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Time Series Forecasting Models in Python

Time series analysis is a statistical technique that deals with time-series data, or trend analysis. Time series data means that data is in a series of particular time periods or intervals. Time series forecasting is the use of a model to predict future values based on previously observed values. There are different models that are used for time series forecasting.

ARIMA

It combines both Autoregression (AR) and Moving Average (MA) models as well as a differencing pre-processing step of the sequence to make the sequence stationary, called integration

Autoregressive Integrated Moving Average model adds differencing to an ARMA model.

The method is suitable for univariate time series with trend and without seasonal components

Example of using ARIMA Model:

```
#Importing Model:

from statsmodels.tsa.arima.model import
ARIMA

#Reading data:

import pandas as pd
data = pd.read_csv(‘filename.csv’)

#Fittting Model:

model = ARIMA(data)
model_fit = model.fit(disp=False)

#Prediction:
ytrain = model_fit.predict(len(data), len(data),
typ='levels')
print(ytrain)
```

SES

Simple Exponential Smoothing models the next time step as an exponentially weighted linear function of observations at prior time steps.

The method is suitable for univariate time series without trend and seasonal components.

It is a powerful forecasting method that may be used as an alternative to the popular Box-Jenkins ARIMA family of methods.

Example of using SES Model:

```
#Importing Model:

from statsmodels.tsa.holtwinters import
SimpleExpSmoothing

#Reading data:

data = pd.read_csv(‘filename.csv’)

#Fitting Model:

model = SimpleExpSmoothing(data)
model_fit = model.fit()

#Prediction:
ytrain = model_fit.predict(len(data), len(data))
print(ytrain)
```

ARCH

Autoregressive Conditional Heteroskedasticity is a method that explicitly models the change in variance over time in a time series. Specifically, an ARCH method models the variance at a time step as a function of the residual errors from a mean process.
It describes the variance of the current error term or innovation as a function of the actual sizes of the previous time periods' error terms.

Example of using ARCH Model:

```
#Importing Model:

from arch import arch_model

#Reading data:

data = pd.read_csv(filename.csv)

# split into train/test
a_test = 10
train, test = data[:-a_test], data[-a_test:]
model = arch_model(train, mean='Zero',
vol='ARCH', p=15)

#Fitting Model:

model_fit = model.fit()

#Prediction:
ytrain = model_fit.forecast(horizon=a_test)
print(ytrain)
```

GARCH

GARCH is a statistical model that can be used to analyze a number of different types of financial data, for instance, macroeconomic data. Financial institutions typically use this model to estimate the volatility of returns for stocks, bonds, and market indices.

In the GARCH model, the ARIMA model is assumed for the error variance.

Example of using GARCH Model:

```
#Importing Model:

from arch import arch_model

#Reading data:

data = pd.read_csv(filename.csv)

# split into train/test
a_test = 10
train, test = data[:-a_test], data[-a_test:]
model = arch_model(train, mean='Zero',
vol='GARCH', p=15)

#Fitting Model:

model_fit = model.fit()

#Prediction:

ytrain = model_fit.forecast(horizon=a_test)
print(ytrain)
```