

Uncertainty avoidance, loss aversion and stock market participation

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Abstract

Stock market participation differs a lot across countries. Cultural dimensions could be a potential factor for that. We show that indeed uncertainty avoidance (UAI) is linked to rates of stock market participation across countries. We can show even more that uncertainty avoidance has an indirect effect through loss aversion on stock market participation. The country level effects are confirmed on the individual level using data from a recent large-scale international survey, but on individual level there is also a strong effect of UAI on stock market participation after controlling for loss aversion. These results are robust after controlling for ambiguity aversion, and economic and demographic variables. Finally, we find that UAI is related to negative attitudes about stock markets in general.

Key words: Uncertainty avoidance; loss aversion; stock market participation; cultural finance.

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1 Introduction

Financial decisions are influenced by cultural differences. This is nowadays well-established, although it took much longer in finance than in other fields of business administration to start taking this into account (Aggarwal & Goodell 2014).

One of the most fundamental financial decision is whether to invest into stocks or not. This decision is clearly related to the huge literature on the equity premium puzzle (Mehra & Prescott 1985), but is also important on the level of the investor, as stock market participation leads to higher long-run returns and therefore is one of the most relevant factors for wealth accumulation.

Given the large differences in stock market participation across countries, it is natural to try to explain parts of this variation with cultural differences. In previous literature, mostly two factors have been in the focus for that: trust (Tao 2006, Guiso, Zingales & Sapienza 2008) and individualism (Chui, Titman & Wei 2010, Breuer, Riesener & Salzmann 2014*b*). Individualism is one of the cultural dimensions by Hofstede (2001) – which already could make us curious whether other dimensions might also play a role. Further motivation for this is given by the observation that stock market development can be related not only to individualism, but also to uncertainty avoidance, another cultural dimensions by Hofstede (2001) that describes the aversion of persons to unclear and uncertain situations (Dutta & Mukherjee 2015). It is natural to consider this to be also a factor in the decision to enter the stock market: an unclear and uncertain zone where returns are not predictable and investment options are manifold and fright-

eningly complicated for laymen. This has already been demonstrated for the difference between local and foreign stocks: foreign stocks seem less predictable and more opaque, thus the foreign bias is stronger where UAI is higher (Beugelsdijk & Frijns 2010). In a related paper, UAI has been found to significantly influence decisions of professionals on corporate takeovers (Frijns, Gilbert, Lehnert & Tourani-Rad 2013) – a situation that in a certain sense can be seen as the professional equivalent to a private investor deciding whether to enter the stock market. In this paper, we therefore study the relation of uncertainty avoidance (UAI) to stock market participation and hypothesize that a higher degree of UAI will lead to a lower stock market participation. We find that this relation exists. Moreover, on the country level, we are able to determine a link between culture and financial decisions through risk preferences: the effect of uncertainty avoidance on stock market participation is mediated by loss aversion (Baron & Kenny 1986). The effect is robust, even when controlling for standard control variables and for ambiguity aversion which has previously been found to be related to the equity premium (Gollier 2011, Rieger, Wang & Hens 2013).

On the individual level, the effect of UAI is even stronger and persists when controlling for loss aversion.

The paper is structured as follows: in Section 2, we describe the data used in our empirical analysis. In Section 3, we present the main results on UAI and loss aversion and also present some robustness tests. Section 4 concludes.

2 Data

We use stock market participation data from Giannetti & Koskinen (2010), a very comprehensive dataset. Although the data is not as much up to date as we could wish for, we do not see this as a serious problem: stock market participation is usually not undergoing dramatic changes, and in particular its dependence on cultural differences will likely not change quickly. Moreover, we will use data for UAI, ambiguity aversion and loss aversion that has been collected at a similar point in time (mostly 2008 and 2012) for the INTRA study (Rieger, Wang & Hens 2015, Wang, Rieger & Hens 2017) that included around 7000 subjects from 53 countries and regions. Both datasets together have an overlap of 23 countries – not that much, but enough to use correlations or simple regression models.

Ambiguity aversion was measured with a simple binary choice (Rieger et al. 2015) and we use the country average of this number, i.e. the proportion of subjects from a country that showed ambiguity aversion. Loss aversion was measured with the variable θ from prospect theory as defined by Kahneman & Tversky (1979) and Tversky & Kahneman (1992). The precise definition and the measurement can be found in Wang et al. (2017). On the country level we use the median value. As the distribution of average UAI across countries is far from normal, we use its rank instead.

As robustness test, we use data from a recent study on economic preferences, attitudes and norms that has been conducted in 2019 in China, Taiwan, Japan, Vietnam, Germany and Estonia with more than 3000 participants (see, e.g., Ashtiani, Rieger & Yousefi Amin (2020) and Rieger, Wang, Massloch & Reinhardt (2020)). Data was collected in an online survey advertised

at a number of universities. While the key motivation for that study (the PANDA study¹) was to investigate cultural differences between East Asia and Europe, we can utilize the data for our purpose as well, since it includes a measurement of loss aversion and ambiguity aversion as well as a question about the willingness to invest into stocks (once the subject had enough money to do so) and about actual investment experience. The questions on UAI, loss aversion and ambiguity aversion were the same as in the INTRA study. In the case of the loss aversion question we winsorized the data by omitting the top and bottom 5% values of θ to remove outliers, following the procedure from Wang et al. (2017). The question on potential stock investments read: “How likely is it that you would invest money in stocks or funds in the future, provided you had a reasonable amount of savings?” Possible answers were: very unlikely, not likely, likely, very likely. They were coded with values from 1 to 4.

The PANDA study also contained six items about attitudes towards stocks. Four of those were about morality and profitability of stocks:

- Investing in stocks is only for gamblers.
- It is morally questionable to earn money with stocks, because whatever I gain, somebody else must lose.
- On the long run, stocks give a good return.
- Investing on the stock market is a perfectly normal way to earn money.

Two items were about herding behavior:

- If my friend buys stocks, I would also consider it.

¹PANDA stands for “Preferences, Attitudes, Norms and Decisions in Asia”.

- I make financial decisions by myself.

For each item we elicited agreement (strongly disagree/disagree/undecided/agree/strongly agree) that we coded on a Likert scale from 1 to 5.

The items were designed such that there was the same number of positive and negative scales, an important point in intercultural studies to prevent biases caused simply by cultural differences in the general tendency to agree to statements.

Besides the main variables we also used controls where we took country level economic variables from Rieger et al. (2015). The demographic variables in the PANDA study that we used are standard and were also elicited in the survey. The monthly income has been adjusted to purchasing power parity, according to data by the Worldbank. After taking out subjects with missing values and low quality data (i.e., if the time spent for answering all questions in the relevant part of the survey was too short), we used data from $N = 2211$ subjects for most of the further analysis.

3 Empirical results

3.1 Effects of UAI and loss aversion on stock market participation

We start with a very simple observation: the correlation between UAI and the rank of stock market participation. This correlation is indeed significantly negative, as we have expected, with a Pearson correlation of -0.43^* ($p=0.04$, $N=23$). This, however, leaves the question open of whether there is a direct influence of uncertainty avoidance on stock market participation or whether this influence is indirect, in particular via loss aversion or ambi-

guity aversion, as it has been shown that these variables are related to UAI (Rieger et al. 2015, Wang et al. 2017) and to the equity premium and stock investments (Benartzi & Thaler 1995, Ben-Rephael & Izhakian 2020). This possibility is supported by the fact that loss aversion also shows a significant correlation with the rank of stock market participation of -0.51^{**} ($p=0.014$, $N=23$).

To test for the hypothesized effect of UAI through loss aversion on stock market participation (and for a potential effect of the wealth level (and therefore the financial development) of a country, we conduct a regression analysis (Tab. 1). The results shows that there seems to be no direct effect of UAI on stock market participation, but indeed a strong *indirect* one: loss aversion (by itself influenced by UAI, as shown in Wang et al. (2017)) is a significant factor in explaining cross-country variation in stock market participation, even after controlling for GDP per capita.

There are, of course, a number of other variables that might be connected to both, stock market participation and loss aversion. In particular, ambiguity aversion and a number of country level variables (GINI index, inflation, growth). Therefore, we conduct a second regression analysis, including these variables (and excluding UAI), see Tab. 2. It shows that there is indeed a significant effect of wealth (wealthier countries have more stock market participation, as expected), but none of the other controls are significant. Loss aversion, however, is significant in all models under consideration and becomes even more significant after controlling for GDP per capita.

In summary, we have found:

- (a) a significant effect of UAI on loss aversion (Wang et al. 2017)

Table 1: UAI does not have a direct effect on stock market participation, but an indirect effect via loss aversion. The effect is independent of controlling for GDP per capita. (T-values in parentheses.)

| | Stock market participation | |
|----------------|----------------------------|----------------------|
| | Model (1) | Model (2) |
| (Constant) | 0.511*** (4.329) | 0.397** (2.854) |
| loss aversion | -0.157** (-2.439) | -0.160** (-2.566) |
| UAI | -0.002 (-1.235) | -0.001 (-0.341) |
| GDPcapita | | 0.000 (1.443) |
| N | 23 | 23 |
| Adjusted R^2 | 0.288 | 0.327 |

Significance levels: *=5%, **=1%, ***=0.1%.

Table 2: Loss aversion is a significant explanatory factor for stock market participation on the country level, even after controlling for various other factors. (T-values in parentheses.)

| | Stock market participation | | | |
|------------------|----------------------------|-----------|-----------|-----------|
| | Model (1) | Model (2) | Model (3) | Model (4) |
| (Constant) | 0.564*** | 0.474** | 0.152 | 0.232 |
| | (4.145) | (2.494) | (0.795) | (1.021) |
| loss aversion | -0.198** | -0.209** | -0.251*** | -0.26*** |
| | (-2.809) | (-2.845) | (-4.071) | (-4.017) |
| ambiguity av. | | 0.199 | 0.518* | 0.438 |
| | | (0.687) | (1.992) | (1.319) |
| GDP per capita | | | 0.000** | 0.000* |
| | | | (2.913) | (2.36) |
| GINI index | | | | 0.002 |
| | | | | (0.552) |
| inflation | | | | -0.003 |
| | | | | (-0.24) |
| real growth rate | | | | -0.025 |
| | | | | (-1.19) |
| N | 23 | 23 | 23 | 23 |
| Adjusted R^2 | 0.288 | 0.264 | 0.509 | 0.511 |

Significance levels: *=5%, **=1%, ***=0.1%.

- (b) a strong and robust effect of loss aversion on stock market participation (see correlation results and Table 2).
- (c) a connection between UAI and stock market participation (see correlation results) that becomes insignificant when controlling for loss aversion (Table 1).

All together this suggest a mediator effect (Baron & Kenny 1986): UAI influencing loss aversion that itself influences the decision to enter the stock market, as schematically depicted in Fig. 1.

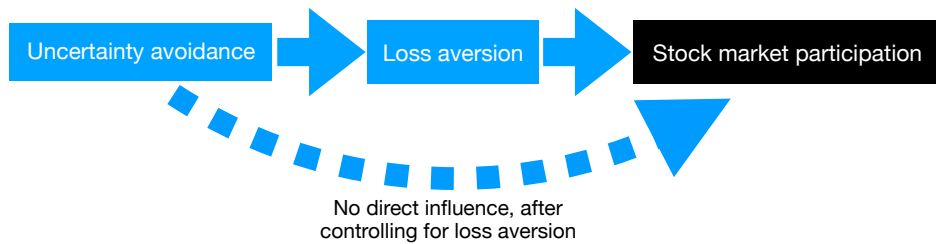


Figure 1: Schematic illustration on how uncertainty avoidance influences stock market participation through loss aversion on the *country level*. – The *individual level* analysis will show different results.

While this observation holds on the country level, it is a priori not clear whether this is also true on the individual level: stock market participation might be affected by the average loss aversion in a country, because this leads to a certain investment culture and individuals may just follow this while their own loss aversion might have little influence on their decisions. Similarly it might be that the role of UAI changes when not considering countries, but individual persons. We will therefore in the following study the PANDA data to assess the situation on the individual level.

3.2 Effect of UAI and loss aversion on the individual level

Table 3: Loss aversion is a robust and significant factor for decisions on stock market participation, also on the individual level when controlling for a variety of factors. (T-values in parentheses.)

| Willingness to invest in stocks | | |
|---------------------------------|-----------------------|-----------------------|
| | Model (1) | Model (2) |
| (Constant) | 2.999*** (139.209) | 3.961*** (26.311) |
| loss aversion | -0.007* (-2.398) | -0.006* (-2.077) |
| age | | -0.031*** (-8.289) |
| female | | -0.258*** (-6.765) |
| PPP-adj. income | | 0.000 (1.868) |
| working | | 0.156 (1.501) |
| student | | -0.243* (-2.409) |
| bachelor | | 0.165*** (4.032) |
| master | | -0.018 (-0.287) |
| N | 2211 | 2211 |
| adj. R^2 | 0.2% | 6.0% |

Significance levels: *=5%, **=1%, ***=0.1%.

While INTRA does not have any individual level data for stock market investments, the PANDA study, as described in Sec. 2, has such data. We will use this data to test whether loss aversion and UAI have a significant effect on stock market participation decisions on the individual level. The

question we study moreover allows to exclude reverse causality, since it is a hypothetical question about some point in the future and therefore cannot be influenced by learning effects from stock ownership: a priori it might have been possible that owning stocks reduces loss aversion.² In the regression (Tab. 3), we control for age, gender, income (purchasing power parity adjusted), whether a person is currently working or a university student and whether they have a bachelor or a master degree.

The regression results clearly confirm that loss aversion is a significant factor in stock market participation, although there are of course personal characteristics that show an even higher significance, in particular age and gender. Interestingly, the impact of income was smaller in size than the impact of loss aversion.

How about UAI? Tab. 4 shows that UAI is indeed also a very good predictor of stock market participation, like on the country level. However, we do not find evidence for the mediator effect that we had observed in the country level data: very much to the contrary, on the individual level UAI plays a dominant role, even after controlling for loss aversion, as the partial correlation results (controlling for loss aversion and country dummies) in Tab. 5 show. This difference is also not due to the different proxy for stock market participation: when replacing it with actual stock market experience, the results are basically unchanged.

This is a certainly intriguing finding: the way UAI influences stock market participation differs between country and individual level.

²The proportion of subjects owning already stocks was small compared to the proportion who stated that they likely or very likely would invest into stocks.

Table 4: Individual differences in UAI also predict stock market participation very well, even after controlling for a number of factors.

| Willingness to invest in stocks | | |
|---------------------------------|-----------------------|-----------------------|
| | Model (1) | Model (2) |
| (Constant) | 3.12*** (115.152) | 3.995*** (26.044) |
| UAI | -0.003*** (-7.837) | -0.002*** (-6.27) |
| age | | -0.03*** (-7.952) |
| female | | -0.234*** (-5.973) |
| PPP-adj. income | | 0.000 (1.342) |
| working | | 0.196 (1.843) |
| student | | -0.209* (-2.026) |
| bachelor | | 0.159*** (3.806) |
| master | | -0.02 (-0.311) |
| N | 2116 | 2116 |
| adjusted R^2 | 2.8% | 7.8% |

Significance levels: *=5%, **=1%, ***=0.1%.

Table 5: Partial correlation results (controlling for loss aversion and country dummies) shows that UAI on the individual level has a significant impact on stock market participation.

| Item | Partial correlation with UAI (p-value) |
|---------------------------------|--|
| Actual stock market investment | -0.084*** (p<0.001) |
| Willingness to invest in stocks | -0.111*** (p<0.001) |

Table 6: Partial correlations of attitudes towards stock markets with UAI (controlling for loss aversion and country dummies). We see that UAI is associated with lower perceptions of morality and benefits, and higher perception of the stock market as gambling.

| Item | Partial correlation with UAI (p-value) |
|---|--|
| Stocks only for gamblers. | 0.081*** (p<0.001) |
| Morally questionable to earn money with stocks. | 0.178*** (p<0.001) |
| I make financial decisions by myself. | -0.004 (p=0.854) |
| On the long run, stocks give a good return. | -0.100*** (p<0.001) |
| If my friend buys stocks, I would also consider it. | -0.038 (p=0.077) |
| Perfectly normal way to earn money. | -0.134*** (p<0.001) |

3.3 UAI and attitudes towards stocks

Finally, we will take a look at the effect that UAI has on the perception of stocks and stock markets on an individual level. We will see that this effect is indeed strong and highly significant.

To test for this effect, we use again partial correlations, controlling for loss aversion and country dummies. Tab. 6 shows that UAI is associated with the following four items:

- Investing in stocks is only for gamblers.
- It is morally questionable to earn money with stocks, because whatever I gain, somebody else must lose.
- On the long run, stocks give a good return.
- Investing on the stock market is a perfectly normal way to earn money.

Higher UAI corresponds to more agreement with the first two items and less with the third and fourth which is consistent in that higher UAI is

always related to a more negative view about the stock market. There is no statistically significant relation to the two items related to herding.

This shows that uncertainty avoidance has a clear relation with how people perceive stocks: as a risky and morally questionable thing for gamblers or as a profitable long-term way to earn money. This perception itself, however, has a significant impact on the willingness to participate in the stock market (Ashtiani et al. 2020).

4 Conclusions

In summary, our results show in a rather short and straightforward way that on the country level, uncertainty avoidance through its influence on loss aversion exhibits a significant impact on the decision to enter the stock market. This result is in line with a number of other studies in cultural finance that suggest that many of the cultural differences on financial markets act through their influence on behavioral preferences, in particular loss aversion (like in our study) and time discounting (Breuer, Hens, Salzmann & Wang 2015, Rieger et al. 2013, Breuer, Rieger & Soypak 2014a, Breuer, Rieger & Soypak 2016, Hens & Schindler 2020).

The picture becomes more complex when we look at the level of individual investors: here, UAI has its own strong influence on (actual and prospective) stock market participation. It is also related to attitudes about stock markets, e.g., whether stocks are considered to have good long-run returns or whether stock markets are considered only something for gamblers. This suggests that these factors are at least co-determined by culture.

It would be very interesting to investigate the cause of this difference be-

tween country and individual level, but this might require a comprehensive international data set including UAI, loss aversion and stock market participation, all measured on the individual level which currently does not seem to be available.

Future research could focus also on the question whether an indirect effect also occurs in other fields of management science that are maybe less focused on mathematical models and therefore do not take behavioral preferences as much into account as finance does.

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