Dave Smith Capstone Project Proposals

Project #1

I spent the break week meeting with different people at Adobe to see if there were areas in the CFO’s organization (so Finance) that they needed help understanding their data to help with business insights. I had four meetings and am in the process of having others with groups in different departments. Here are some very preliminary ideas I am exploring

* Forecasting bookings from potential customer data (and historical bookings information about existing customer data). The Financial Planning and Analysis group has had a difficult time understanding how to forecast bookings for some of their businesses and has not done an in-depth analysis on better forecasting techniques
* Forecasting usage-based bookings for our customers. (Smaller part of the business)
* Modeling customer adoption based on all of Adobe’s lifecycle data. Adobe built an end to end database of all parts of the customer experience (from first time someone lands on their web page to every keystroke and button click on their products). I have been introduced to the team that owns this process and does analysis but have not been able to finalize the time as it was Adobe’s quarter end. I am still working on this.
* I am going to meet with the marketing analytics team that is working on how to best spend Adobe’s own marketing budget to generate the most revenue. (Big team here and I do not have a close relationship with this group.)
* I am also speaking with a few other members of specific business units to see if there are areas I can help with the work on my capstone.

I know there is not really a solid idea here yet, but there is a great opportunity to do some great work and transition my position at Adobe to something that has a bigger impact and can use the tools I am learning in this class. I would really prefer to do something non-financial for my capstone, but if this does not work, I will have to resort to one of my other ideas below.

Project #2 Time series analysis for interest rate hedging

The first three principal components of the US Treasury yield curve explain about 95% of the variation in the yield curve over time. The first principal component is usually referred to as a parallel shift (even though the eigenvectors are not all the same value) which increases or decreases the entire yield curve. The second principal component represents a steepening or flattening of the yield curve and the third principal component represents a change in curvature with the middle of the yield curve moving in a different direction than the short and long end of the curve.

I would like to do a time series analysis on the changes in the treasury yield curve based on this principal component analysis looking at how the US treasury yield curve evolves as a function of current and past shocks to the US treasury curve, changes in foreign exchange rates and bond yields of other large countries. I believe using vector autoregressions and impulse response functions could lead to an interesting analysis of what is noise and what represents a trended change in yield curves.

This is an important topic for corporates that need to issue long-term debt and are uncertain about the timing of hedging their debt issuance. For example, suppose a hypothetical local tech company has $3.25B in debt maturing over the next 18 months and needs to refinance this debt. The company can hedge the expected future issuance at a cost, but the cost of hedging swings wildly over time. Is there some signal in the changes to foreign exchange rates, US yields or foreign yields that would indicate the variance of treasury yields is increasing or decreasing that help make the decision of when to hedge or to remain exposed to chances in the yield curve.

Project #3 Bayesian Approach to Asset Price Distributions given Option Prices

Financial asset returns are usually assumed to have Gaussian distributions (therefore lognormal asset price distributions.) This is done mostly for convenience of deriving closed form solutions for derivative prices. In practice we see derivatives being priced at very different variances for the Gaussian distribution. I would like to explore this from a Bayesian approach.

For example, suppose we have an asset with an a-priori return distribution that is Normal with a mean of x, and a variance of v. We later see a derivative being traded that has implies a variance of v’. Can we derive the posterior distribution for this asset, given the new derivatives being traded? How would this posterior distribution evolve over time as new derivatives are traded on a daily basis?