, 50 or 65 which are considered the numbers under which the indecision to spin the second time is higher, Portuguese first players correctly used the second spin only 78%, 73% and 25%, respectively, while American first players correctly used the second spin 89%, 82% and 50% respectively.

With this it is also possible to infer that the differences that exist between the two cultures might have an impact on the results observed. So, in fact culture can be consider a factor that impacts risk aversion on financial decisions and thus should be considered in theoretical models that seek to predict and understand decisions with a financial impact. Additionally, the results achieved should contribute to grow awareness among financial professionals that culture is an important factor with an important role in the way financial agents make their financial decisions (Li et al, 2013).

This finding that differences in risk aversion that exist between individuals that belong to different countries with totally distinct cultures can be explained by cultural factors is corroborated by several other studies. For example, Breuer et al. (2012) try to find a reason as to why households hold few stocks in their portfolio. They document that an individual propensity to take financial risks is linked to cultural factors, particularly the individualism dimension is positively linked with the propensity to take financial risks. Additionally, Rieger, et al. (2015) conducted a study over 53 countries to study individuals' preferences towards risk and they found that there are differences across countries in the degree of risk aversion and these differences can be explained by cultural factors besides the economic factors. The same conclusion was found by Wang et al. (2017) that by conducting a study in 53 countries, found that individualism, power distance and masculinity increase risk aversion. On the other hand, the authors state that uncertainty avoidance has less impact. In what concerns the relationship between culture and corporate decisions, Kreiser et al. (2010) found that uncertainty avoidance and power distance have a negative influence on the propensity to take risks in small and median enterprises. For example, Li et al. (2013) also found that individualism positively impacts the propensity to take risks while uncertainty avoidance has a negative impact on corporate risk-taking.

The conclusions of this work can be useful for the finance and social psychology field. In this work it is shown that the idea of standard finance that a financial agent is always rational and always decides optimally is less and less supported. In reality individuals are affected by their emotions and other external factors like culture can affect their decision-making process which can make them decide in a non-optimal way. Additionally, the findings of this dissertation can provide support for portfolio managers and financial advisors and other type of financial agents/international organizations that provide insurance and investment services as these are typical jobs that require the need to assess the level of risk aversion of their clients (Corter and Chen, 2006; Matters, 2008). So, these results can contribute to improve the international management in the securities industry.

Furthermore, it is also important to take into account that this study has some limitations. For example, the differences observed in the behaviour of people that belong to countries that culturally are very distant are being attributed to cultural factors while, in reality, those differences can be explained by other factors like gender, economic differences and even the differences in terms of financial literacy which has been consider a factor that impacts

financial agents' investment decisions. For example, Aren and Zengin (2016) found that financial literacy is a factor that affects an individual's risk perception as well as its investment preferences. So, there might be other factors that influence the way an individual decides and are not being captured in this study.

Finally, this paper is just a starting point on the study of the relationship between these two factors because there is much more to explore on the impact of culture on risk aversion in financial decisions. For example, future studies can control for other factors that may impact risk aversion like gender, economic differences and also the financial literacy of each country. Additionally, this type of study can be made with other countries given that this TV show is aired in several countries worldwide (e.g., Bulgaria, Croatia, Germany, Uruguay, Romania, etc.

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