Title of the project
Optimal hedging portfolio for non-tradeable consumer commodities

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Introduction: Non-tradable commodities are typically non-fungible and have small market sizes, which limits hedging options. Producers that look to hedge cannot do so with current market contracts [1]. We present a framework to robustly identify highly correlated futures contracts traded on open exchanges to create synthetic hedging portfolios to mitigate financial exposure to the underlying commodity.

Motivation: Hedging is a strategy used to mitigate financial risk, and for non-tradable commodities, this can only be accomplished through private agreements known as Over-The-Counter (OTC) contracts [2]. In contrast, public exchanges facilitate trading among many participants and offer advantages such as cross-margining and reduced counterparty risk. However, OTC contracts often lack these features, making them less secure and more capital-intensive [3].

Our work focuses on developing a framework to construct synthetic futures hedging portfolios. Market participants, such as asset managers and suppliers, often use futures contracts to protect against adverse price movements [4]. However, these contracts can be inadequate for certain commodities, especially when a suitable futures contract does not exist. Additionally, if the basis value—the difference between the spot price and the futures price—is not properly managed, the hedging strategy may become ineffective [5].

Our study will specifically focus on ice cream, as it is likely to have strong correlations with tradable contracts such as CME's Milk and Singapore Exchange's Whole Milk Powder. We will also explore potential correlations with Cocoa, Coffee, Sugar No. 11, and Soybean Oil.

Datasets:
- List of tradable commodities: https://en.wikipedia.org/wiki/List_of_traded_commodities
- TradingEconomics daily HLOC Futures data: https://tradingeconomics.com/commodities
- Per capital consumption of Ice Cream
- USDA Ice Cream Production Volumes
- Federal Reserve Economics Data, Ice Cream Producer Price Indices

Plan of Work: We will use correlation analysis to build a correlation matrix between Ice Cream and all other tradable commodities. We will also take into account stationarity of the underlying distributions [6] by calculating using Dickey-Fuller and if the Null hypothesis is rejected then we will look into normalizing either through interest rate mechanisms or log returns [7]. We will evaluate our model by backtesting it and noting the slippage compared with naive models. The naive models will consist of either hedging portfolio consisting of naive correlation analysis using linear regression type methods or using no hedging at all. This will be directly in-line with material from the course including correlation analysis, time series analysis, network science, unsupervised clustering, and regression type methods. Plenty of coding will be needed including Jupter notebooks for data cleaning, data normalization, correlation analysis, clustering analysis, portfolio analysis [8-9], and backtesting.

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3. Ooi, Yao Hua, et al. *Building a Better Commodities Portfolio*, www.aqr.com/-/media/AQR/Documents/Whitepapers/Building-a-Better-Commodities-Portfolio-2022_sec.pdf?sc_lang=en. Accessed 8 Oct. 2024.
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