

It can be shown that linear transformations of logarithm are the only utility functions whose optimal portfolios do not depend on numeraire. This thesis focuses on maximization of expected logarithmic utility of a general portfolio. We show that, given our market opinion represented by a state price density, the optimal expected payoff is the Kullback-Leibler divergence of the market state price density and the numeraire state price density. In an incomplete market however, the market density may not be replicable and the best we can do is to find the portfolio with the smallest K-L divergence to the market density. This problem does not have a general analytical solution and may not be numerically feasible for large portfolios but can be approximated, in two different ways, by a mean variance problem that do have such solutions. We demonstrate this approach on simple portfolios of 2 assets and one or two maximal contracts, that are just shifted European options and finally we point out some option strategies that can be used to partially hedge the portfolio against certain market scenarios.