Week 07, Forecasting with Python – Teaching Approach

The purpose of this document is to describe the teaching approach used to cover the content within Week 7, Forecasting with Python.

# Background Information

Students within this course have experience using Python and Jupyter notebooks for obtaining, structuring, cleaning, and visualizing data. This week is the first time that students will create a financial model within Python and Jupyter notebooks.

# Section 1: Introducing Time Series Analysis in Python

In this section, students are introduced to the concept of data modeling and associated terminology through the use of a Microsoft PowerPoint presentation (BUS391\_07\_01A - Data Modeling.pptx). The steps within data modeling are also covered, as well as concepts such as overfitting, data partitioning, and cross validation.

Then, in a second presentation, students are provided a review of time series data and its analysis through the use of a Microsoft PowerPoint presentation (BUS391\_07\_01B - Time Series Forecasting.pptx). As part of this presentation, the components of times series data are discussed, as well as the types of forecasting we would be using.

Finally, a Jupyter notebook (Python\_18\_ForecastingBasics.ipynb) was used to demonstrate the creation of a basic forecasting model using Python. Using this model as an example, we discussed the hypotheses that may be tested as well as the steps to creating and interpreting data models. This notebook also includes homework prompts for the students to work on prior to the next section (to confirm their understanding of the concepts).

The purpose of this section is to review the concepts from Week 6 while structuring the discussion to prepare students for modeling in Python. In addition, students would experience their first Python forecasting model (beginning to end) as an introduction to the data modeling process.

Content within this section supports the following learning outcomes:

* Demonstrate data wrangling techniques required to prepare data for use in financial modeling.
* Create and interpret appropriate financial models.

# Section 2: Using Datetime Objects and the DatetimeIndex

In Section 2, we covered the use of Datetime objects within Python and how these objects have built-in functionality for indexing and converting existing data into date/time formats. In addition, the Jupyter notebook used (Python\_19\_UsingDatetimeIndex.ipynb) demonstrates the use of the YahooFinancials and Fred packages to obtain data.

The purpose of this section is to demonstrate the appropriate data wrangling for time series data, especially when data are obtained from publicly available sources (Yahoo and FRED). In addition, students are introduced to different date/time formats that may require conversion before analysis continues.

Content within this section supports the following learning outcomes:

* Demonstrate data wrangling techniques required to prepare data for use in financial modeling.

# Section 3: Creating Forecasting Models Using Python

In the final section, students work more deeply with time series forecasting and regression-based forecasting.

First, using the Python\_20\_TimeSeriesForecasting.ipynb Jupyter notebook, students visualize a series of stock prices and then learn about frequencies and resampling using Python. We then use this data to create naïve, moving average (MA), weighted MA, and exponential MA forecasts.

Second, using the Python\_21\_RegressionForecasting.ipynb Jupyter notebook, students visualize data with trends and seasonality and create regression-based forecasting models appropriate for data with these components.

In both notebooks, students are provided homework prompts to confirm their understanding of these concepts.

During the final in-class session for this week, students have the opportunity to work on the homework prompts with their classmates and instructors present. They can ask questions, work on challenges, etc. The goal of this structure is to allow students to work through any questions or concerns they may have before the forecasting summative case is due. The homework is not turned in or graded.

Content within this section supports the following learning outcomes:

* Identify and describe business decision making scenarios appropriate for financial modeling.
* Create and interpret appropriate financial models.
* Professionally communicate the process and results of financial modeling to a variety of stakeholders.

# Summative Case

At the completion of Weeks 6 and 6, students complete a case that requires them to create forecasting models within Python. In this case, students complete the following:

* Obtain data and perform appropriate data wrangling.
* Demonstrate appropriate use of Datetime objects within Python.
* Create, interpret, and compare naïve, MA, weighted MA, and exponential MA forecasts.

This case is graded and included in the student’s final grade for the course. This assessment is summative and is used to assess achievement of course learning outcomes.

# References

References for datasets and Jupyter notebooks are provided within the Jupyter notebooks.