On Market Efficiency, Optimal Distributional Trading Gain, and Utility Maximization

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The aim of this thesis is multifold. First, using results from the optimal distributional trading gain problem, we determine a utility-maximizing portfolio that optimizes the benefit an agent may receive by trading the difference between his perceived future distribution of a security price and the risk-neutral density provided by the corresponding option market. Moreover, we show how one can fit the risk-neutral density directly from option market data using the SVI parameterization. We use integer programming with kernel search heuristics to statically replicate the optimal payoff. Second, we show that the United States equity market was inefficient during the weeks following the initiation of the COVID-19 pandemic. This is demonstrated by showing that utility-maximizing agents over the period ranging from mid-February to late March 2020 could generate statistically significant profits by utilizing historical price and virus-related data to forecast future equity ETF returns.

Finally, we focus on the passport option. We present a version of insurance of a traded account that symmetrically treats both of its underlying assets. In our approach, we impose a natural symmetric limit in which the agent can fully invest in any underlying asset up to his current wealth and without shorting any asset. The optimal solution leads to a well-known stop-loss strategy when all wealth is invested in only one asset.