Chapter 14
The Role of Big Data Research Methodologies in Describing Investor Risk Attitudes and Predicting Stock Market Performance:
Deep Learning and Risk Tolerance

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ABSTRACT

The purpose of this chapter is to compare the performance of a deep learning modeling technique to predict market performance compared to conventional prediction modeling techniques. A secondary purpose of this chapter is to describe the degree to which financial risk tolerance can be used to predict future stock market performance. Specifically, the models used in this chapter were developed to test whether aggregate investor financial risk tolerance is of value in establishing risk and return market expectations. Findings from this chapter's examples also provide insights into whether financial risk tolerance is more appropriately conceptualized as a predictor of market returns or as an outcome of returns.

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INTRODUCTION

Portfolio theory assumes that in the aggregate, investors evaluate the return and risk characteristics of securities and the markets, form market expectations, select assets, and build portfolios that align with their expectations and willingness to take a risk (Merkle & Weber, 2014). In this regard, Merkle and Weber (2014) noted that investor beliefs are not useful predictors of short-term trading behavior, but over extended periods, changes in portfolio composition are systematically related to investor return and risk expectations. They concluded that risk-taking increases as return expectations increase and vice-a-versa.

From a practical standpoint, the conclusion of Merkle et al. (2014) helps explain a relatively common household-level risk-taking bias. Rather than hold stable portfolios, investors tend to switch between and among assets in a way that matches ever-changing expectations. Stated another way, portfolio risk appears to change in accordance with investor risk and return expectations. This implies that the willingness of investors to take financial risk might also exhibit a degree of elasticity.

This brings to mind the following question, which is the focus of this chapter: Does the collective willingness of investors to take a financial risk—as an indicator of market sentiment—help explain future market returns? The underlying argument supporting why this might be the case was presented by Keynes (1936). Keynes argued that 'animal spirits' help explain why even when individual security values vary, market averages move in general unison, particularly in times of economic stress. In essence, animal spirits is a term used to describe investor confidence, which is thought to be driven by risk and return expectations. There is an argument to be made that the inverse could also be true. It is possible that rather than being explained by the collective risk attitude of investors, financial risk tolerance—the willingness of investors to invest in assets where future returns are unknown and potentially negative (Nobre & Grable, 2015)—varies with market returns.

The purpose of this chapter is to describe, in non-technical language, how an Artificial Intelligence Deep Learning big data research methodological approach can be used to predict future stock market performance using investor risk tolerance as an indicator of market expectations (i.e., sentiment). The chapter focuses on comparing the prediction reliability of a traditional regression model against a deep learning estimation model. The tests described in this chapter are intended to provide readers with information about whether aggregate investor financial risk tolerance is of value in explaining future market performance or whether financial risk tolerance is more appropriately used as an outcome measure associated with market conditions. This chapter advances the risk-tolerance, investment management, and personal finance methodological literature by showing how a deep learning prediction model can provide a much more robust indication of future market returns. The deep learning prediction model that is described in this chapter provides researchers, educators, policymakers, and financial services professionals insights into the kinds of variables that are important when predicting stock prices.

BACKGROUND

Investor expectations regarding future market gains and losses drive investment flows. Investments in the markets can thus be seen as being influenced by the degree to which investors proactively participate in the market. The more participation, as evidenced by consistent buying of securities, the higher the value of a given market index. The opposite is true as well. As investor participation in a market wanes, so does the value of the market index.