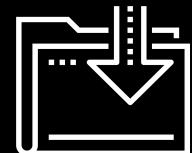


# Introduction to Time Series Forecasting

FinTech  
Lesson 10.2



# Class Objectives

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By the end of this class, you will be able to:



Identify relationships between time series patterns.



Use data correlation to evaluate the predictive relationship between time series patterns.



Compute data correlation of time series data by using the Pandas corr function.



Describe what time series forecasting implies.



Recognize the value of automating time series forecasting.



**WELCOME**

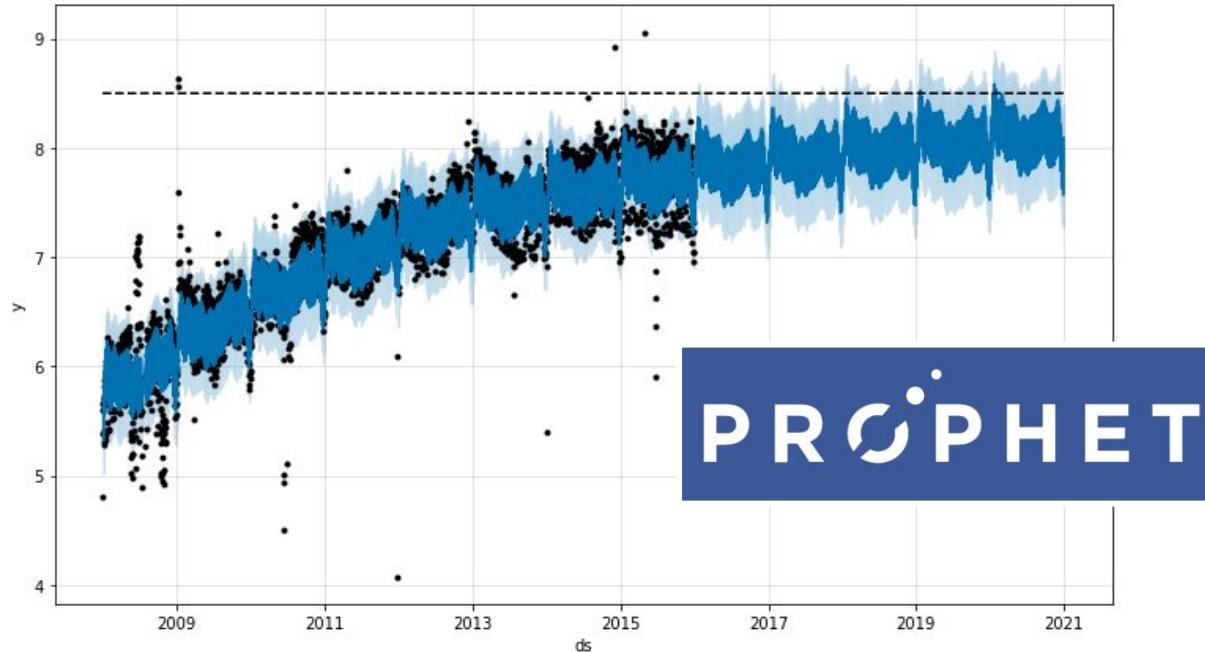


Today, we will start with a warm-up activity to strengthen your time series analysis skills and recap the Pandas functions you learned in the last class.

# Introduction to Time Series Forecasting

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We will learn how to use [Facebook Prophet](#), a library that automates the process of time series forecasting.



A photograph of a person's hand holding a white pen, pointing it towards a black smartphone. The phone's screen displays various financial data, including a line graph with a blue trend line and red triangles, several white bars of different heights, and numerical values like '+17,28' and '-11,28'. The background is slightly blurred, showing more of the same financial data.

By using automation tools, you can focus your time on analyzing the forecast results and assessing their business value.

# Questions?





## Time Series Warm-Up

Suggested Time:

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20 minutes



Time's Up! Let's Review.

# Questions?



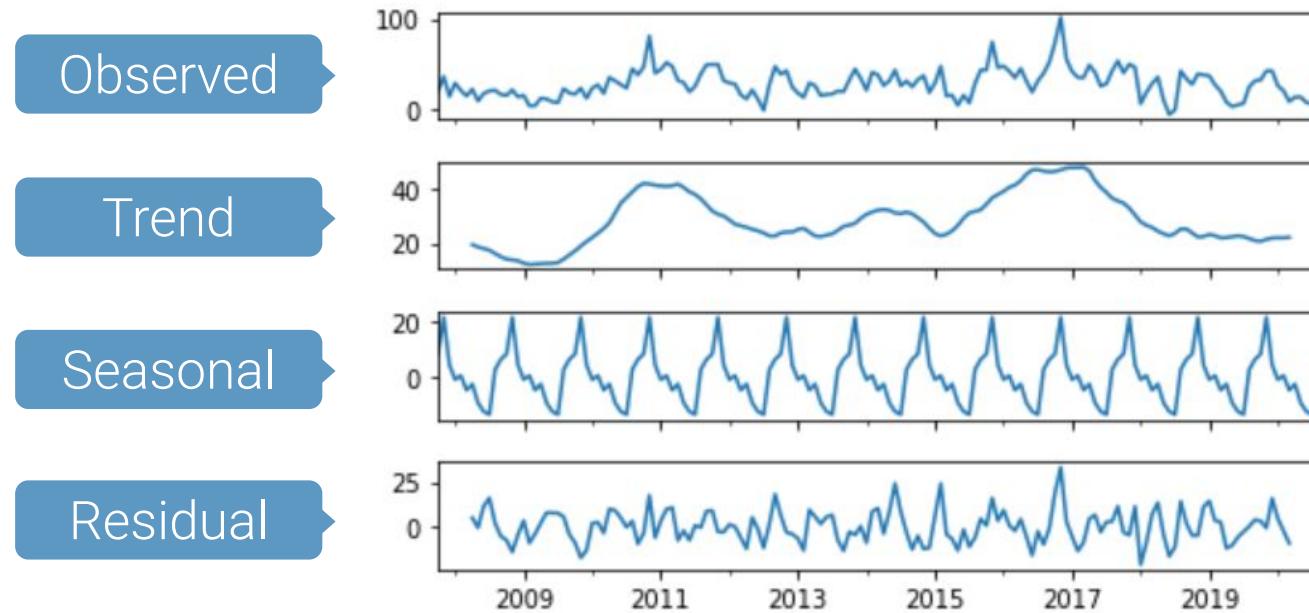
# Identifying Patterned Relationships and Correlation



When analyzing  
time series,  
finding seasonal  
patterns is just one  
part of the job.

# Identifying Patterned Relationships and Correlation

Another important task is to identify any relationships between time series patterns. By doing so, we can better understand the time series behavior and identify predictable relationships.





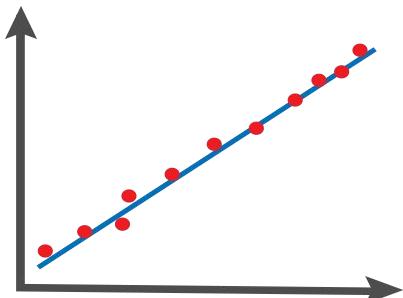
## Instructor Demonstration

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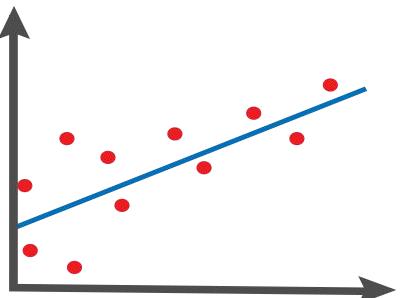
Identifying Patterned Relationships  
and Correlation

In statistics, a **correlation** defines the relationship between two or more variables, whether causal or not.

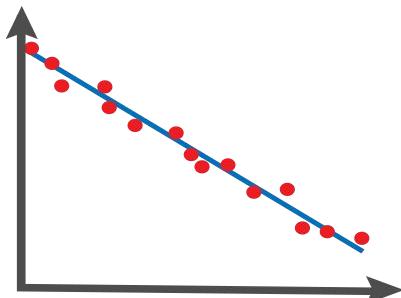
# Comparison of Correlation Relationships



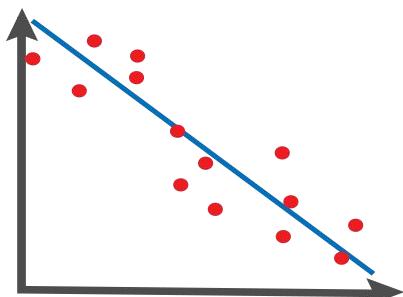
Strong Positive Correlation



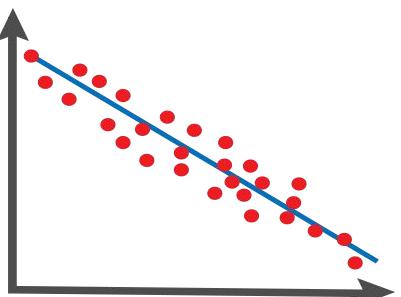
Weak Positive Correlation



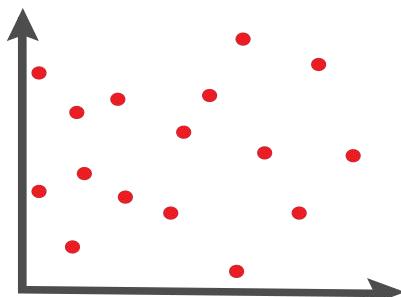
Strong Negative Correlation



Weak Negative Correlation



Moderate Negative Correlation



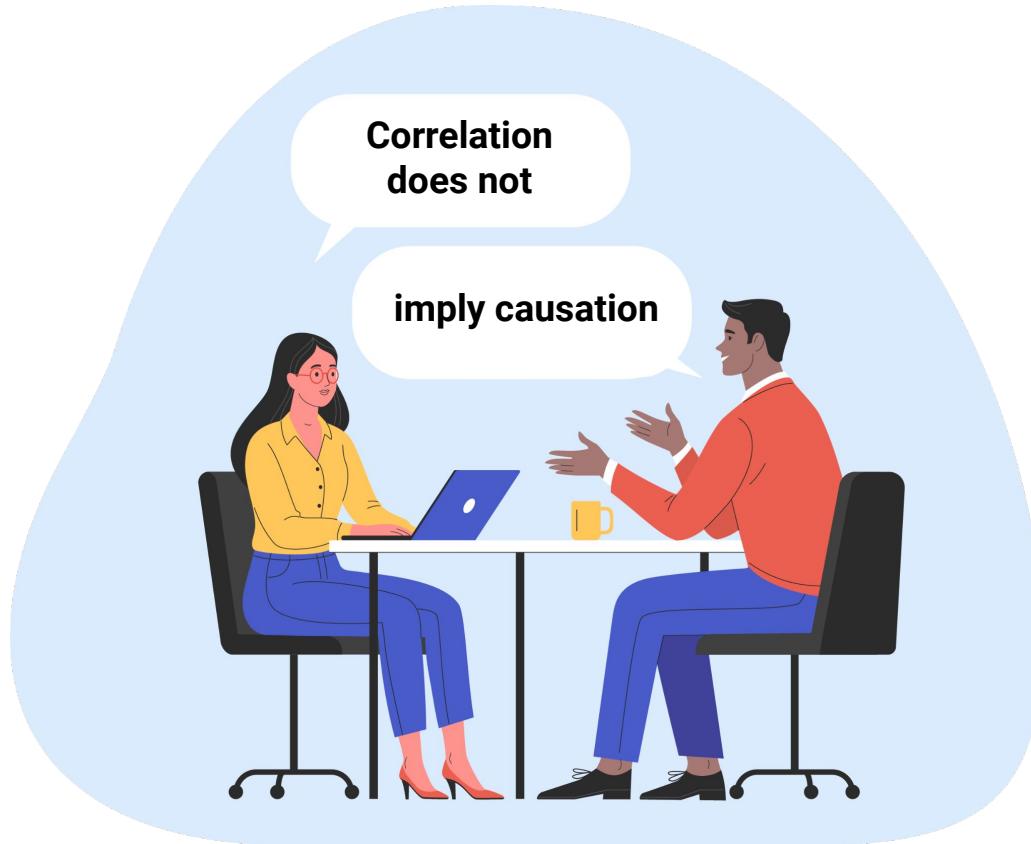
No Correlation



Correlations can be helpful, but they don't provide enough information to infer the relationship between two variables.

# Statisticians Say...

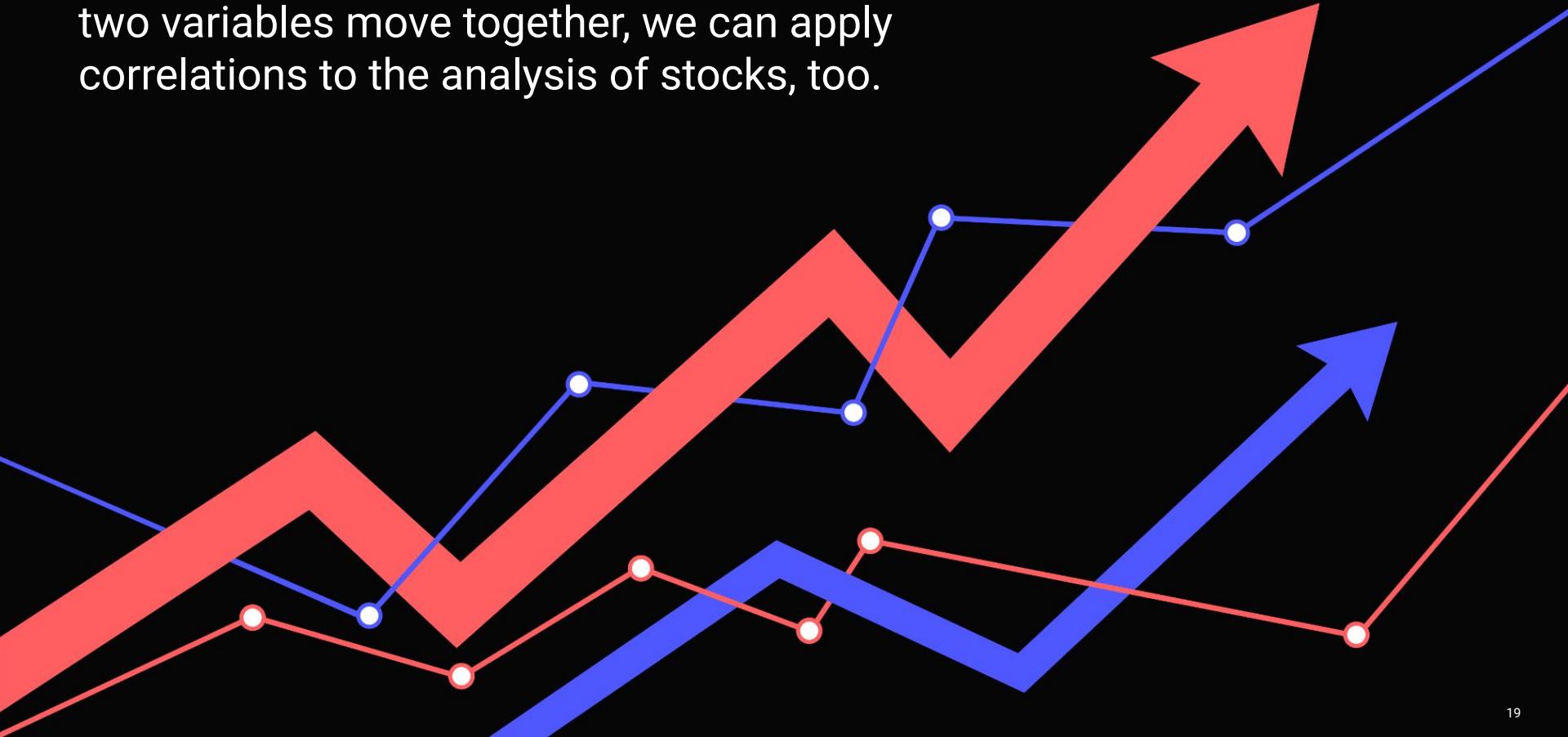
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It means that you can't assume causation from only a correlation value.

You will need a good deal of information to determine causation between factors, including expertise in the field and extensive testing, which will likely include the ability to control for other related factors.

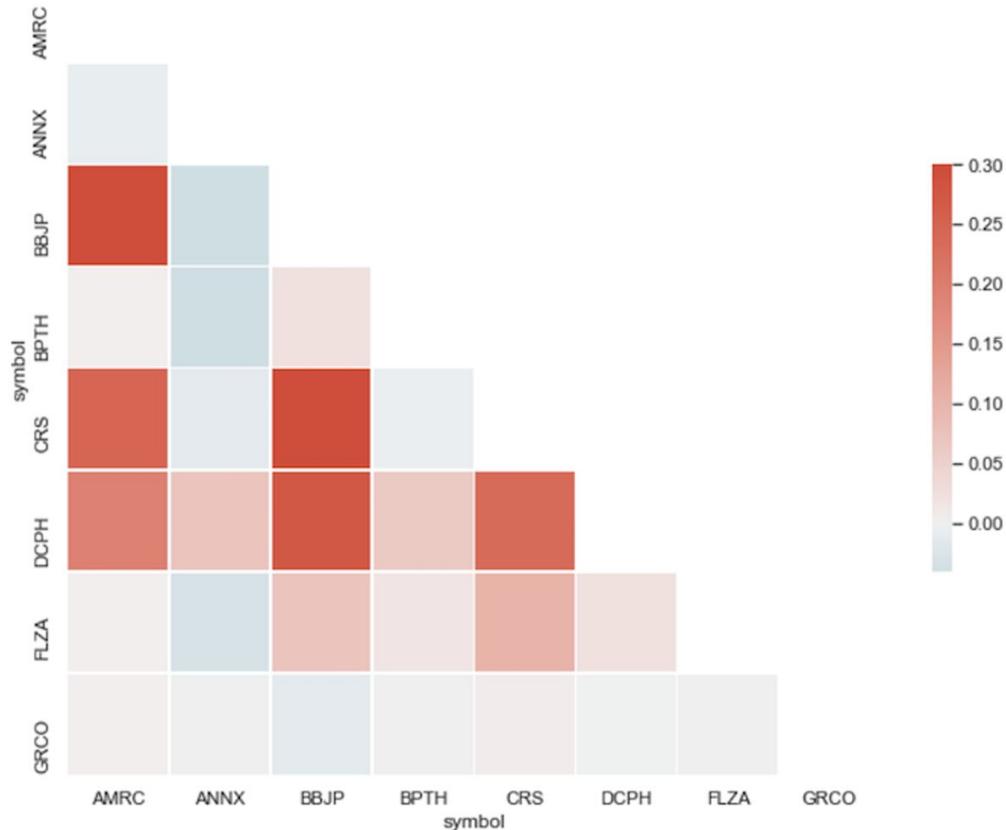
Since a correlation evaluates how much two variables move together, we can apply correlations to the analysis of stocks, too.



# Question

Consider the following correlation table in the form of a heatmap, which contains the correlations of various intraday stock returns (the returns are measured by using minute-level price data).

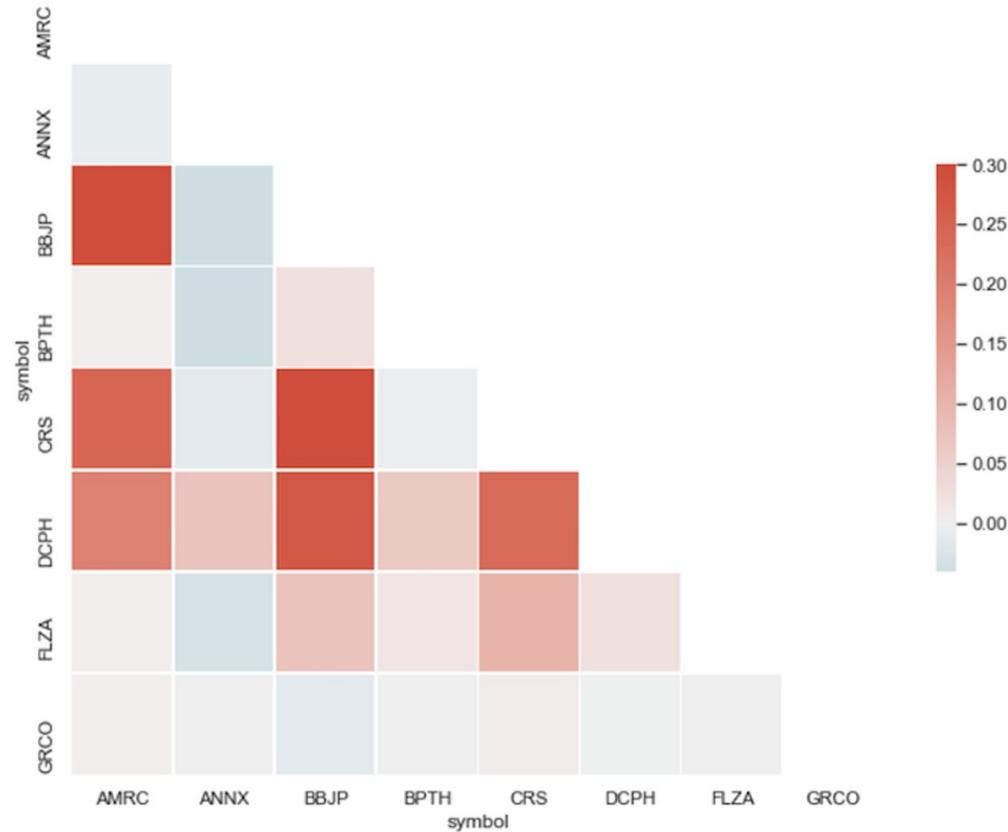
Can you identify which stocks tend to move together the most strongly?



# Answer

It seems that CRS and AMRC have the highest correlation, as does CRS and BBJP.

All three pertain to the heavy manufacturing industry, so it makes sense that their returns closely move together.



# Questions?





# Activity: Stock Volatility and Google Trends

In this activity, you will analyze time series data about Apple to identify any correlations among Google Trends, the stock price returns, and the stock volatility.

Suggested Time:

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20 minutes



Time's Up! Let's Review.

# Questions?



*Break*



# Introduction to Time Series Forecasting

# Introduction to Time Series Forecasting

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The financial world widely uses time series forecasting. This is because of its origins in the mathematics and statistics space.



People sometimes refer to time series forecasting as a statistical tool, but there's a lot of overlap between statistical tools and machine learning models. People tend to use both to solve similar problems.



As you learned before, time series analysis involves analyzing time series data to identify meaningful patterns in the data.



Time series forecasting involves using a model that's based on historical data to predict future values in the time series.

In this lesson, you'll perform time series forecasting by creating models to predict the future.



# Time series forecasting can prove challenging.

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This is because there are numerous statistical techniques that we can use, and because external factors can impact the typical behavior of the patterns.

Holidays, breaking news, and special events—like the Olympics—are examples of external factors that can affect the behavior of time series data.



# Automating Time Series Forecasting

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Suppose that we're collaborating with the International Co-operative Alliance on a project.

The project will help alpaca farms in Bolivia owned by the Aymara indigenous people to export alpaca wool scarves to Japan.



# Automating Time Series Forecasting

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We're asked to find the best season to sell scarves in Japan and to forecast the demand for scarves for one year.

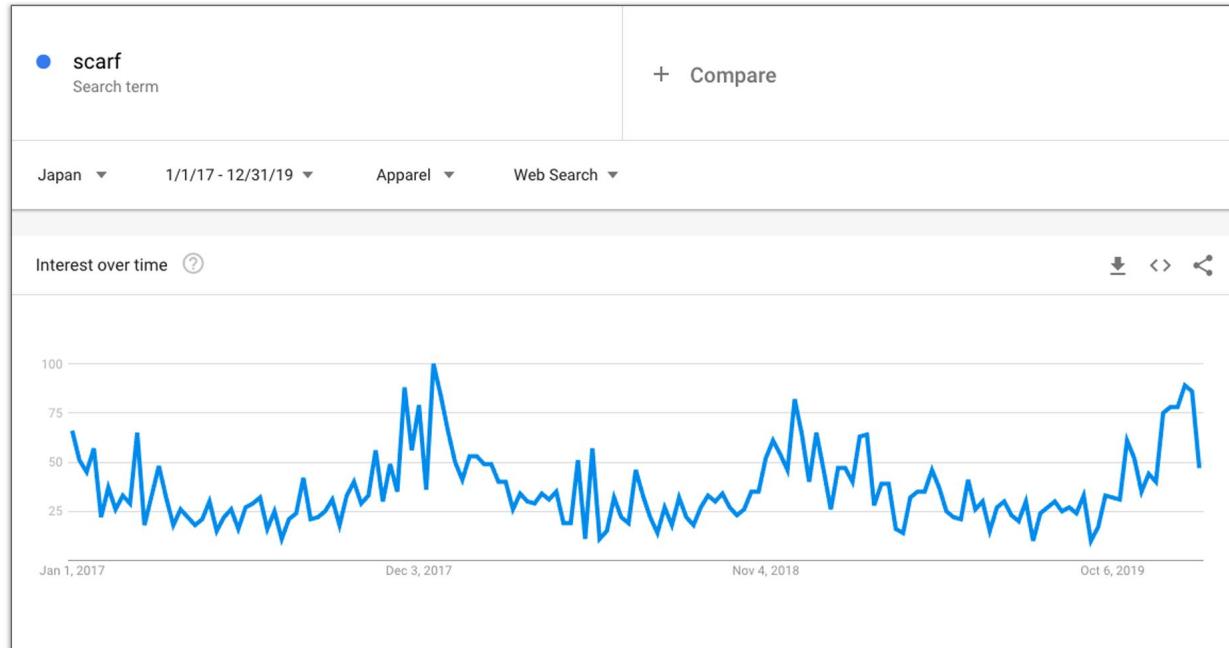
We don't know anything about the scarf market in Japan, so we obtained some data from Google Trends in order to figure out the optimal selling season.



# Automating Time Series Forecasting

Using our time analysis skills, we identified that people in Japan have more interest in scarves in the winter months because of the weather.

So, it might be optimal to start marketing campaigns in August and start selling scarves by October.





Wouldn't it be terrific to have  
a tool to speed up our time series  
modeling and forecasting?

# Focusing on Results Analysis and Decision Making with Prophet

Meet [Prophet](#), an open-source library for time series forecasting that Facebook developed to analyze their data.



**Forecasts** not only the growth of the social network but also its technological infrastructure demand, services revenue, and fraudulent activity.

**Automates** the process of time series forecasting, allowing you as a fintech professional to focus on a business problem. It also tests and forecasts as many scenarios as you identify.

**Simplifies** your time series analysis. It deals with noise, holidays or special events, and time series decomposition—allowing you to work more efficiently.



## Instructor Demonstration

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## Configuring Google Colab

# Questions?





# Time to Code

## Setting Up Google Colab

Suggested Time:

10 minutes



Time's Up! Let's Review.

# Questions?





## Instructor Demonstration

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# Data Preparation for Time Series Forecasting with Prophet

# Questions?





# Data Preparation to Forecast Market Opportunities

Suggested Time:

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20 minutes



Time's Up! Let's Review.

# Questions?





# Questions?



The  
End