Bonus Task Energy Market Optimisation

Group 13

10^{th} October 2021

1 Vector Auto-Regression

1.1 Approach

Consider the for-ex trading, where we do not know the future prices at a given time t. We ideally want to know the best price at the next time $t+1$, often it is challenging to get the result before a given time $t+1$. Since our energy market price is updated every 30 minutes, by using Vector Auto-Regression, we are able to predict the price before $t+1$ hits. Thus, Vector Auto-Regression is our chosen model. The equation for Vector Auto-Regression with 2 predictors and 195 lags are:

$$\mathrm{Y}_{1,t} = \alpha_1 + \beta_{1,1} \times Y_{1,t-1} + ... + \beta_{1,390} \times Y_{2,t-195} + \epsilon_{1,t}$$
$$\mathrm{Y}_{2,t} = \alpha_1 + \beta_{2,1} \times Y_{1,t-1} + ... + \beta_{2,390} \times Y_{2,t-195} + \epsilon_{2,t}$$

where α is the intercept, $Y_{1,t}$ is the matrix of predicted price and $Y_{2,t}$ is the matrix of predicted Demand. Here, we are taking the predicted price for the bonus task. For the prediction results, we use the training period to obtain β and test it on 1^{st} July 2021 until 15^{th} of August 2021. To calculate the revenue, we simulate the predicted price on the mandatory task algorithm.

1.1.1 Challenges

Some challenges faced when using the VAR model is that we can only predict prices based on a predictable pattern but it won't perform well when it encounters significant spikes seen in the data caused by Bushfire or Electricity Grid exploding. Those unpredictable factors may cause the model to perform less than expected. With that said, an improvement that could be made is that we could add risk management to the prediction to know what is the margin that the user will incur loss or profit. At least, with risk management unpredictable factors can be accounted for beforehand.