

Trading Exchange Rate Funds

Assignment

April 11, 2021



Question 1

(30 POINTS)

Tracking Error is a key component in evaluating the performance of an exchange traded fund. A lower tracking error is one of the key selling points for any ETF.

An estimate of daily tracking error (TE_d) can be based on the following formula:

$$TE_d = \sqrt{\frac{\sum_{t=1}^N (R_{b,t} - R_{x,t})^2}{N - 1}}$$

where $R_{b,t}$ denotes the daily return of the benchmark at time t , $R_{x,t}$ denotes the daily return of the fund x at time t and N denotes the total number of trading days considered. TE_d is usually scaled by a factor of $\sqrt{252}$ to obtain an estimate of annualized tracking error (TE).

The following files have been provided along with this assignment :

- **NIFTY-TotalReturnsIndex.csv** : Nifty Total Returns Index (2016 and 2017)
- **Reliance Nifty ETF.xlsx** : Historical NAV data for Reliance Nifty ETF (2016 and 2017)
- **Kotak Nifty ETF.xlsx** : Historical NAV data for Kotak Nifty ETF (2016 and 2017)
- **HDFC Nifty ETF.xlsx** : Historical NAV data for HDFC Nifty ETF (2016 and 2017)
- **UTI Nifty ETF.xlsx** : Historical NAV data for UTI Nifty ETF (2016 and 2017)

Compute the annualized tracking error for Reliance, Kotak, HDFC and UTI ETFs in 2016 and 2017 separately.

DELIVERABLE

- R code or Python code used for the analysis.
- Arrange the four funds (Reliance, Kotak, HDFC and UTI) in the increasing order of TE in 2016 and 2017.
- Out of the four funds, which ones have shown an increase in Annualized TE from 2016 to 2017 ?
- Out of the four funds, which ones have shown a decrease in Annualized TE from 2016 to 2017 ?
- Put in comments towards the end of your code that shows the results of the above questions

Question 2

(40 POINTS)

This question deals with the computation of returns and sharpe ratio for a simple asset allocation strategy. The following are the details of the strategy

- Initial Capital : 100 Million INR
- Portfolio Allocation Start Date : January 1, 2016
- Portfolio Redemption Date : December 30, 2017
- Capital invested among Nifty BeES, Junior BeES and Gold BeES in the ratio of 5:2:3 on the Portfolio Allocation Start Date. The portfolio is rebalanced ONLY at the end of every quarter to bring the weights back to the initial allocation, i.e. 5:2:3. Note that the rebalancing should be done on the last day of each quarter and hence the close prices on the last working day of each quarter should be used for rebalancing portfolio.

Compute the sharpe ratio of your asset allocation strategy for 2016 and 2017. Assume zero transaction costs for quarterly rebalancing. Assume you can rebalance based on end of the day NAV.

The Historical NAV files for Nifty BeES, Junior BeES and Gold BeES are provided with the assignment. The following are the details :

- **Nifty ETF.xlsx** : Historical NAV data for Nifty ETF
- **Junior ETF.xlsx** : Historical NAV data for Junior ETF
- **Gold ETF.xlsx** : Historical NAV data for Gold ETF

DELIVERABLE

- **R** code or **Python** code used for the analysis.
- Annualized returns for the strategy in 2016 and 2017
- Sharpe Ratio for the strategy in 2016 and 2017
- Put in comments towards the end of your code that shows the results of the above questions

Question 3

(30 POINTS)

Assume you have an initial capital of 100 Million INR and the start date of your investment in January 1, 2016. Select any 10 stocks trading on National Stock Exchange as of January 1, 2016 and allocate equally amongst all the 10 stocks($1/10^{th}$ of your initial capital in each stock). Post the allocation on the start date, there is no rebalancing done until the end 2017. You redeem your portfolio at the end of 2017

Compute the daily portfolio returns from the start date till the redemption date. Do a linear regression of your portfolio returns on Nifty ETF daily returns and Junior ETF daily returns.

$$R_{P,t} = \beta_0 + \beta_1 \cdot R_{N,t} + \beta_2 \cdot R_{J,t} + \epsilon_t$$

where $R_{P,t}$ denotes the daily return of your portfolio at time t , $R_{N,t}$ denotes the daily return of Nifty ETF at time t and $R_{J,t}$ denotes the daily return of Junior ETF at time t .

The Historical NAV files for Nifty BeES, Junior BeES are provided with the assignment.

- **Nifty ETF.xlsx** : Historical NAV data for Nifty ETF
- **Junior ETF.xlsx** : Historical NAV data for Junior ETF

DELIVERABLE

- **R** code or **Python** code used for the analysis.
- Compute the coefficients β_1 and β_2
- Compute of Portfolio return variation that is not explained by Nifty ETF and Junior ETF return variation
- Put in comments towards the end of your code that lists out β_1 , β_2 and unexplained portfolio return variation.

Submission Due Date

The due date for submitting the assignment is **May 12, 2021**. In case the submission is after **May 12, 2021**, there will be no feedback/ evaluation for the same.