Time Series Analysis

ARMA Models

Nicoleta Serban, Ph.D.
Professor
Stewart School of Industrial and Systems Engineering

Overview

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About This Lesson

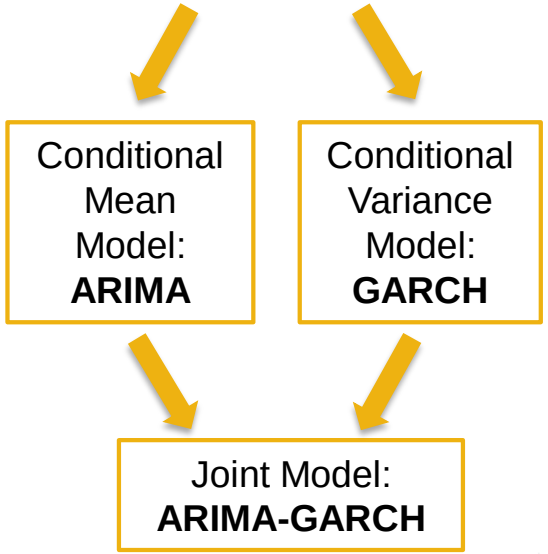
Course Road Map

Pre-requisite: Basic Statistical Modeling & Inference

Basic Time Series Modeling

- Trend
- Seasonality
- Serial Dependence
- Prediction

Univariate Analysis



Multivariate Analysis

- Correlation between & within time series
- Multivariate AR model (VAR)

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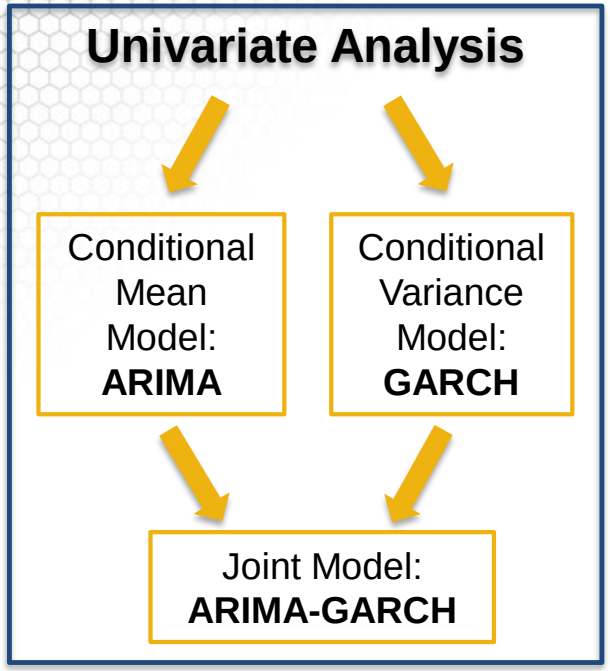
Course Road Map: Univariate Analysis



Modeling (Time) Conditional Mean

- *Stationary Time Series: ARMA*
- *Non-stationarity: ARIMA*
- *Seasonality: Seasonal ARIMA*
- *Model Selection*
- *Prediction: Best Linear Predictor*

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ARMA Models

What will this module cover?

1. Fundamentals of ARMA model
    - Formulation: AR & MA
    - Stationary models: auto-covariance and auto-correlation
    - Properties: causal and invertible processes

Why important?

Fundamentals of ARMA modeling are the grounding of many time series models, including GARCH and VAR models.

ARMA Models (cont'd)

What will this module cover?

2. Model Estimation and Inference
    - Method of Moments: Yule-Walker & Innovation algorithm
    - AR as a regression model
    - Maximum likelihood estimation & inference using approximate normality assumption
    - Order selection and goodness of fit
    - Prediction

Why important?

ARMA estimation and inference is used in model interpretation and evaluation.

ARMA Models (cont'd)

What will this module cover?

3. Extension of ARMA models
    - ARIMA: non-stationarity
    - Seasonal ARIMA
    - Order selection
    - Prediction

Why important?

ARMA models can be applied broadly to many time series with various characteristics.

Data Examples using R Statistical Software

1. Data Examples
   - Emergency Department Volume
   - IBM stock Price
   - U.S. Fuel Consumption

2. R Statistical Software
   - Visual analytics
   - Evaluating performance and goodness of fit
   - Forecasting and evaluation of prediction error

Why important?

Fundamentals of time series modeling are best understood by illustrating them using data examples.

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