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## Essays on the social dimensions of investor behavior

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## 6. Conclusions and Future Research

### 6.1 Conclusions

In the introduction of this thesis, we have identified two main research objectives that this thesis aimed to achieve as well as three research questions this thesis aimed to answer. In the remainder of this section, we will summarize how we have achieved the research objectives of this thesis by answering our research questions.

To memorize, the following research objectives and research questions have been central to the research of which this thesis reported:

**RO 1** This thesis aims to contribute both to the understanding in the academic literature of as well as to the professional practitioners' knowledge on individual investors' personal needs, level of investment-related knowledge and experience, and the effect of afore-mentioned investor characteristics on (the social dimensions of) individual investors' decision-making behavior.

**RO 2** Moreover, this thesis aims to contribute both to the understanding in the academic literature of as well as to the professional practitioners' knowledge on the possible effects of the micro level investor behavior as identified in the first research objective on macro level stock market dynamics as measured by the occurrence of stylized financial market facts like e.g., volatility clustering.

To achieve the research objectives as outlined above, a number of research questions have been formulated that this thesis aimed to answer. The main research questions of this thesis are:

**RQ 1** To what extent and in what way do different personal needs and individual investors' level of investment-related knowledge and experience exert influence on the social dimensions of these investors' decision-making behavior like their propensity to demonstrate conformity behavior?

**RQ 2** To what extent and in what way does the micro level individual investor behavior as meant in the first research question exert influence on macro level stock market dynamics as measured by the occurrence of stylized financial market facts like e.g., volatility clustering?

**RQ 3** To what extent and in what way can the micro level individual investors' decision-making behavior and their market interactions be influenced by the overall macro level stock market dynamics?

### **6.1.1 Conclusions Research Question 1**

Using an empirical study on individual investors' preferences and their behavior, in this thesis we have answered the first research question and thereby achieved our first research objective.

In chapters 2 and 3, we have reported on the results of our online investment survey and described how these results contributed to answering the first research question. These results can be summarized in the following way.

First and foremost, in line with recent behavioral finance research this thesis has empirically proved that investors care about much more than only the risks and expected returns of their investments. Apart from financially oriented needs, the investors that participated in our investment survey tried to satisfy more socially oriented needs like affiliating with other investors and participating in investment-related conversations with other investors. Moreover, these investors found investing to be a nice free-time activity and appreciated investing for the opportunities it gives for analyzing problems, looking for new security constructions and learn.

Second, this study has found considerable differences between investors with regard to their self-reported level of investment-related knowledge and experience. Moreover, we have found that investors that give a greater importance to socially oriented needs and/or have lower levels of investment-related knowledge and experience, have a greater propensity to perform normative conformity behavior as well as informational conformity behavior. In the first instance, this socially oriented behavior is driven by the social needs of investors. In the second instance, this socially oriented behavior is driven by a desire to reduce the feelings of uncertainty investors may experience as a result from their low levels of investment-related knowledge and experience.

To which extent these results may also hold for the more general population of investors with direct investments in the Dutch stock market has been discussed in section 2.5 and 3.5. and we will come back on this issue in section 6.2.

### **6.1.2 Conclusions Research Questions 2 and 3**

Empirical studies like those used to answer the first research question are less suited to answer research questions that deal with the interactions between micro level investor behavior and macro level stock market dynamics which are central to the second and third research question. Multi-agent social simulation models, however, are a particularly suitable method to answer these types of questions.

In chapters 4 and 5, we have reported on the results obtained from two different multi-agent social simulation models and described how these results contributed to answering the second and third research question, respectively.

In chapter 4, the model on investor behavior by Day and Huang (1990) was re-formalized in a multi-agent social simulation environment. In this chapter we have performed a number of simulation experiments that concerned the influence of micro level investor behavior on macro level stock market dynamics and the possible influences of macro level stock market dynamics on micro level investor behavior.

With regard to the first, we have found that increasing the proportion of socially oriented trend following investors leads to increasingly volatile stock market price and returns dynamics. Moreover, it was found that markets populated by homogenous investors reached higher levels of volatility earlier than markets that were populated by heterogeneous investor populations. That is, stock markets where all investors respond in an identical way to e.g., price changes, can be assumed to be more susceptible to stock market hypes and crashes. Considering the propensity of investors to perform conformity behavior as was found in chapter 3, a situation in which many investors perform similar behavior does not seem particularly unlikely. Socially oriented investor behavior such as conformity behavior may therefore be considered to be a potentially important driver of aberrant stock market phenomena such as crashes, bubbles, and hypes.

With regard to the latter (the possible influence of macro level stock market dynamics on micro level investor behavior), we have performed a number of simulation experiments in which we have found that as investors become more sensitive to macro level stock market dynamics in terms of their fear that the current stock market price developments may turn around, the resulting stock market dynamics as measured by the standard deviation of returns also become more turbulent.

Finally, in chapter 5 we have presented our newly developed artificial stock market SimStockExchange. This multi-agent social simulation model overcomes many of the limitations of the model on investor behavior that was presented in chapter 4 and incorporates the most important results of our empirical studies in its agent trading and interaction rules.

In this chapter, we have presented the results of two simulation experiments, in which the agents either interacted in a regular torus network or in a Barabasi and Albert scale free network (Barabasi, 2002; Barabasi & Albert, 1999). Subsequently, we have studied the stock market price and returns dynamics as well as the occurrence of several stylized financial market facts for these two network configurations. Moreover, we have compared these results with those that can be found for real stock markets, like the Dutch stock market AEX. For these first simulation experiments, we have found a number of qualitative and quantitative agreements between our simulated results and the AEX, as well as a number of future research opportunities that might further improve this fit. We will report more extensively on this in section 6.2.

## **6.2. Limitations and Future Research**

The scope of this thesis has caused several limitations, which however offer perspectives for future research. These limitations can be related to either the scope of the empirical studies of which the results have been discussed in chapters 2 and 3 or to the scope of the simulation studies of which the results have been discussed in chapters 4 and 5, respectively.

In the following, these limitations will be summarized for each of these two categories and the opportunities for future research will be outlined accordingly.

### **6.2.1 Limitations and Future Research of the Empirical Studies**

A comparison that has been made with regard to a number of descriptive characteristics has shown our sample not to be far out of line with the more general population of investors with direct investments in the Dutch stock market. Yet, the specific nature of our investment survey as discussed in chapter 2 and 3 may bring along a number of possible limitations to the generalizability of its results. It is important to consider these limitations before generalizing our results beyond the specific class of investors that has participated in our investment survey.

First, a potential sample bias may exist as only those investors that actually visited the specific four investment-related websites that were used in our studies could participate in our investment survey. Yet, the websites that have been used can be considered to be both well-known as well as to have nationwide visitors.

Second, a potential non-response bias may exist as investors that did not participate in our investment survey could be different from our respondents in more ways than the simple fact that they refused to complete our online questionnaire. Socially oriented investors, for example, may be considered to be more inclined to answer questionnaires in general and about this topic in specific and may therefore be overrepresented in our sample. Yet, the call to participate in our research was neutrally worded on each of the four websites as “Research on Investor Behavior by the University of Groningen”. No reference was made to the specific nature of the questions that would be part of the survey, which to some extent may mitigate the potential for this specific bias.

Third, the participants of our studies were interested in spending their free time on the computer accessing investment-related websites and seemed to be relatively active investors who like to transact. This could possibly affect their scoring on a number of questions of our investment survey. In particular, these characteristics could lead to higher scores for investing as a nice free time activity.

Fourth, although the greater part of the general population of investors with direct investments in the Dutch stock market are older males, the participants of our investment survey were slightly older and even more likely to be male.

Fifth, the respondents of our investment survey were Dutch investors. Dutch society - like the society of the United States, Great Britain, and Australia - has

been found to have a very high level of individuality (Hofstede, 1983). Similar results could therefore be expected to be found in these countries, but future studies have to show what effects can be found in more collectivistic countries, like for example those in Central America, Asia, or even Scandinavia. If more socially oriented needs and investors' conformity behavior can already be observed in a highly individualistic country as The Netherlands, even stronger effects may be found in more collectivistic countries.

Sixth, the participants of our investment survey were mainly individual investors. Only a small percentage (approximately 5%) of the respondents indicated to be either a professional investor, a broker or to work at a large investment company.

To demonstrate the universality of this study's results, future studies should therefore have a larger and more international sample as well as a more even distribution of male and female investors and a larger proportion of institutional investors.

### **6.2.2 Limitations and Future Research of the Simulation Studies**

In chapter 5, we have presented the artificial stock market SimStockExchange (SSE), that has been developed using the results from the empirical studies as reported on in chapters 2 and 3. This model of investor behavior has succeeded in overcoming many of the limitations of the model on investor behavior that was presented in chapter 4. Yet, even in the most recent formalization of this model, a number of potential limitations may remain.

First, notwithstanding its level of sophistication, SSE remains a model and is therefore a simplified reproduction of reality. As discussed more extensively in chapter 5, especially the question on how to formalize the news arrival process poses a number of difficulties which are hard to overcome. We have chosen to model the news arrival process in a simplified way as normally distributed noise around a current price, which forms a limitation of the current study but poses a challenge for future research.

Second, as discussed in the previous paragraph, the participants of our investment survey of which the results were used to formalize the agents' trading and interaction rules, were mainly individual investors. It could be argued, that due to the size of their portfolios, large institutional investors have a far greater influence on stock market dynamics and therefore the composition of our sample may represent a limitation. Yet, there are a number of reasons why we expect the implications of this possible limitation to be limited. First, individual investors constitute an important group in the financial marketplace and their decision-making behavior is likely to have an impact on the stock market as a whole (De Bondt, 1998). The latter argument becomes even more pronounced taking into consideration that even a small country as The Netherlands already accommodates 2,300,000 individual investors that invest directly and indirectly in the stock market (VEB, 2002). Second, it seems safe to assume, that the stock price

expectations of most large institutional investors and investment banks - who are well-connected to the most important stock analysts - are predominantly of the correct magnitude. This implies that most market disturbances would be caused by individual investors and that the large institutional investors merely form a stable force in the market that has to react to or is affected by disturbances caused by these individual investors. This again makes it highly interesting and very relevant to investigate the effect of different types of individual investors on stock market dynamics.

Third, the empirical benchmark used in this study was the overall Dutch stock market, rather than specific shares of a company that are traded on this market. Yet, one may expect differences between the time series behavior of specific companies and that of the aggregate market. It seems a realistic assumption, that certain shares are traded more by investors with a low confidence or who are highly socially oriented and other shares are traded more by high confidence, experienced investors who are only interested in certain fundamental characteristics of the company and who also make their decisions in a more individual way. Future research may therefore also want to compare the results of the SSE to the price and returns time series of several individual publicly traded companies.

### **6.3 Final Remarks**

All in all, this thesis has empirically proved that to many investors, investing constitutes much more than simply weighting the risks and expected returns of the various investment assets at their disposal. Rather, the investors that participated in our investment survey indicated that for them, investing is also a nice free-time activity. Moreover, these investors valued the opportunities to analyze problems and learn, but most importantly, they valued the opportunity to satisfy their more socially oriented needs by investing.

Moreover, investors that gave a greater importance to these social needs or that had lower levels of investment-related knowledge and experience performed more normative and informational conformity behavior.

Finally, using multi-agent social simulation models, this thesis has showed that markets with a greater proportion of socially oriented investors display more volatility as measured by e.g., the standard deviations of returns and can therefore be assumed to be relatively fertile grounds for aberrant stock market phenomena such as crashes, bubbles and hypes.