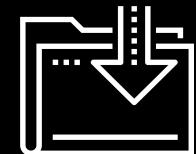


# Introduction to Time Series Forecasting

Fintech  
Lesson 11.2



# Class Objectives

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



Identify relationships among time series patterns.



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



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



Describe the business value of time series forecasting.



Recognize the value of automating time series forecasting.



**WELCOME**

# It's time to predict the future with Prophet!





# Activity: Time Series Warm-Up

In this activity, you will strengthen your time series analysis skills and review the Pandas functions that you learned in the previous class.

Suggested Time:

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20 Minutes



Time's Up! Let's Review.

# Questions?



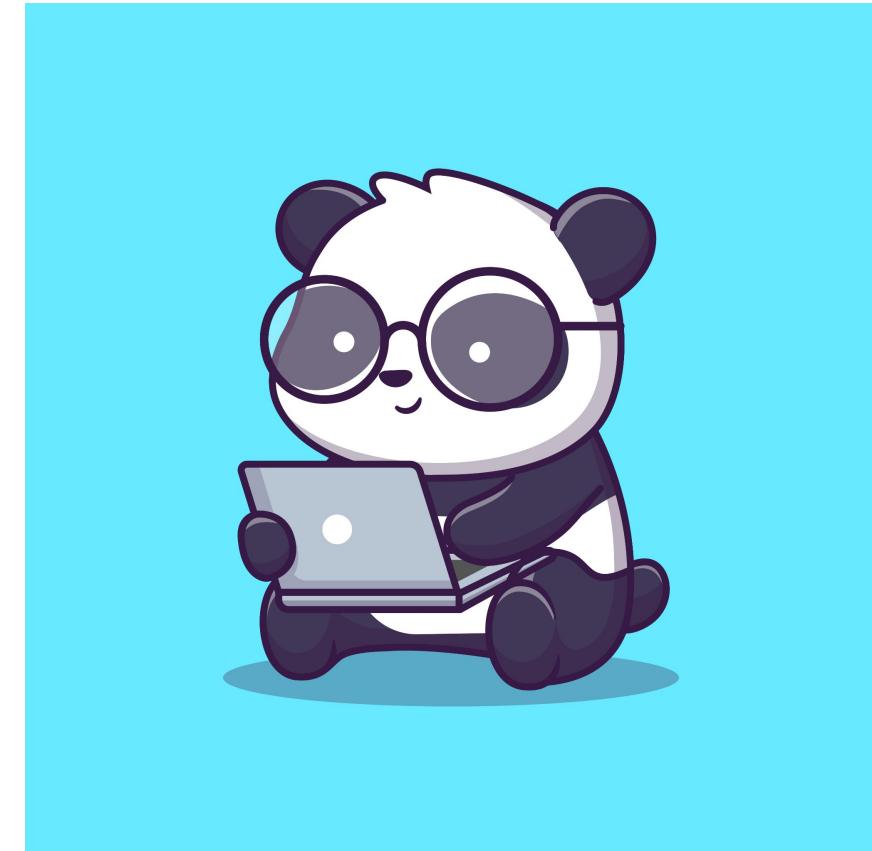
# Identifying Patterned Relationships and Correlation

# Identifying Patterned Relationships and Correlation

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In this section, you will learn to use:

- 01 Pandas to identify patterned relationships between time series.
- 02 Correlation as a measure to assess the predictive power of time series.

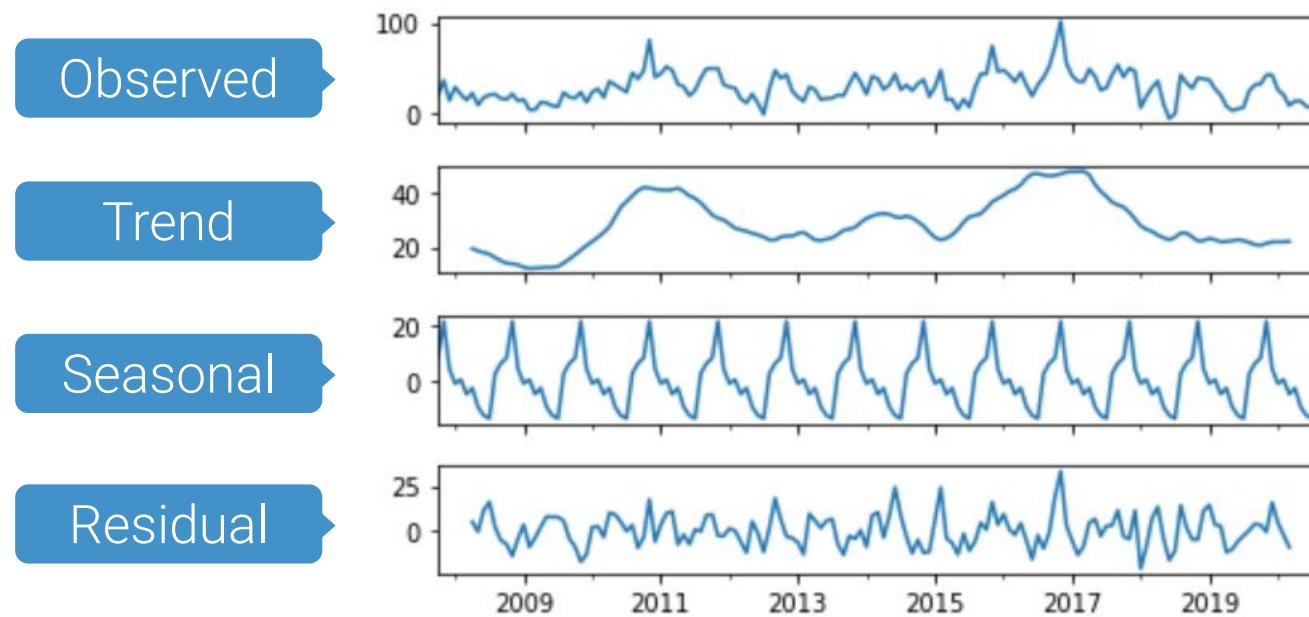


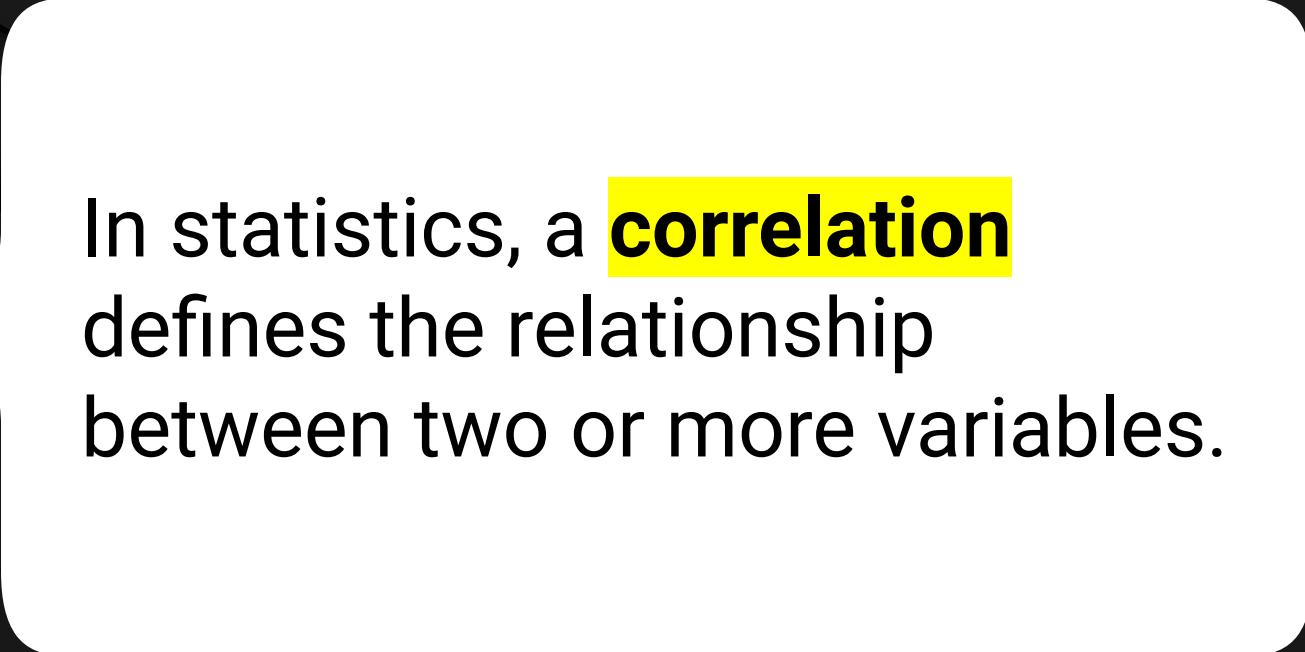


When analyzing  
time series,  
finding seasonal  
patterns is just one  
part of the job.

# Identifying Patterned Relationships and Correlation

Another important task is identifying any relationships between time series patterns and determining if these relationships are predictable.

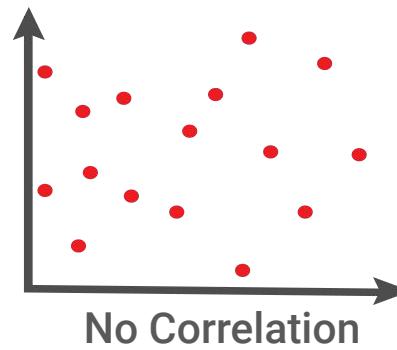
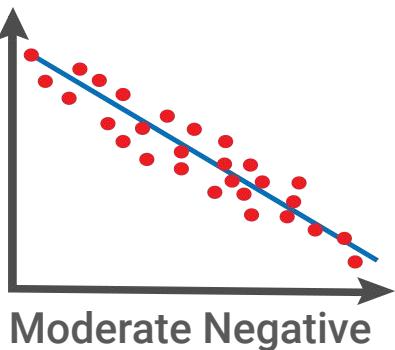
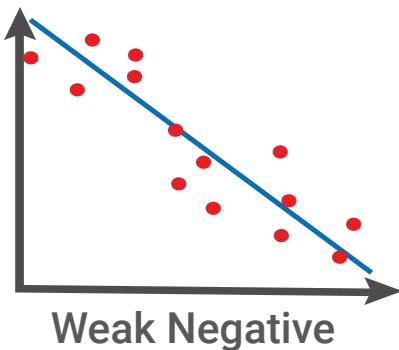
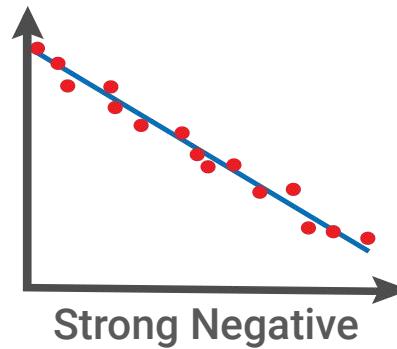
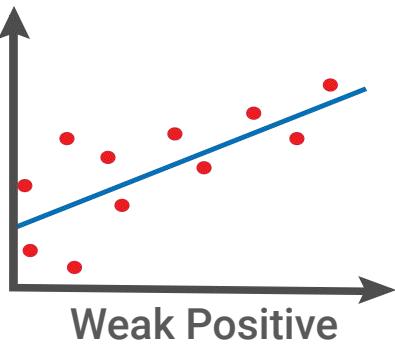
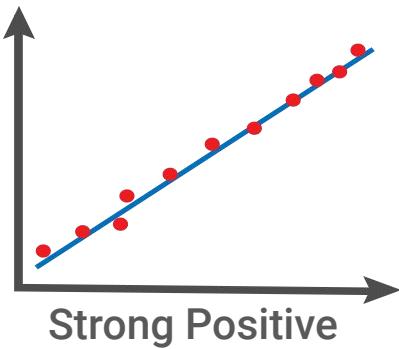




In statistics, a **correlation** defines the relationship between two or more variables.

# Comparison of Correlation Relationships

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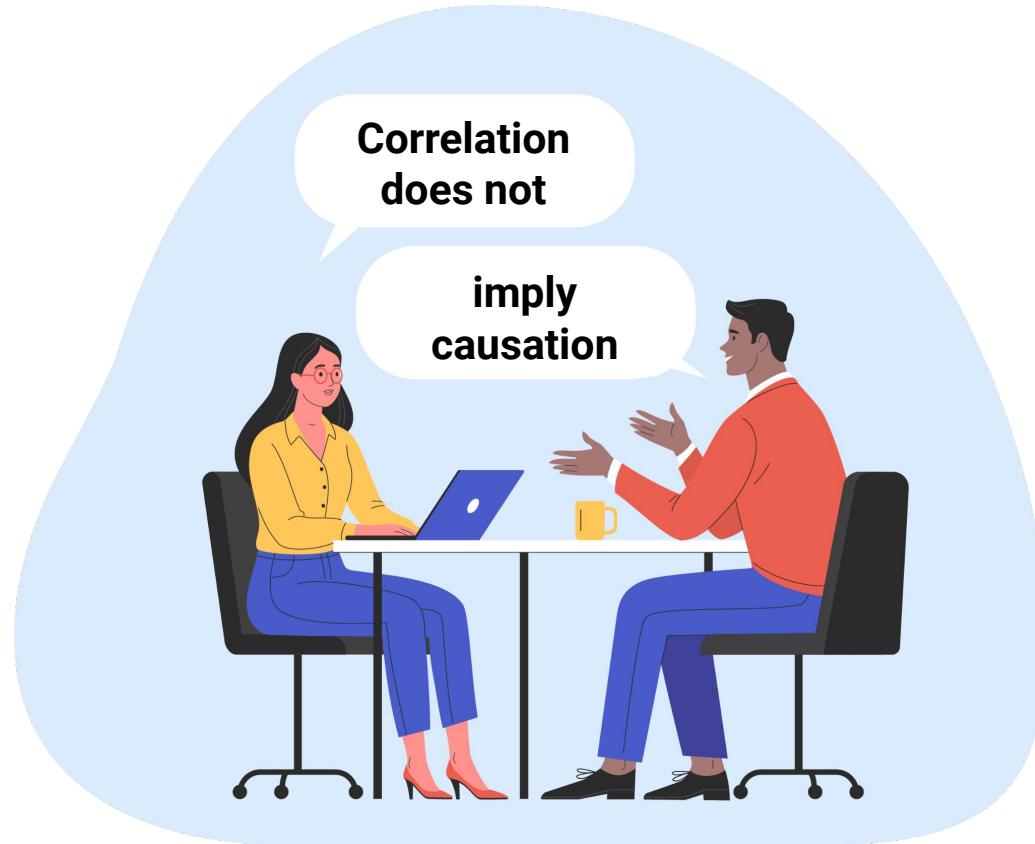




Correlations can be helpful,  
but they don't provide enough  
information to infer the relationship  
between two variables.

# Statisticians Say ...

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**In other words, you can't assume causation from a correlation value only.**

You will need a lot 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.

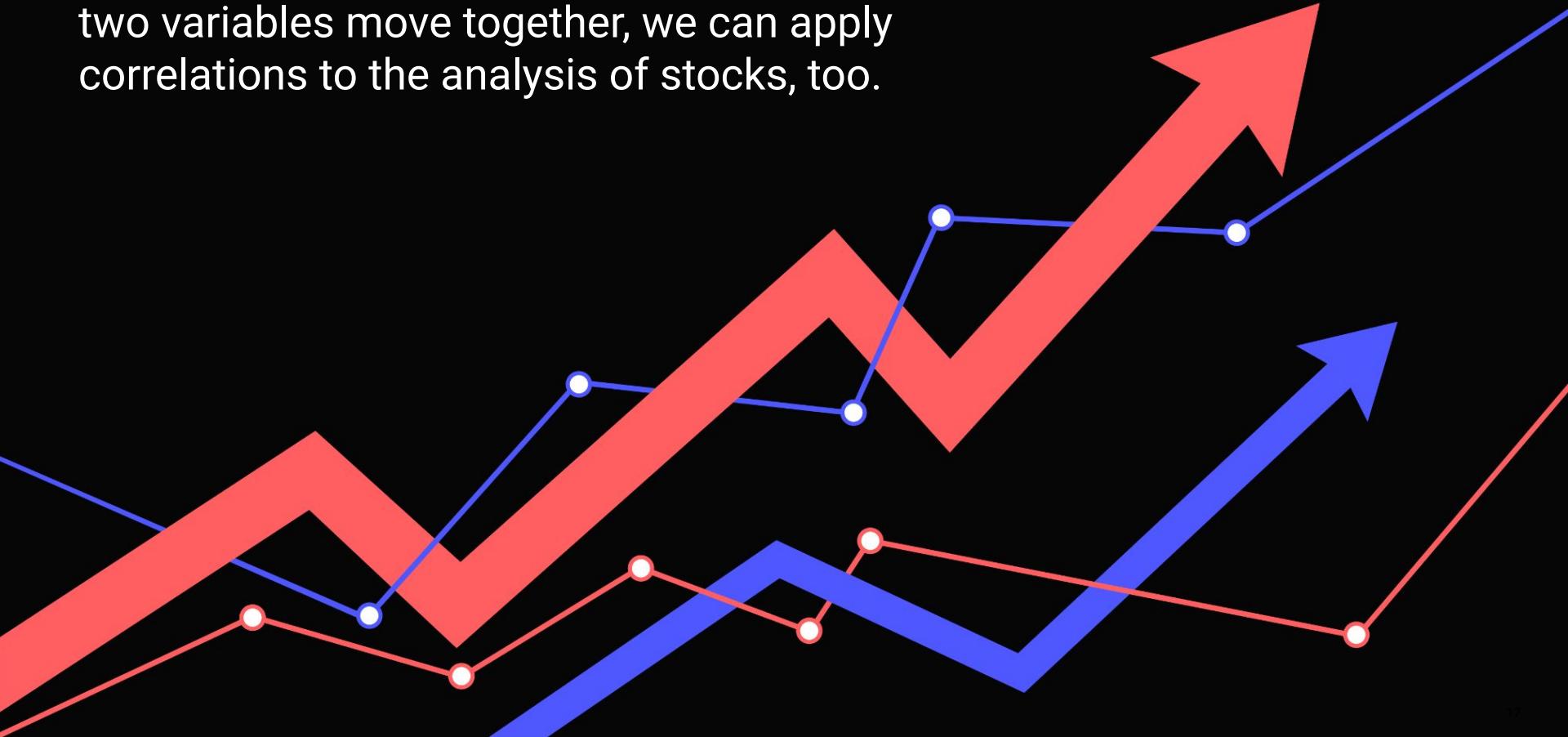


## Instructor Demonstration

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Identifying Patterned Relationships  
and Correlation

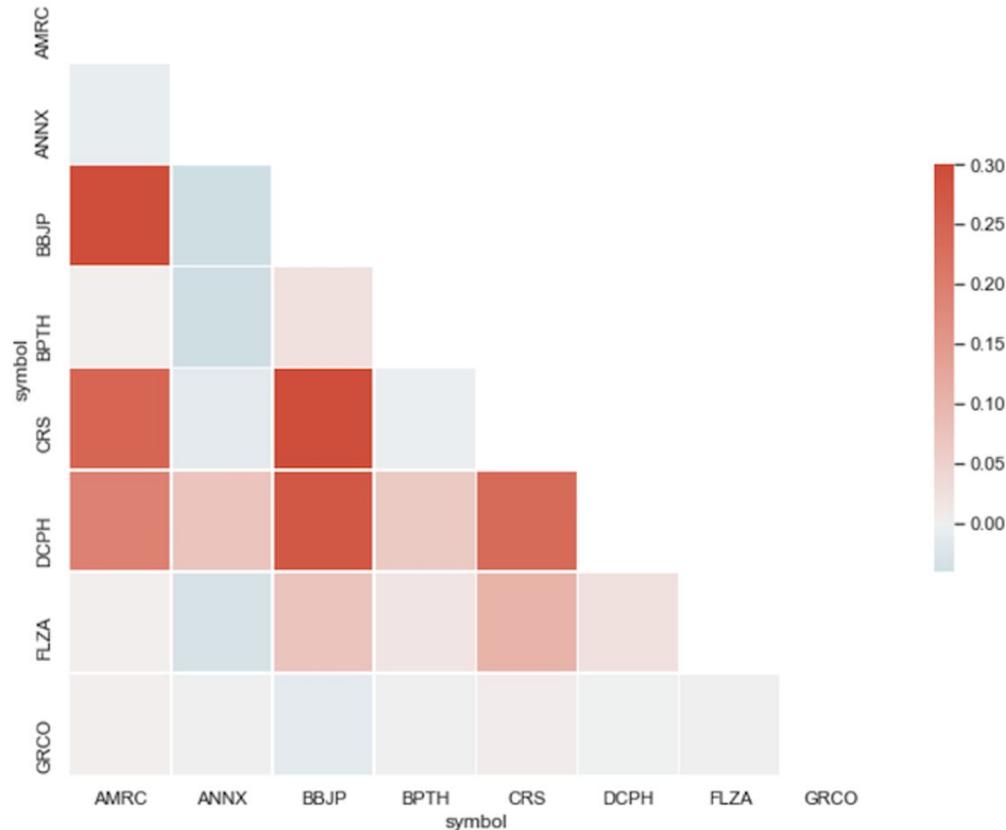
Since a correlation evaluates how much two variables move together, we can apply correlations to the analysis of stocks, too.



# Question

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

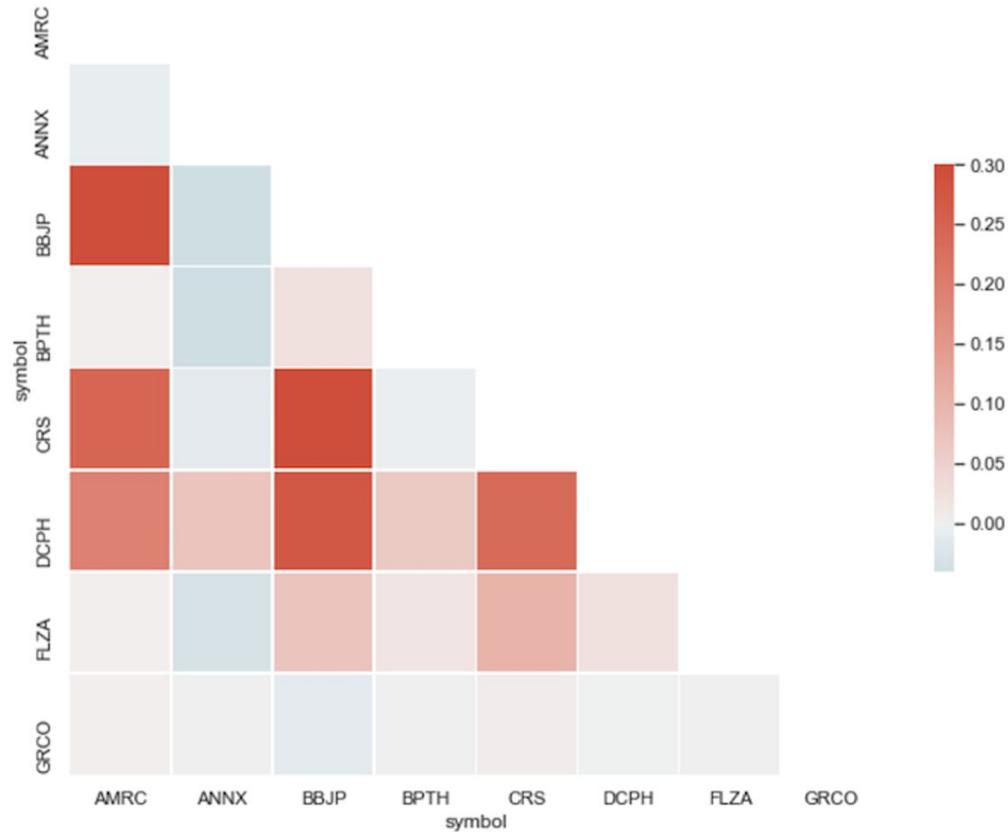
Can you identify which stocks tend to move together most strongly?



# Answer

**It seems that CRS and AMRC and CRS and BBJP both have the highest correlations.**

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



# Going Forward

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You will use correlations to identify the relationships between current observations and future values.

This differs from identifying the relationships for variables that are measured at the same time.



# 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?





Countdown timer

15:00

(with alarm)

Break



# Introduction to Time Series Forecasting

# Introduction to Time Series Forecasting

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The financial world makes great use of time series forecasting because of its origin in mathematics and statistics.



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. Both can solve similar problems.



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



Time series forecasting involves using a model that is 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 difficult.

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External factors, such as holidays, breaking news, and special events, can impact the usual behavior of the patterns.

Additionally, it can be challenging to select the best statistical technique for analysis.



# Automating Time Series Forecasting

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Let's look at a scenario where we are collaborating with the International Co-operative Alliance.

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

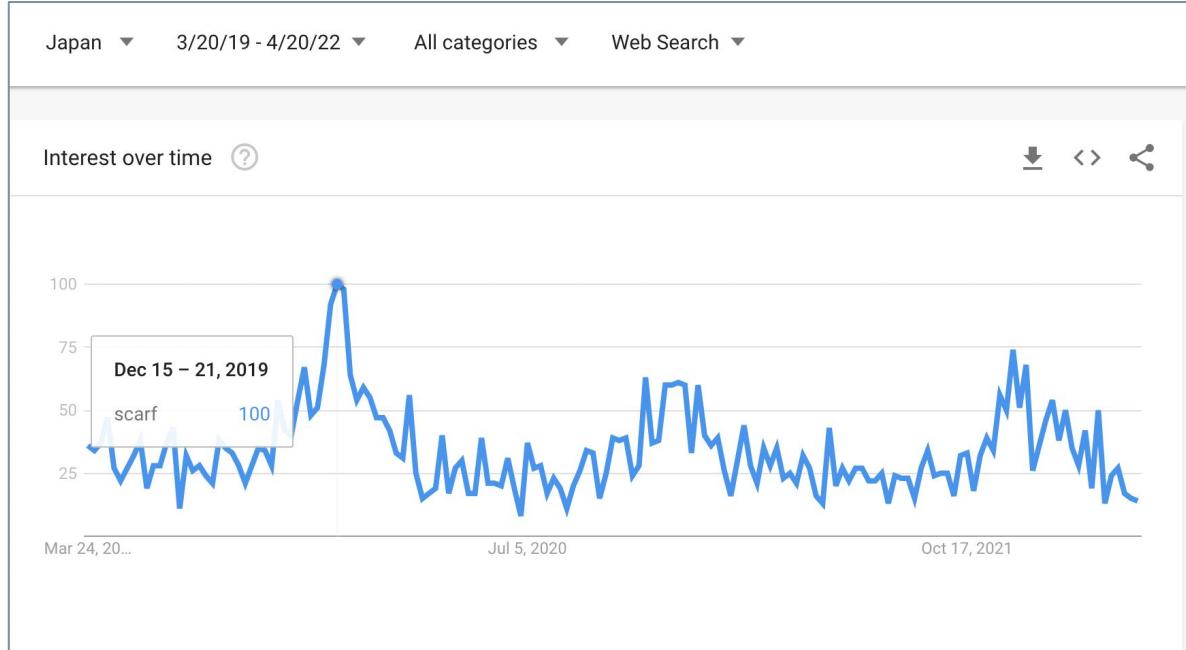
We don't know anything about the scarf market in Japan, so we've obtained some data from Google Trends to figure out the optimal selling season.



# Automating Time Series Forecasting

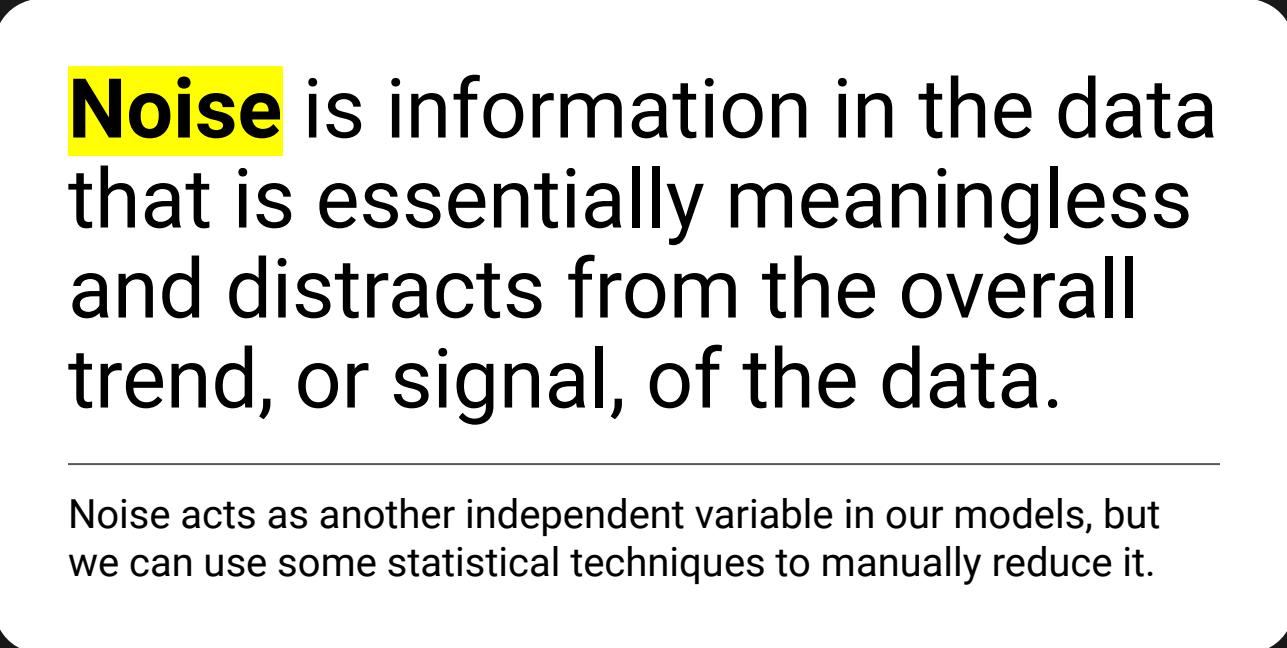
Using our time analysis skills, we identified that people in Japan have more interest in scarves in the winter months because of the weather.

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





External factors,  
like weather or holidays,  
impact a time series and  
sometimes **introduce noise**.



**Noise** is information in the data that is essentially meaningless and distracts from the overall trend, or signal, of the data.

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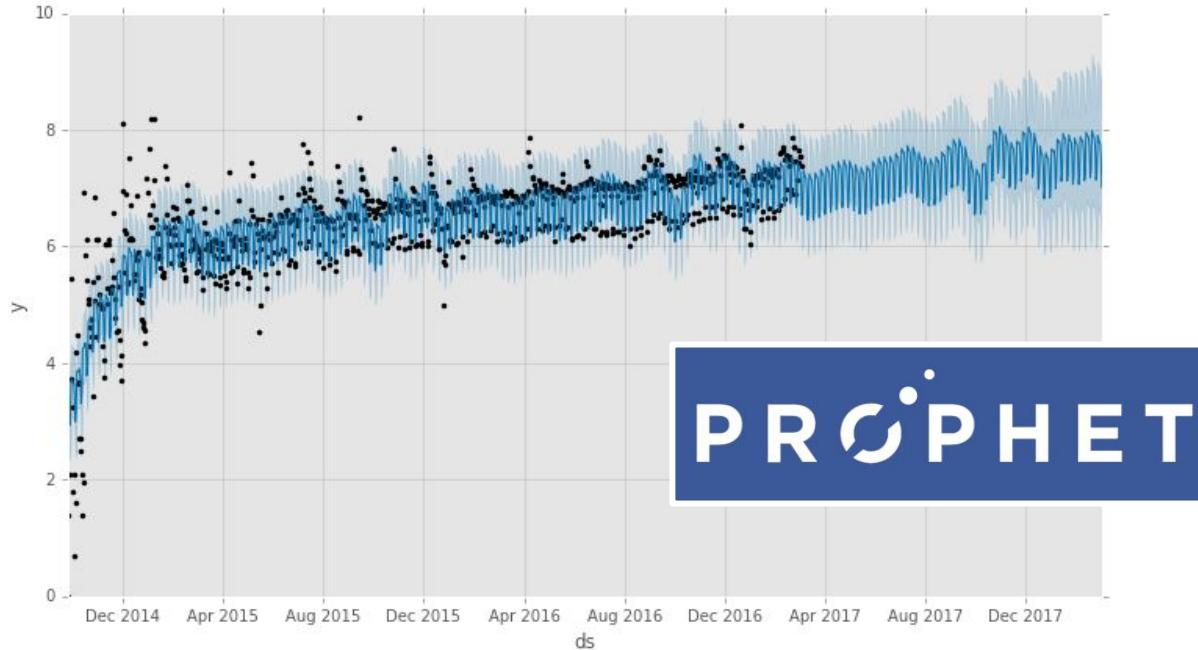
Noise acts as another independent variable in our models, but we can use some statistical techniques to manually reduce it.



# Focusing on Results Analysis and Decision-Making with Prophet

# Introducing Prophet

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



# Results Analysis and Decision-Making with Prophet

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Facebook uses Prophet to forecast growth, technological infrastructure demand, service revenue, and user activity.



Prophet 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.



Prophet's forecasting automation can help to simplify your time series analysis.

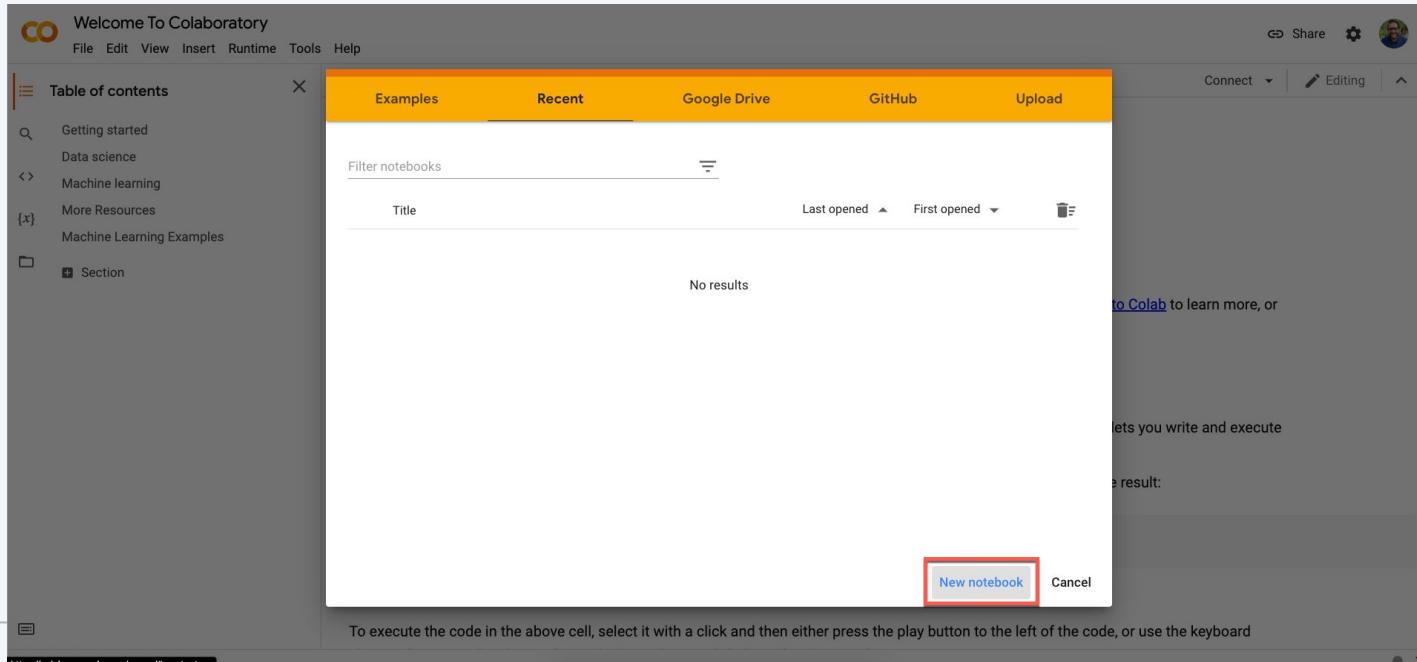


It deals with noise, holidays or special events, and **time series decomposition**.

# Results Analysis and Decision-Making with Prophet

Installing Prophet can be tricky on some machines.

For simplicity, we'll be using [Google Colab](#)—an IDE that allows us to run Jupyter notebooks in the cloud, which allows everyone to have the same computational environment.





## Instructor Demonstration

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## Configuring Google Colab

# Questions?





# Activity: Setting Up Google Colab

In this activity, you will get additional practice with opening and configuring Google Colab.

Suggested Time:

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10 Minutes



Time's Up! Let's Review.

# Questions?





## Instructor Demonstration

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Data Preparation for  
Time Series Forecasting with Prophet

# Questions?





# Activity: Data Preparation to Forecast Market Opportunities

In this activity, you will use Google Colab to prepare a dataset and then use that dataset and Prophet to forecast market opportunities.

Suggested Time:

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20 minutes



Time's Up! Let's Review.

# Questions?

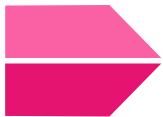




# Recap

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Today, we learned:



How to use Pandas to analyze time series data.



*This is one of the most important capabilities of Pandas.*



How to create and analyze visualizations for time series data.



The benefits of automating time series forecasting.



## Next Class

We'll manage time series data and create models to predict the future using Prophet.

# Questions?



*The  
End*