Geometric Progression

We Bring AI to Reality.

Time Series Analysis using Python:

Master Time Series Techniques from the Basics to Advanced with a Focus on Financial Applications

Overview

Welcome to our comprehensive course on Time Series Analysis with Python, tailored for analysts, data scientists and business professionals aiming to master time-dependent data analysis. This course equips you with skills essential to tackle real-world time series problems using Python, blending theoretical knowledge with practical, hands-on applications.

Our curriculum is meticulously designed, covering everything from foundational concepts of time series to advanced forecasting models, including ARIMA, SARIMAX and **state-of-the-art classical machine learning and deep learning methods**. The course ensures you gain expertise in Python's time series libraries and frameworks, making you proficient in applying the latest forecasting techniques in diverse domains.

What sets this course apart is the balance of theory and practical exercises. With interactive sessions, you'll not only gain technical skills but also understand the implications of each method in business and analytics settings. Each session is designed to build progressively on the last, allowing for a comprehensive learning experience.

We will use econometric time series data such as inflation and GDP, stock market data such as share prices and yields. If preferred, you can request your own specific data set.

Additional Features:

- Includes Lifetime access to comprehensive electronic course materials, insightful videos, and curated resources for deeper exploration.
- Cheat Sheets.
- Recorded sessions for future reference.

Please refer to the detailed agenda below for more information.

Level	Introduction to Advanced.
Duration	Customized to your needs.
Requirements	Computer with internet access. Contact us for files to download and setup.
Suitable For	Analysts, Data Scientists, Business Professionals, and anyone dealing with time-dependent data.
Not Suitable For	Anyone without a basic understanding of Python or elementary data analysis fundamentals.

Tutor: Mark Raffaelli
Mark is obtained his CFA Charter in 2000 and became fellow member of the Global Association of Risk Professionals (FRM) in 2001. Mark's extensive experience includes:

- Trading in Spot & Derivative Products professionally.
- Development of quantitative financial models for Surveillance, Performance Attribution, Price Validation, Price Models, Risk and Automation.
- Developments of Apps for the investment and insurance industry.
- Machine Learning and Deep Learning with Sklearn, Tensorflow & Pytorch in the Financial Markets for Banks, Asset Managers and general business.
- Time Series Analysis, Regime Change & Optimization with and without AI.
- Strategic implementation of AI.

Those who have attended Mark's courses will know about his passion and ability to cut through jargon, simplify technical issues and provide real life examples.

Detailed Agenda

1. Jargon of Time Series

Delegates will be able to:

- Define and understand key terminology in time series analysis, such as *error*, *trend*, *seasonality and exogenous data*.
- Comprehend *Stationarity* and perform the *ADF test* to check for stationarity in time series data.
- Transforming non-stationary data with differencing.
- Understand *Correlation* in time series data and conduct the *Granger causality test* to determine causal relationships.
- Understand Autocorrelation and run a ACF and PCF plot.
- Model a Random Walk.
- Calculate SMA and EWMA in time series.
- Interpret results and understand when to apply each method in forecasting and smoothing.
- Splitting data into training and test sets.
- Understand variations in constructing a time series forecasting model and setting up a baseline.

2. Regressions and it's Limitations in Time Series

Delegates will be able to:

- Perform regression analysis on data.
- Recognize and address limitations of linear regressions when used with time-dependent data.

3. Forecasting with Holt-Winters Method

Delegates will be able to:

- Understand the components of the Holt-Winters model.
- Apply the Holt-Winters method to time series data for forecasting.
- Put together some python functions to plot the train, test and predict data.
- Bootstrap confidence intervals and plotting the results.

4. Autoregressive (AR) & Autoregressive Moving Average (ARMA) Model

Delegates will be able to:

- Develop AR models for forecasting.
- Identify and interpret the autoregressive coefficients and assess model accuracy.
- Build ARMA models for time series data that combines autoregressive and moving average components.
- Evaluate model effectiveness and suitability for various time series patterns.

5. Autoregressive Integrated Moving Average (ARIMA) & Seasonal Autoregressive Integrated Moving Average (SARIMA) Model

Delegates will be able to:

- Implement ARIMA models for non-stationary time series data.
- Differentiate between AR, MA, and ARIMA models and apply model tuning methods.
- Develop SARIMA models for time series data with seasonal patterns.
- Interpret the results of these models

6. ARIMAX & SARIMAX Models

Delegates will be able to:

- Incorporate exogenous variables for enhanced forecasting accuracy.
- Understand and implement ARIMAX and SARIMAX models.
- Interpret the results of these models

7. Vector Autoregression (VAR), VARMA, and VARMAX Models

Delegates will be able to:

- Apply VAR models for multivariate time series analysis.
- Develop VARMA and VARMAX models and interpret multivariate relationships over time.

Please note for the sections of the course that follow, we assume that delegates have an understanding of:

- **Machine learning algorithms using Python and the Sklearn library.**
- **Either Pytorch or Tensorflow for neural network implementation.**

Mark can separately structure and "accelerated AI program" customised for delegates focussed on time series if required.

8. Classical Machine Learning Methods for Time Series

Delegates will be able to:

- Use *Random Forests* for feature selection and forecasting.
- Apply *Support Vector Machines (SVM)* in time series classification.
- Explore *Gradient Boosting* and *XGBoosting* for handling complex time series datasets.

9. Deep Learning Methods

Delegates will be able to:

- Develop models using *Artificial Neural Networks (ANN)* and understand their limitations in time series.
- Implement *Convolutional Neural Networks (CNN)* for pattern recognition in time series data.
- Use *Recurrent Neural Networks (RNN)*, including *LSTMs* for sequential data modelling.

10. Other New Methods

Delegates will be able to:

- Explore *Prophet* for quick and interpretable forecasting.
- Apply *WaveNet* for generative time series modelling.
- Experiment with advanced methods like *N-Hits*, *N-Beats*, *TimeGPT and many more* to make time series predictions.
- Delegates will explore the latest time series algorithms.