

# VAR Models for Time Series Modeling and Forecasting

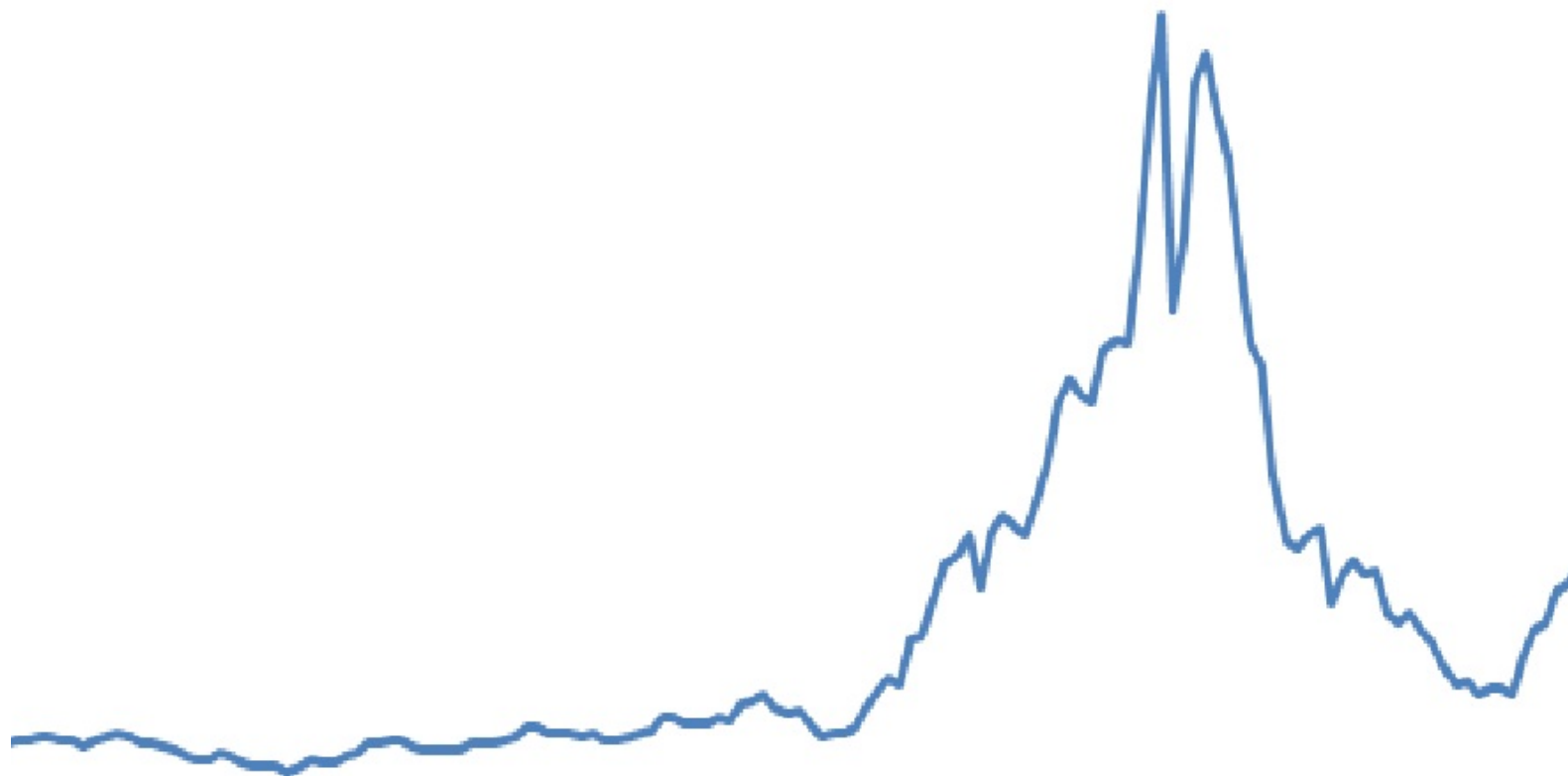
Alfonso L. Castaño

University of  
Murcia

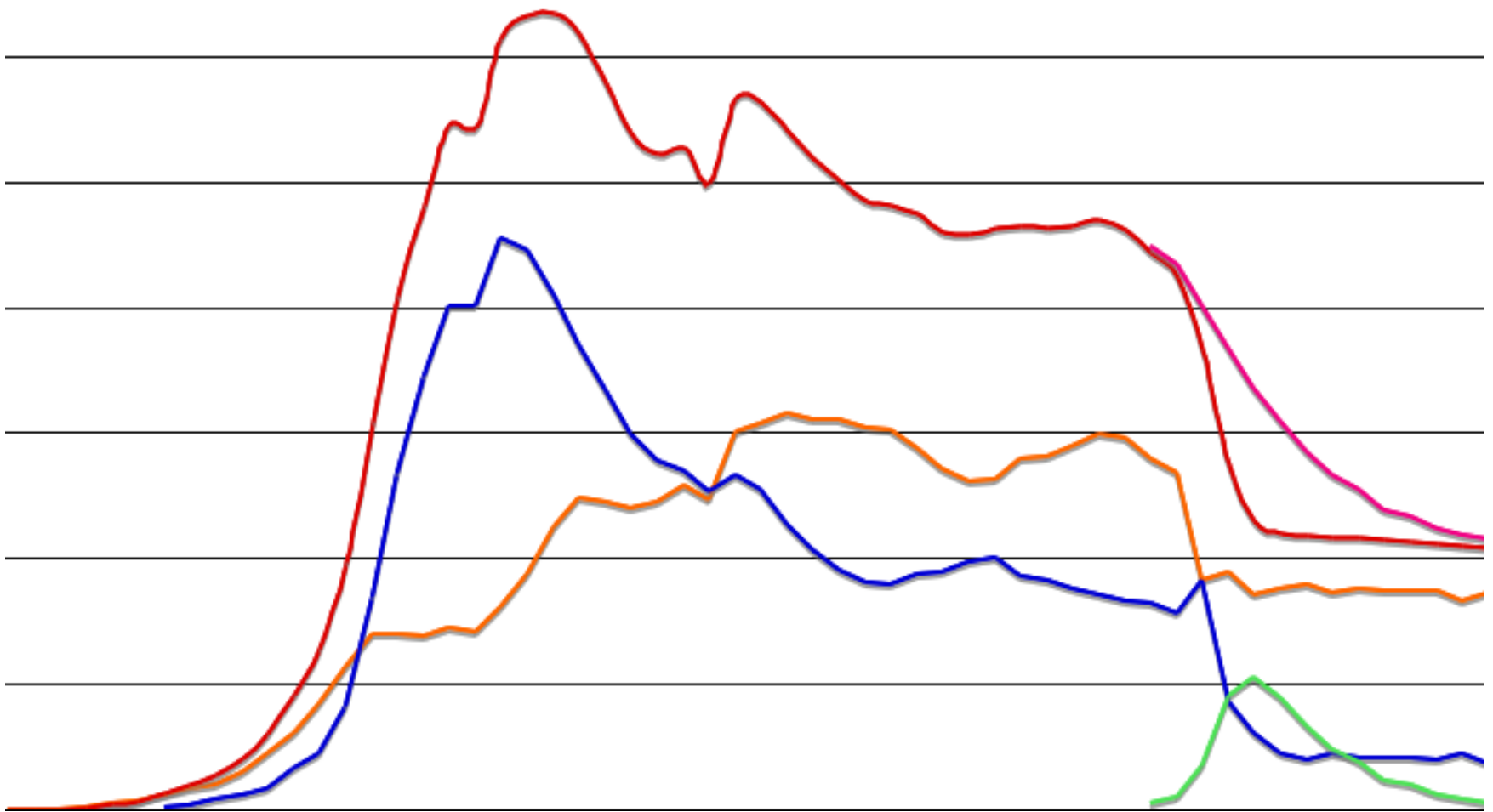
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What is a Time Series?

Data points indexed in time order

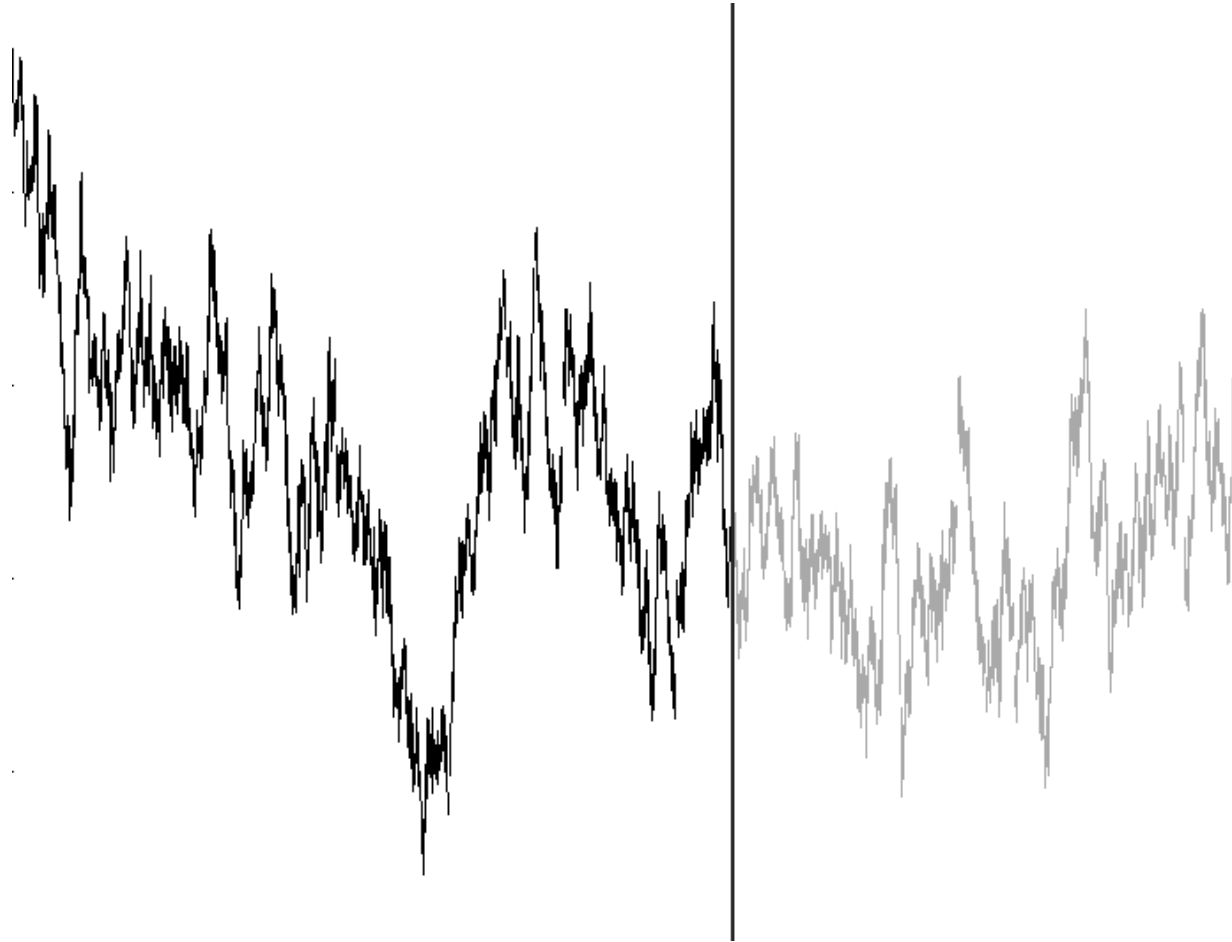


# Multivariable



What can we do with them?

# Modeling and Forecasting



How?

# Autoregression



The value of variable depends on its previous values

$$x^{(j)} \approx x^{(j-1)} a_1 + \dots + x^{(j-i)} a_i + c$$

More variables?

Now we are talking

# Vector Autoregression

$$\mathbf{y}^{(j)} \approx \mathbf{y}^{(j-1)} A_1 + \dots + \mathbf{y}^{(j-i)} A_i + \mathbf{C}$$

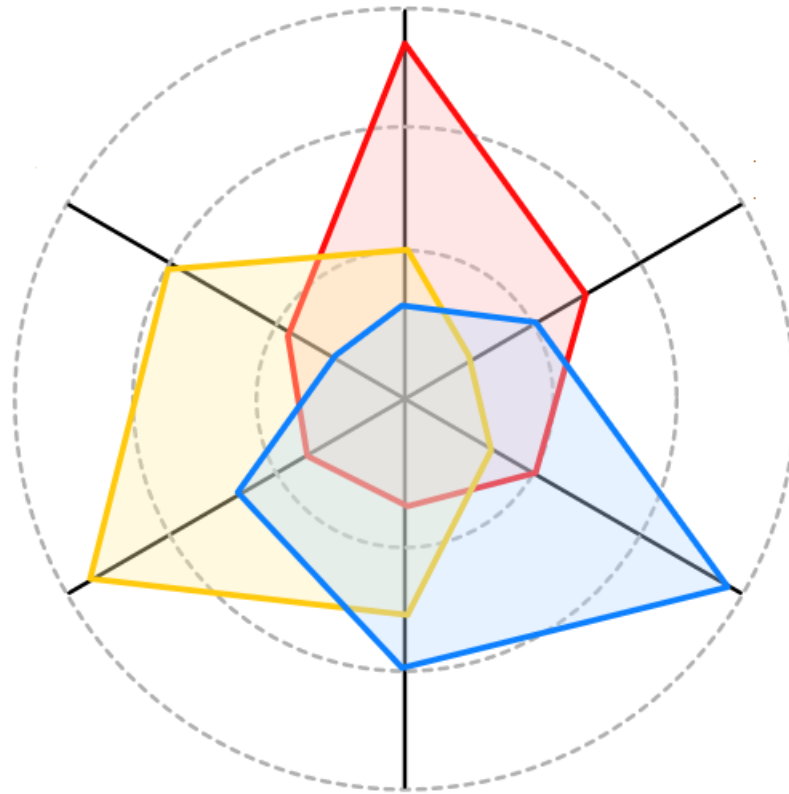
How to find the model?

Huge Computational Problem

# Least Squares

$$\begin{pmatrix} y^{(i)} \\ \vdots \\ y^{(t)} \end{pmatrix} = \begin{pmatrix} y^{(i-1)} & \dots & y^{(0)} & z^{(i-1)} & \dots & z^{(i-k)} & 1 \\ \vdots & & \vdots & \vdots & & \vdots & \vdots \\ y^{(t-1)} & \dots & y^{(t-i)} & z^{(t-1)} & \dots & z^{(t-k)} & 1 \end{pmatrix} \begin{pmatrix} A_1 \\ \vdots \\ A_i \\ B_1 \\ \vdots \\ B_k \\ C \end{pmatrix}$$

# Metaheuristics



Any Question?

*<https://fylux.github.io/about/>*