



# COMMERCIAL BANKING, CORP

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REQUEST FOR PROPOSAL

RFP #: VM – S1.H2

TITLE: VOLATILITY MODELING & PORTFOLIO OPTIMIZATION

CLOSING DATE AND TIME: **FEBRUARY 22, 2019 @ 5:00 PM**

# Volatility Modeling & Portfolio Optimization: VM – S1.H2

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## Background and Purpose

By responding to this Request for Proposal (RFP), the Proposer agrees that s/he has read and understood all documents within this RFP package.

## Submission Details

Responders to this RFP should supply:

- A business report up to 5 pages, including any supporting plots and tables.
- An appendix with code.

The report should address **all points described in the “Objective” section** below.

The report should be returned in the following way:

- Electronic (mailto: [Aric\\_LaBarr@ncsu.edu](mailto:Aric_LaBarr@ncsu.edu) and [sjsimmo2@ncsu.edu](mailto:sjsimmo2@ncsu.edu); Subject Line: Volatility Modeling & Portfolio Optimization)

## Objective

The Commercial Banking Corporation (hereafter the “Bank”), acting by and through its department of *Portfolio Pricing* is seeking proposals for banking services. The scope of services includes the following:

Part 1:

- Collecting of **daily** stock prices and **daily** returns for the 30 stocks in the Dow Jones Industrial Average (DJIA).
- Ranking these 30 stock components of the DJIA by most significant to be predicted with ARCH/GARCH modeling.
  - The Bank’s analysts recommend using the Lagrange Multiplier Lag 1 test p-values to make this ranking; the Bank is open to other proposals as long as they are clearly stated and supported.
- Creation of a series of models to predict the volatility from the top five most significant stock components of the DJIA to be predicted with ARCH/GARCH modeling.
  - The Bank’s analysts recommend using the top 5 stock components ranked by the LM test previously calculated.
  - The Bank’s analysts recommend picking one of the following models: GARCH(1,1)-Normal, t-GARCH(1,1), QGARCH(1,1)-Normal, QGARCH(1,1)-t for each stock; the Bank is open to other proposals as long as they are clearly stated and supported.
  - The Bank’s analysts recommend picking the best model based off of lowest AIC value; the Bank is open to other proposals as long as they are clearly stated and supported.
- Forecast of the next 5 days of volatility for each of the five models mentioned above.
- Rank these five stocks by order of most likely to be bothered by a shock to the market today.
- Rank these five stocks by order of longest effect a shock lasts; compare this to the previous ranking and interpret.

Part 2:

- Using the forecasted 5 days of volatility and historical median return, optimize the daily stock strategy for the next 5 days to minimize the risk for a return of at least 0.05% each day (assume  $\sum p_i = 1$ ). For this you can assume no transaction costs to buy or sell stocks, so you just need to recommend how many of each stock to hold for the next 5 business days. You will only be optimizing the portfolio once for the whole 5 days, **not** each day. Use the median forecasted volatility of each stock for your optimization, however, the rest of the covariance matrix (off-diagonals) should be calculated as discussed in Dr. LaBarr's class.
- Create the efficient frontier for these stocks (using the median forecasted volatility and median historical returns) for minimum returns.

## Data Provided

No data is provided to the consulting team for this analysis. The team itself through any means it desires must gather all data. The dates for the data you should pull are February 1, 2017 to February 8, 2019. You will be forecasting volatility for the dates of February 11 through 15, 2019.