We have learned several quantitative techniques in this course, all of which can certainly be used to drive business decisions by providing solid data analysis results. The skill that we need to craft over time, in my opinion, is to analyze the problem we’re trying to solve, then come up with the right techniques and modeling. This course has taught me not only the theories and techniques but also the use cases where these can be applied.

One example of this is using sampling distribution to answer the effectiveness of a sleeping pill. When we want to test whether a new pill is working, testing the entire population is not practical or possible. The sampling distribution is one way to calculate the population parameters. In this case, MIT found out 40 young male volunteers to use this medicine then go to a darkroom in the middle of the day. They recorded the time of them falling into sleep. The company has historical data that people will fall asleep without melatonin on an average of 15 minutes. People who took the pill fall asleep in about 6 minutes, which is the sample mean. Then the probability of 6 mins can be calculated to be the mean value of the population. According to the Central Limit Theorem, one can calculate that the probability P(z < -5.70) is almost 0. This means that it’s next to impossible that the sample mean could be below 6 mins. Provided that people who have taken the pill will fall asleep in much less than 15 minutes, one can draw the analytical conclusion that the pill is effective.

Another example would be using forecastings we’ve learned in chapter 3. In this case, we are going to forecast the sales performance of a cold medicine. There is historical data provided. And then use a simple exponential smoothing forecast, simple linear regression, and seasonal regression model to solve it. Since the first two models provided two wide intervals of (1,750, 7,989) and (480.5, 8,147.9), the results are unusable. The seasonal regression model, on the other hand, provided the most accurate value (4,285.8, 6,349.2) since a cyclical trend in the monthly data was detected. The F-test value is 0.000, meaning that the model is statistically useful for predicting. The coefficient of determination is 0.983, meaning that 98.3% of the sample variation is explained by the seasonal regression model. In my opinion, this is a great example of how a business problem can be solved by skilled analytics.

Reference:   
1. Dollins, A. B., Zhdanova, I. V., Wurtman, R. J., Lynch, H. J., Deng, M. H. (March 1, 1994). *Effect of inducing nocturnal serum melatonin concentrations in daytime on sleep, mood, body temperature, and performance*. Retrieved from https://www.researchgate.net/publication/15071141\_Effect\_of\_Inducing\_nocturnal\_serum\_melatonin\_concentrations\_in\_daytime\_on\_sleep\_mood\_body\_temperature\_and\_performance.

2. Mcclave, J., Benson, G., Sincich, T. (2016). *Statistics for Business and Economics*. Chapter 14.

I have always wanted to be a data analyst in financial analytics or business analytics. I find myself more educated on providing data evidence in the areas of the asset allocation of portfolios, or providing sales data analytics. One problem that had troubled me before, was that even when I had a clear problem to solve, it’s hard to utilize the data to come up with theories to support my proposal. Learning more into the theories and the programming usage of those theories, I can now go out of the excel word and do some hard-core data analysis.

For example, in one of the homework assignments, I really felt I learned a lot by first doing some math on paper, then come up with the model in R, to solve the problem of Boston hospital’s pandemic routing strategy. Without this course, I’ll probably just do some excel and solve things manually, which is error-prone. After studying this course, with the theories in mind and R programming ability grasped, I find solving that problem programmatically to be both efficient and fun. In Chapter 6, we’ve learned MPT and option pricing. Both could help with portfolio management. MPT would help with asset allocation in a portfolio that calculates for the lowest risk. Option pricing is a formula that helps to figure out the fair value of options. Compared with MPT, option pricing models focus more on maximum profit.

Another example that I’m thinking is from some problems I solved in a previous job. I was a sales analyst at a bank, where we need to analyze sales data for the bank’s private banking customers, then use that to rank the salesperson’s performance. I was responsible for gathering sales performance reports from all sub-branches in the city and provided a daily city sales report for the management team in a timely manner. My teammate and I spent a few days tweaking the Excel spreadsheet with 'sumproduct' function and database theory used, to speed up the reporting system. But with professional R skills, I think the efficiency can be solved by loading in the raw CSV data and performing analysis. This would have saved us a lot of time, and the data is also a lot easier to verify because we will never have to worry about a wrong manual entry into a spreadsheet anymore. In the future, I could see that all the statistics knowledge and R skill that I've learned in this course would help me to find and capable of a data analytics job.