STA 3180 Statistical Modelling: Time Series

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Time series is a type of data that is collected over time. It can be used to analyze trends, make predictions, and identify patterns. Time series data can be used in many different fields, such as economics, finance, engineering, and medicine.

Key Concepts

* Autocorrelation: Autocorrelation is the correlation between values of a time series at different points in time. It is used to measure the similarity between values of a time series over time.

* Stationarity: Stationarity is a property of a time series where the mean, variance, and autocorrelation are constant over time. A stationary time series is easier to model than a non-stationary time series.

* Trend: A trend is a long-term change in the direction of a time series. Trends can be linear or nonlinear.

* Seasonality: Seasonality is a pattern in a time series that repeats itself over a certain period of time. Seasonality can be caused by factors such as weather, holidays, or other events.

* White Noise: White noise is a random process that has a constant mean and variance over time. White noise is often used as a baseline for comparing other time series models.

Coding Examples

Autocorrelation

```
Start of Code
import numpy as np
import pandas as pd
from statsmodels.graphics.tsaplots import plot_acf
# Generate a random time series
ts = np.random.randn(100)
# Plot the autocorrelation
plot_acf(ts)
End of Code
```

Stationarity

```
Start of Code
import numpy as np
```

```
import pandas as pd
from statsmodels.tsa.stattools import adfuller
# Generate a random time series
ts = np.random.randn(100)
# Perform the Augmented Dickey-Fuller test
adfuller(ts)
End of Code
```

Practice Multiple Choice Questions

Q1. Which of the following is NOT a key concept of time series?

A. Autocorrelation

B. Regression

C. Trend

D. Seasonality

Answer: B. Regression