

Behavioral Heuristics and Financial Modelling

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All financial models are based on some simplifying assumptions about the behavior of market participants. One of such underlying behavioral assumptions is that the investors make decisions about buying or selling securities on the basis of their expectations about the future. An important element of forming these expectations is the agents' beliefs about the likelihood of particular events or, stated formally, the subjective probabilities that the investors assign to different possible states of the world. It is observed that, when determining the subjective probabilities, people often make systematic mental mistakes by adopting some intuitive simplifying rules of thumb, or heuristics, for information processing rather than strict logic. As a result, the subjective probabilities may deviate substantially from the objective probabilities that are based on formal rules or analysis. This deviation in probabilities can lead to biased expectations that, in turn, can cause irrational investment decisions. Gilovich et al. [1] provide an excellent overview of the behavioral heuristics.

Several recently developed financial models and estimation techniques based on the (explicit or implicit) use of the behavioral heuristics demonstrate how taking into account the investors' irrationality may help solve some problems documented in the finance literature. For example, it has been shown that allowing for the fact that the investors do not weight equally all possible states of the world and, believing that the most recent values may be the most relevant for next period distribution, assign to different scenarios probability weights declining through the past enables to more precisely estimate the portfolio Value-at-Risk (VaR), i.e., the measure of the risk of loss on a specific portfolio of financial assets. This is the weighted historical simulation approach to estimating the portfolio VaR that is based on the availability heuristic, i.e., the observation that the investors often assess the probability of an event by the ease with which information is recalled from memory, which was first reported by Tversky and Kahneman [2]. Different versions of the well-known moving-window estimation technique, which consists in estimating the model parameters over moving periods of time, may also be viewed as an example of the empirical implementation of the availability heuristic. Another example of allowing for psychological biases in forming the agents' beliefs is the papers by Abel [3] and Semenov [4] who showed that pessimism, doubt, and the availability heuristic can help better explain the large risk premium that the market participants require for holding risky assets. Loss aversion refers to investors' tendency to prefer avoiding losses to acquiring gains of the same size. The loss aversion theory may be regarded as displaying the decision framing heuristic in which people behave based on the way that the decision problem is presented. There are many other examples of the implementation of heuristics in financial modelling.

One common critique of the heuristics tradition is to argue that people are not that dumb and that if they systematically made biased judgments critical for survival and reproduction, then they would not survive long. Another critique is that the reported heuristics are just the product of the experiments in which participants were required to answer ambiguous or misleading questions. Although there is some merit to these arguments, empirical evidence, however, demonstrates that the behavioral heuristics are a very powerful problem solving tools in a wide range of financial disciplines.

Despite the observed ability of the behavioral heuristics to

significantly improve the empirical performance of many existing financial models, there are still some problems with the heuristics research program. One problem is that many heuristics are difficult to formalize and hence to incorporate into financial models. Another problem is that, even when heuristics are accurately formalized, it may still be difficult to quantify the influence of psychological biases reflected by the model parameters. For instance, when using the moving-window estimation techniques, one needs to specify the length of the estimation window or, in other words, to determine how many past observations an investor considers when making his investment decision. In the case of the weighted historical simulation approach, the investor weights differently past observations, but how to determine these weights is also still an open question. The investigation of how to incorporate and quantify the influence of different behavioral heuristics in financial models is a promising direction of future research that may have significant practical implications for investment management.

References

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