



# Algorithmic Trading

FinTech  
Lesson 15.2



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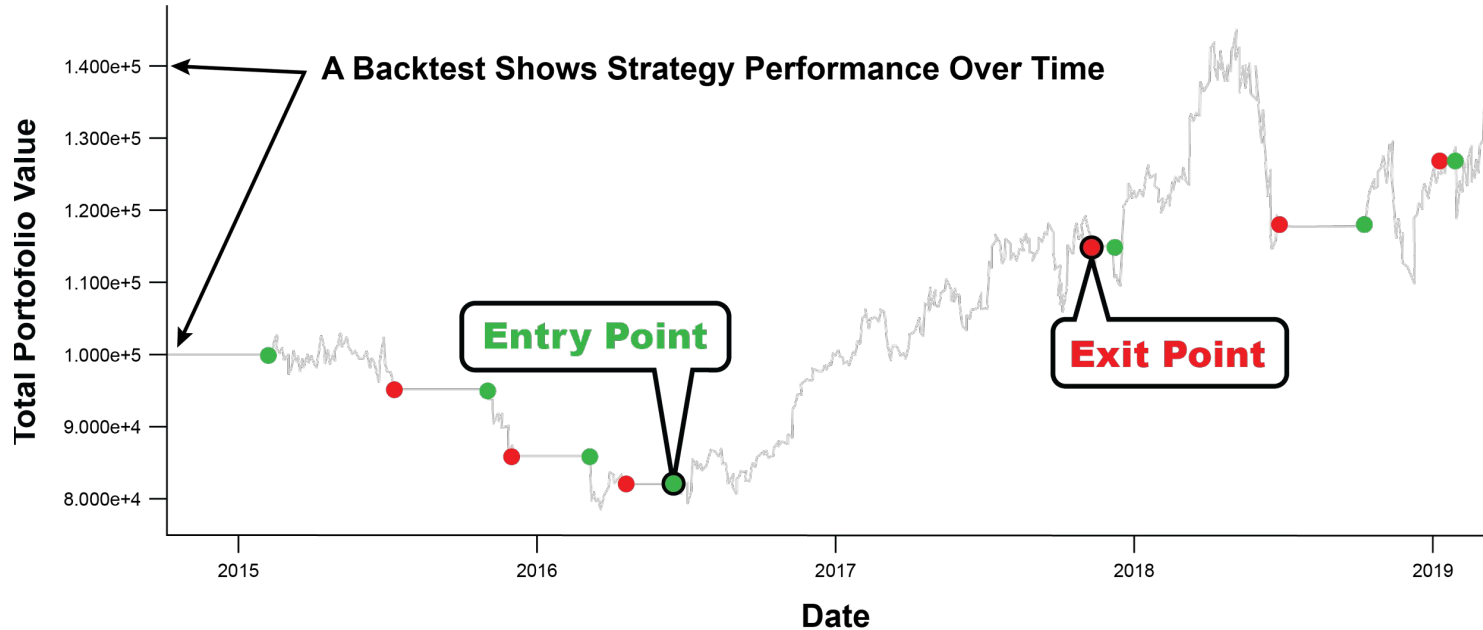
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# Introduction Backtesting

# Backtesting

**Backtesting** is the process for measuring the overall performance of a trading strategy using historical stock prices to simulate executed trades dictated by the calculated trading signals and trade decision logic.





**What's an optimal trading algorithm?**

# Backtesting

At a glance, the optimal trading algorithm is the one that fits the investor's risk tolerance; as its name suggests, it is the level of risk that an investor is willing to tolerate.

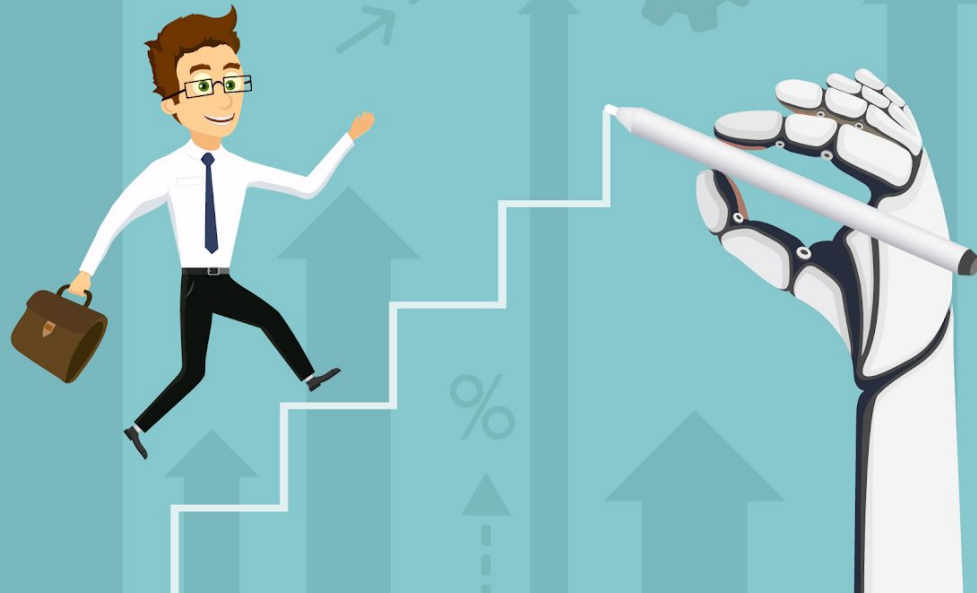
Individuals who are more risk averse want more-conservative trading strategies, or those with less potential profit but also less risk of loss. By contrast, risk tolerant individuals are willing to take on more-speculative trading strategies, or those with the potential for great profit but also for great loss.



# Planning Your Retirement

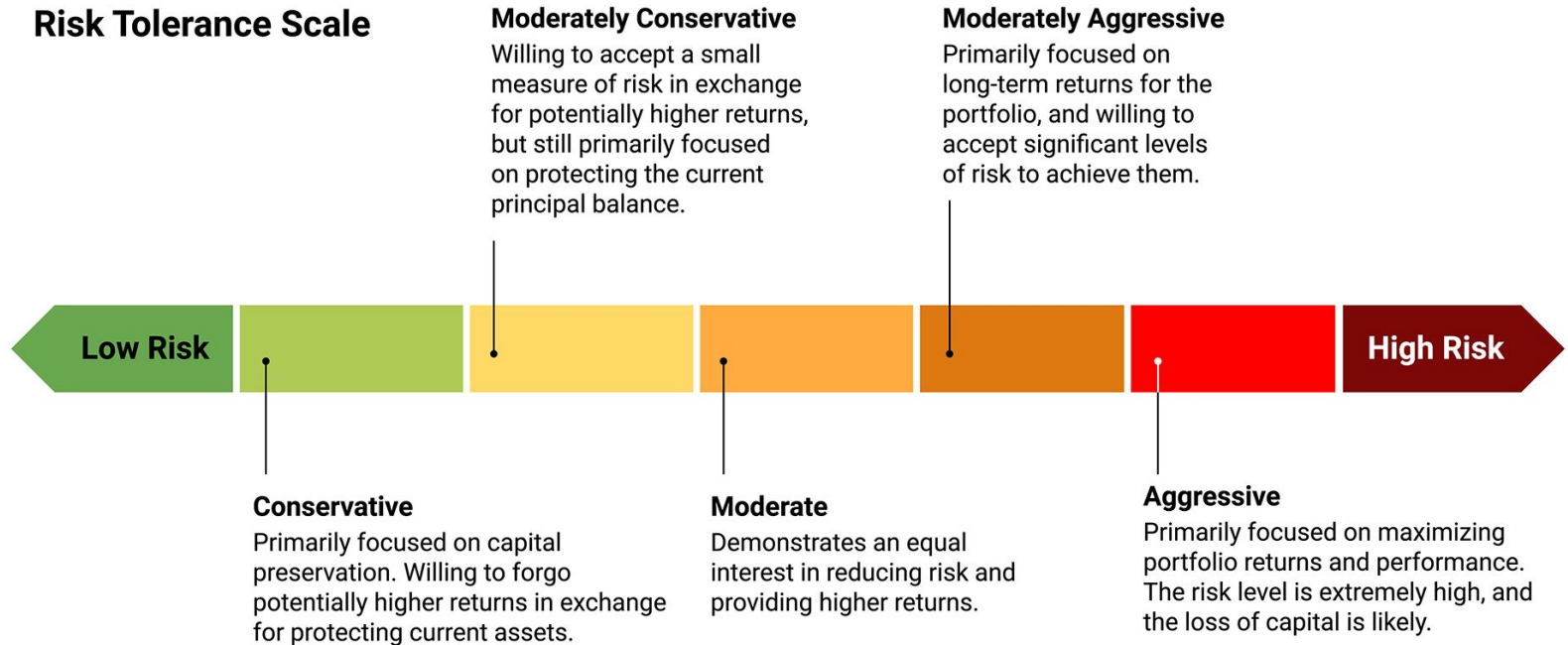
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You might treat your retirement account differently than the short-term account that you use to fund your day-to-day living expenses. You may want to take more risk with your retirement account if a long time will elapse until you'll need the funds. By contrast, if you need the funds from your short-term account to pay the mortgage or rent next month, you won't have time to make up for potential investment losses.



# Risk Tolerance Scale

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# Instructor Demonstration

## Backtesting a Trading Algorithm



## **Activity:** Backtest Your Short-Position Algorithm

In this activity, students will backtest an algorithm to determine both the changes to the overall portfolio values and the daily return and cumulative return metrics.

**Suggested Time:**  
15 Minutes





**Time's Up!** Let's Review.

# Risk/Reward Characteristics

# Balancing Past Vs. Future Data Usage

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When we backtest a trading algorithm, the results are based on historical data. This means that backtesting might demonstrate that the algorithm would have been profitable in the past. However, it doesn't guarantee how the algorithm will perform in the future.

# Balancing Past Vs. Future Data Usage

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Like a machine learning model can overfit to its training data and not perform well on the testing data, an algorithmic trading strategy that's designed to succeed with past data might not work with future data.

# Risk/Reward Management

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## Considerations:

01

Due to the inherent uncertainty about future profitability, the golden rule of trading is to use risk/reward management.

02

Since future market conditions are unknowable, traders should make investments only when they feel comfortable with the level of risk that's required for achieving a certain level of profit

03

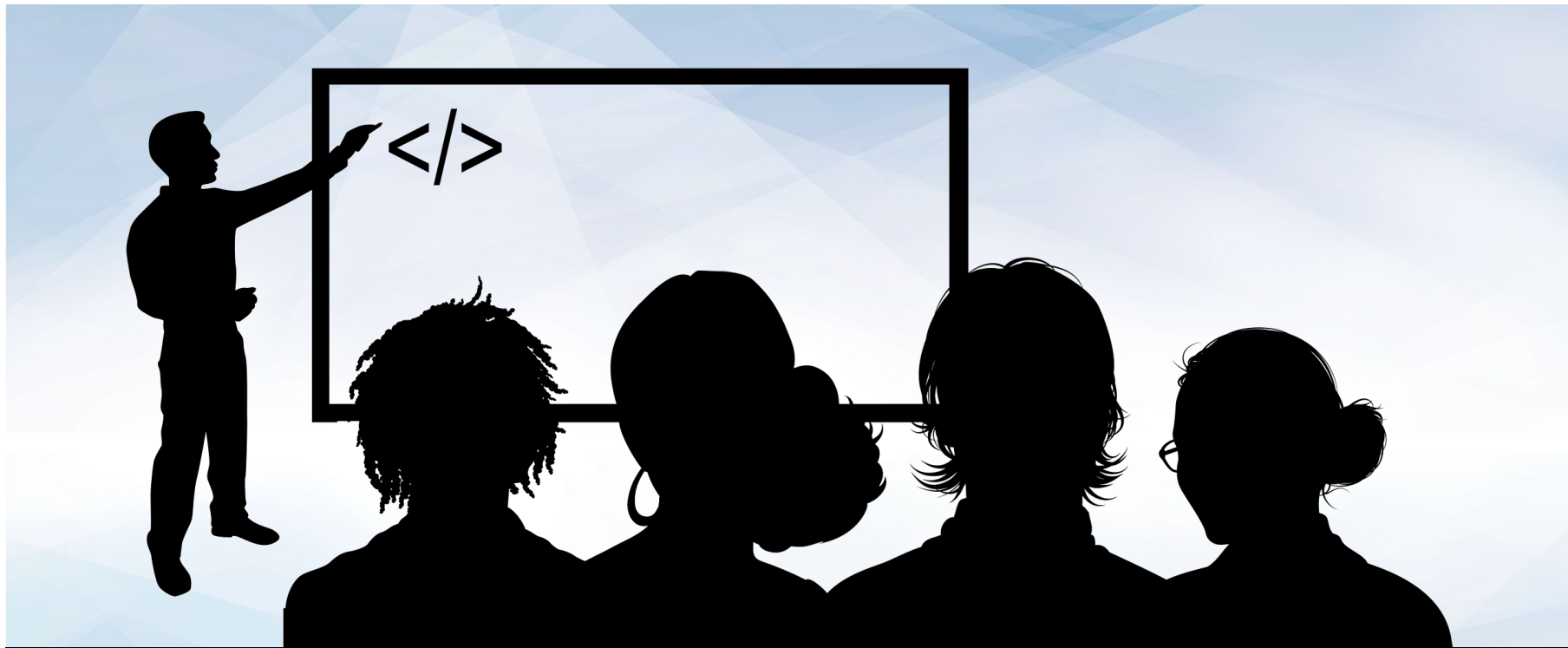
Before deploying a trading algorithm, we need to analyze the algorithm's overall risk/reward characteristics at both the portfolio and per-trade level.

# Risk/Reward Characteristics

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At a glance, the risk/reward characteristics of a trading strategy can be understood as the amount of risk, or the potential loss, that a person assumes for an investment with the expectation of returning a gain, or an expected amount of profit.





# Instructor Demonstration

## Assessing the Risk/Reward Characteristics of a Trading Algorithm

# Risk/Reward Characteristics

These metrics can be calculated historically with backtesting, or they can be used to measure future trades and opportunities for portfolio growth.

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01

Annualized Return

04

Sharpe Ratio

02

Cumulative Returns

05

Sortino Ratio

03

Annual Volatility

01

## Annual Return

A time weighted annual percentage representing the return on an investment over a period of time.

02

## Cumulative Return

The total/aggregated amount of gains and losses for an investment. Cumulative return is measured across time and not for a given time period.

03

## Annual Volatility

The annualized degree of variation in trading prices over time.

## 04 Sharpe Ratio

The return of investment compared to its risk, measured by the difference between the return on investment and the risk-free return.



07

## Sortino Ratio

The quotient of expected return to harmful volatility. The Sortino ratio focuses on downside deviation rather than standard deviation.

# Columns of the trade\_evaluation DataFrame.

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**Stock:** The name of the asset that we're trading.



**Entry/Exit Date:** The date that we entered (bought)/exited (sold) the trade.



**Shares:** The number of shares that we executed for the trade.



**Entry Share Price:** The price of the asset when we entered the trade.



**Exit Share Price:** The price of the asset when we exited the trade.



**Entry Portfolio Holding:** The cost of the trade on entry.



**Exit Portfolio Holding:** The proceeds that we made from the trade on exit.



**Profit/Loss:** The profit or loss from the trade.





## **Activity:** Evaluating Your Short-Position Algorithm

In this activity, students will evaluate the risk/reward characteristics of the short-position strategy that they created before.

**Suggested Time:**  
15 Minutes

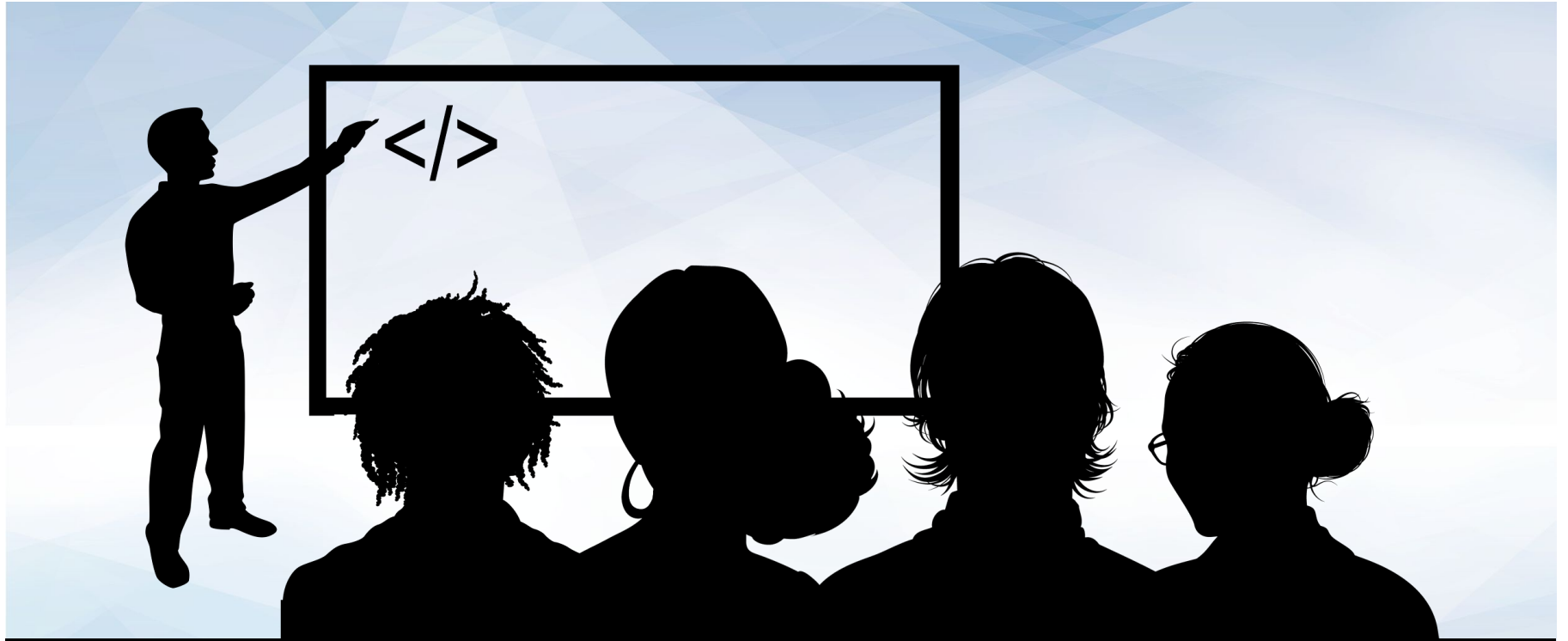




**Time's Up!** Let's Review.



Break



# Instructor Demonstration

## Alternative Technical Indicators



## **Activity:** Using FinTA for Trading Signals

In this activity, students will utilize the FinTA Python library to generate the technical indicator values used in several trading algorithms.

**Suggested Time:**  
15 Minutes





**Time's Up!** Let's Review.



Questions?

*The  
End*