# Pseudo-Algorithm for Causal MK model approach:

The general idea is to model the analytic signal directly, so that our state in a state space model is tracking the analytic signal while the observation is tracking only the real part of the signal with some observation noise. The key insight brought forth by Matsuda and Komaki (2017) is that we can rotate the analytic signal on every observation by an amount that reflects the sampling rate and the frequency being tracked. We can track multiple rhythms (Frequencies) and in this way build our observation from the state. The question is how do we run this in real time? If we have stationary parameters we can use the Kalman filter to predict and filter the state appropriately. Rather than assume stationary parameters my current approach is to use windowed data to estimate parameters and then run the Kalman filter while we get more data and subsequently we can update the parameters again. This iterative process helps account for potentially moving frequencies.

1. Before starting the algorithm use an initial data segment to initialize parameters using a state-space AR model fit. Assume we are only modeling 1 frequency for now.
2. Warm start the EM algorithm with these initialized parameters for the scaling parameters and the variance of the analytic signal.
3. Use estimated parameters for incoming data