Project Proposal

Research Objectives: To determine the extent to which different statistical modelling frameworks, with focus on stochastic and regime switching volatility models, impact the performance of an optimal portfolio allocation strategy for stocks of S&P 500.

Assessment on Current Development: Financial portfolio allocation is an important challenge faced by investors. Markowitz (1952) laid the grounds for modern portfolio theory (MPT) showing that an asset's risk contribution to a portfolio is not only dependent on its own risk but also on its correlation with other assets in the portfolio. Despite the simplifying assumptions with regards to risk modelling (eg. Gaussian distribution of errors) and metrics (eg. variance), the mean-variance framework highlights important trade-off between risk and return, the importance of risk correlation and the need for appropriate statistical modelling without which optimal strategies fail to perform well out-of-sample. Indeed, DeMiguel et al. (2007) evaluates portfolio allocation strategies based on different asset-allocation models showing that gains from optimal diversification are more than outweighed by estimation error. We seek to extend DeMiguel et al. (2007) by considering additional statistical models of expected return and covariance matrix while fixing the allocation strategy.

Proposed Approach: We will focus exclusively on portfolio allocation for listed stocks of the S&P 500. We will estimate the expected return and standard deviation of each stock independently using 3 different statistical models, namely: ARMA, GARCH and Markov regime switching GARCH (MSGARCH). The T periods of 1-month closing prices will be split in two. The in-sample part will be used to estimate the parameters of the model. We will determine the optimal portfolio allocation by maximizing the Sharpe ratio using a one-step ahead forecast. We will use rolling-window to iteratively compute one-step ahead returns. We will compare our different allocation strategies at the end of the out-of-sample period using different financial metrics of risk and return.

Role of team members: Data collection, Statistical modelling (Peng, Wihal)
Portfolio allocation code (Augusto, Chan, Yong)
Portfolio comparison, report writing and presentation (All)

Outcomes: Comparison of the performance of different portfolio allocation strategies based on different statistical modelling strategies.

Preferred presentation mode: Live Zoom