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Garbage In, Garbage Out:
Model Uncertainty in Wealth Simulations

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Wealth managers commonly employ wealth simulators to illustrate the risk-return tradeoff, helping investors visualize projected returns with a given amount of risk. However, clients demanding these high-priced, specially-curated services may wish to reject static modeling assumptions that could misrepresent their terminal wealth. Using a hypothetical example of investing for retirement 30 years from now, we simulated the sensitivity of terminal wealth distributions to various modeling assumptions. Considering different capital market assumptions and levels of risk tolerance, we analyzed variance in terminal wealth given different investor goals and strategies. Our results reflect the strong influence but unreliable predictive power of model assumptions. Because portfolio reallocation decisions largely rely on continually updating capital market assumptions and changing levels of risk tolerance, our models demonstrated higher terminal wealth on average when investors frequently refreshed inputs and maintained their convictions in turbulent markets. Furthermore, assuming a randomly changing real interest rate better reflects portfolio uncertainty compared to a constant real interest rate that grossly misrepresents true market conditions. Even when accounting for this uncertainty, the empirical record does not facilitate a sufficient estimate of parameters such as the rate of mean reversion of interest rates to accurately predict terminal wealth. Ultimately, wealth simulators may easily fall victim to the "garbage in, garbage out" conundrum, leading to potentially misinformed investing decisions. Our paper instead encourages wealth managers to provide clients with simple, transparent, and practical modeling scenarios when they simulate returns in uncertain capital markets, as investing decisions made today bear large impact on future results.