Improvements and Modifications

Moving forward, there are many modifications that can be made to the process and/or model which may yield improved results. The foremost thing is to collect more time-series data. Currently, the model has approximately 31 assets which have historical data a early as 1970. This is quite a small amount and the purchasing of older time series data for assets in the S&P500/NYSE should yield more conclusive results. It will also allow for more close analysis to be done in regards to what assets are invested in and can allow for industry constraints to be included, mandating a minimum weight invested in companies belonging to particular industries. The older data is important because there have been no large inflation shocks in the last 20 years and the 1970’s had large inflation shocks during 1973 and 1979 corresponding to an oil crisis and the Iranian revolution respectively.

Another way to gauge the effectiveness of the model would be to apply it to different countries and their corresponding stock exchanges. Countries whose inflation rates have been volatile or suffered large shocks in recent years would be ideal for testing such as Turkey.

The addition of older time series data(ideally dating to before 1950) will allow the calculation of regime-dependent inflation betas. The Markov tree would then be constructed not for the expected inflation rate, but for the expected asset return. The terminal values would be the nominal expected return plus the product of thex inflation-beta associated with that node and the inflation rate for that node(which has to be calculated recursively). This would yield a much longer computation as it has to be computed for each asset but it should yield better results overall.

The current model for inflation rates is an AR(1) process that only uses the previous inflation rate as data. The addition of a macroeconomic variable, as another autoregressive term, such as the monthly unemployment rate may make the model more accurate and better in forecasting inflation. The unemployment rate in particular holds information on inflation targeting by the Federal Reserve as the Phillips curve shows the connection between the two. It further allows for more complex regimes to be defined such as stagflation, where higher levels of both unemployment and inflation are experience as opposed to the usual inverse relationship between the two.

The transition probabilities currently being used are constant. A significant improvement would be the use of duration-dependent transition probabilities, meaning the transition probabilities of switching to another regime change over time. This makes sense because if you have been in a regime for 10 years vs 2 years, you are more likely to exit the regime and enter another. Therefore the transition probability of staying in the same regime will decrease over time.

An important addition to the model will be to add a method for the user to specify their tolerance to inflation risk. One way to do this would be to add a coefficient that range from 0 to 2 in front of the term that perturbs the nominal return of an asset. This would change the product of an asset’s inflation beta and the expected inflation rate by a factor and consequently change the assets’ expected return. A larger coefficient would lead to a larger allocation in assets with higher

inflation betas and the contrary for a smaller coefficient.

Modifying or completely changing the objective function is another consideration. In its current form, the covariance of the asset is expressed by using the inflation Betas as an intermediate term. Separating this to have a term representing the assets covariance without using inflation beta would be useful because it allows for a distinction between the two risks and variances. The program currently computes CAPM beta as well and including this as a second factor in the model is another potential extension of the model.