**VAR Projection for Factor Time Series**

FACTOR SELECTION

1. Select factors that you think might be leading indicators of the factors currently used to explain fund returns. Maybe use the CMAs as well – the basic idea is that these should be used to predict the factors over time.

STATIONARITY AND PREP

1. Start with time series plots of all factors and summary statistics (counts, mean, median, min, max, quartiles, std dev).
2. Next, IQR box plots so that we can see outliers and other features of the time series.
3. Since VAR models describe the dynamic interrelationship among stationary variables, run unit root tests to determine whether the series are stationary[[1]](#footnote-1).
   1. First, run correlations among variables.
   2. Next, maybe the Augmented Dicky Fuller (ADF) test. The null in an ADF test is that a unit root is present. The alternate is that the time series is stationary or at least, trend stationary.
      1. Note that AIC, BIC, or HQIC may also be used to determine the number of lags to use when running the ADF test.
4. If we find the time series has a unit root, we can next test for cointegration, since correlations can be unstable. We can use the Engle-Granger test for this. There are other alternatives as well, e.g., Johansen test or Phillips-Ouliaris.
5. To confirm the existence of cointegration, we can also run an OLS on the variables and visualize the residuals plot. If the residuals are stationary, the series are cointegrated.
   1. To be sure, we can also perform the Durbin-Watson (or the more general, Breusch-Godfrey) test.
   2. And we can run a Jarque-Bera or Kolmogorov-Smirnov test for normality.
6. We are now ready to run the VAR.

RUNNING THE VAR

1. Start with an impulse response analysis and visualize the impact of changes in one variable on the others at different horizons.
2. Perform a Forecast Error Variance Decomposition (FEVD)[[2]](#footnote-2) wherein we can measure the percent of errors attributable to own shocks.
3. Run the predictions.
4. Check against actuals using RMSE or MSE.

ANIKET COMMENTS

* Autocorrelation was not an issue.
* Correlations are low.
* Other macro variables: interest rates, inflation, payroll statistics, GDP, employment, VIX, term spread, etc.

1. Note: if non-stationary, we can perform first differences and go through the same process. [↑](#footnote-ref-1)
2. Brooks, C. (2019). Introductory econometrics for finance. Cambridge university press. [↑](#footnote-ref-2)