 Multiple time series.

1. "Simple"  OLS not sufficient.

 -> correlated errors

 -> omitted variable bias

 -> lag terms.

2. It is possible to analyze time series data in a regression framework, but you have to take extra steps to adjust standard errors.

3. Time serises data contain unit-roots

--> Random walk is a unit-rrot

--> Non-stationary they are not trend-stationary

---> These data are going to have a lot of false positive is you regress one on the other.

4. If data do have unit root?

--> They migth still be related

--> They are related if they are co-integratd.

--> If contintegrated, then Error Corretion Model.

5. What do we do if co-integrated?

- Differnce of the serie with the unit root, (make it stationary) and then use a VAR

VAR:

Y = function(lag X and lag Y)

X = function(lag X and lag Y)

Both equations are estimated by OLS

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Steps to building a VAR

1. EDA:

-- EAch individual series what you normally would do

-- Scatterplot

-- Cross correlation function

\*ccf function if like an acf

\*acf(x,y, type = "partial")

CCFs:

Gives you a sense of whether there is temporaal correlation

Are the series stationary?

ARe there unit roots?

If so, are they co-integrated?

What order shuold we use in the VAR model?

2. Modeling of the VAR

- include trend [EDA]

- include seasonality [EDA]

how many order to include?

-> choose p, such that AIC is minimized

-> Examine residuals

-> Examine out of sample accuracy

3. Answer the motivating question / produce a forecast.

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cmort, tempr

cmort with a SARIMA

1. Does temperature explain anything?

2. Forecast from a VAR model

3. VAR or SARIMA is better?

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BS 1:

- Estimate a VAR with no seasonality

- Choose an order length.

---> Min forecasting error

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var.model

residuals(var.model)

fitted(var.model)

predict(var.model, n.ahead = x)

Focus on prediction of cmort.

Fit a bunch of models

Min test error.

\*\*Devesh also mentioned that our example had a lot of LAG. This might be because there is a seasonal component that requires more LAG.