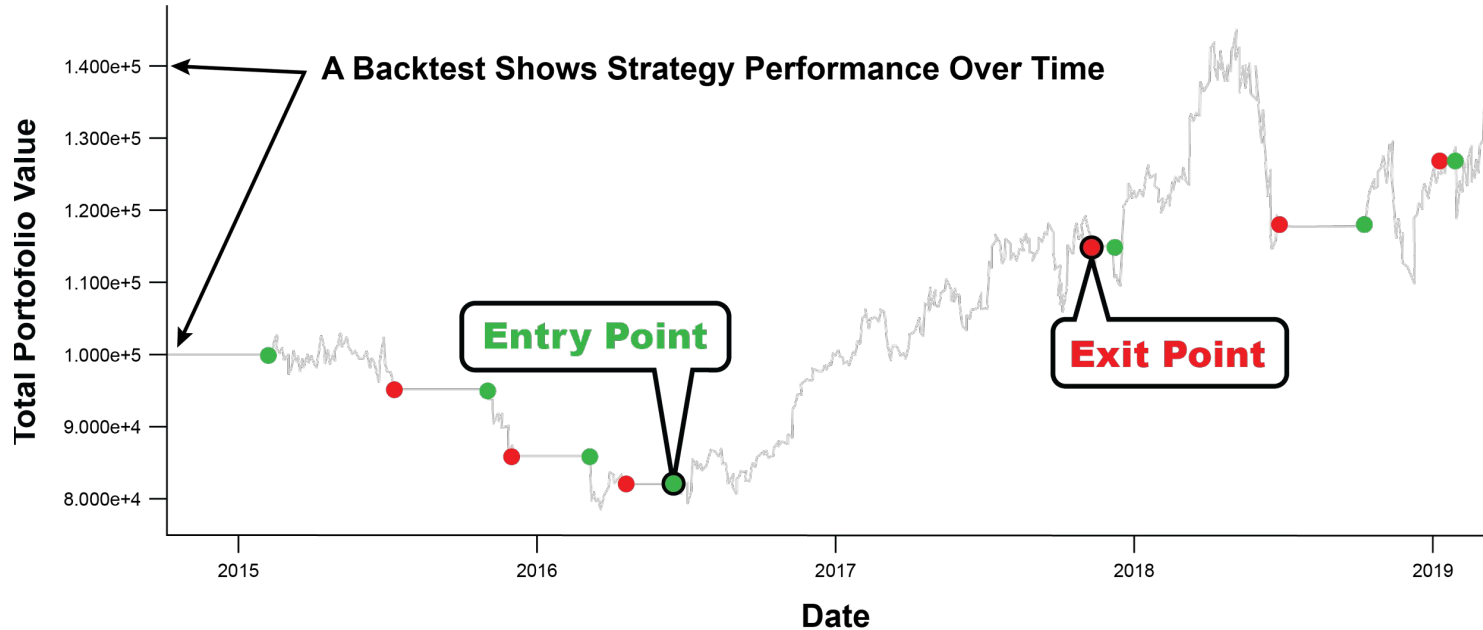# Algorithmic Trading

FinTech

Lesson 15.2

Legal Disclaimer

The content contained in the FinTech Boot Camp (the "Course") is for informational purposes only. You should not construe any such information or other material provided pursuant to the Course (the "Materials") as investment, financial, tax, legal or other advice. The Materials are not investment advice and any observations concerning any security, trading algorithm or investment strategy provided in the Course is not a recommendation to buy, sell or hold such investment or security or to make any other investment decisions. Trilogy Education Services, LLC, its parent, subsidiaries, and affiliates ("Trilogy") do not provide any advice regarding the nature, potential value, risk or suitability of any particular investment strategy, trading algorithm, transaction, security or investment. Any use of the Materials, and any decisions made in reliance thereon, including any trading or investment decisions or strategies, are made at your own risk. You should seek the advice of a competent, licensed professional if you require investment, trading or other advice. No employee, agent or representative of Trilogy is authorized to provide any professional advice in connection with the Course and any such advice, if given, is in violation of Trilogy's policies, is unauthorized and may not be relied upon. Nothing contained in the Materials constitutes a solicitation, recommendation, endorsement, or offer by Trilogy or any third party service provider to buy or sell any securities or other financial instruments in this or in in any other jurisdiction whether or not such solicitation or offer would be unlawful under the securities laws of such jurisdiction.

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.

A Backtest Shows Strategy Performance Over Time

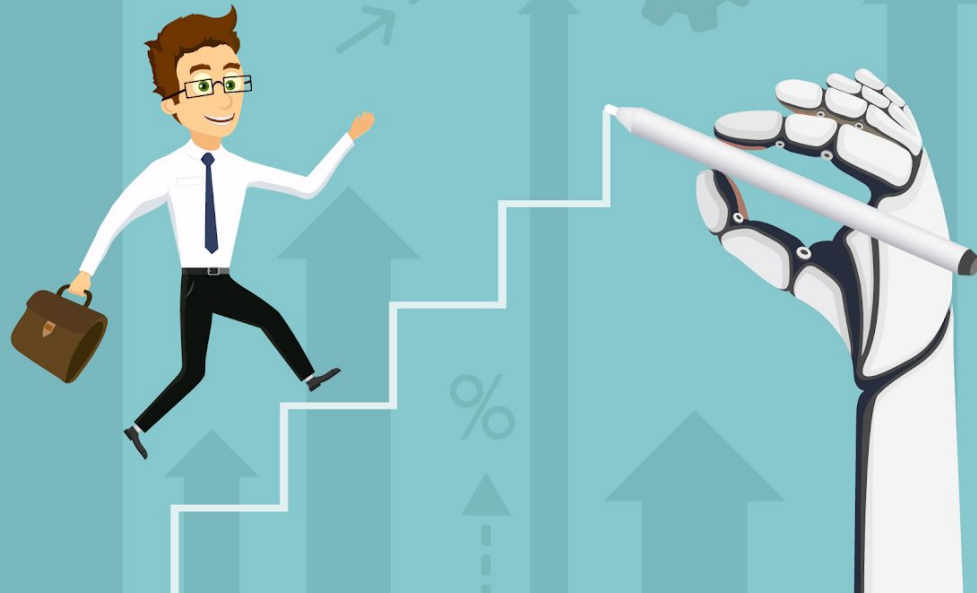# What's an optimal trading algorithm?

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.
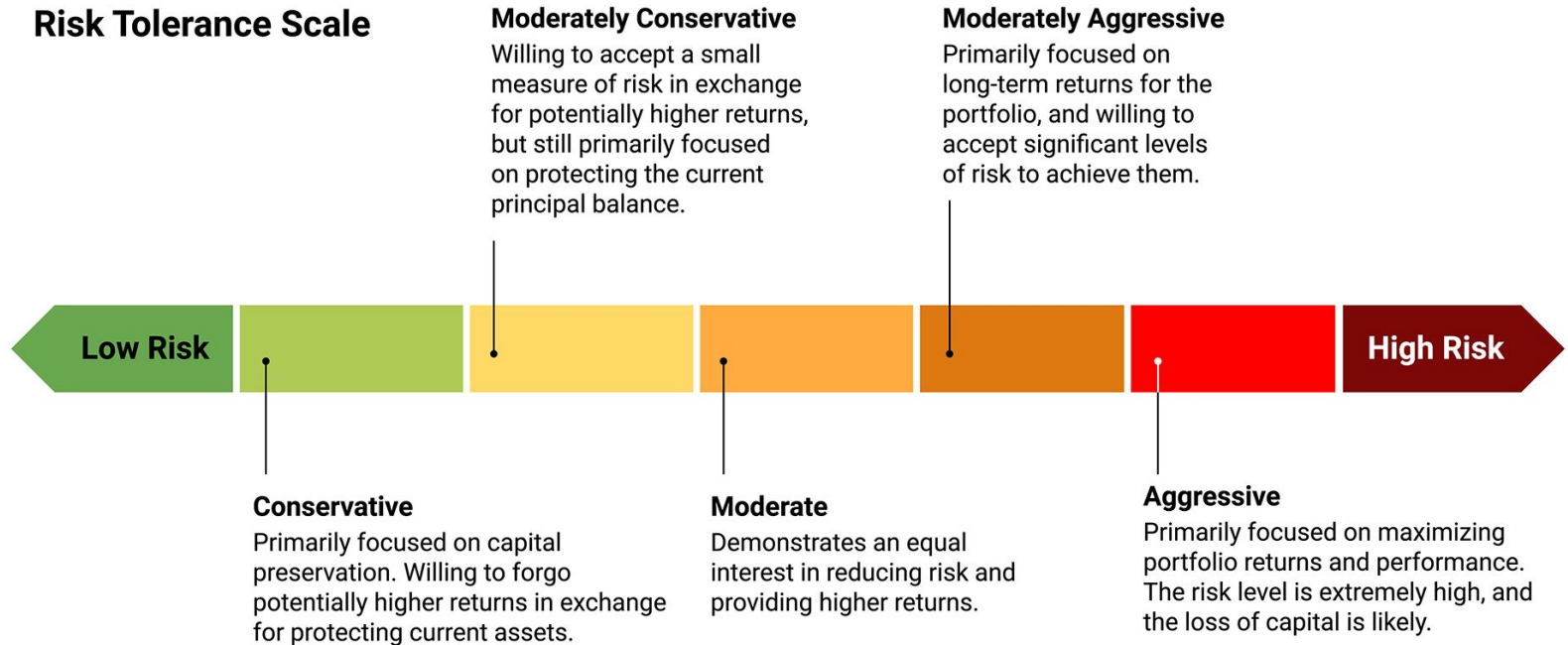
Planning Your Retirement

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

Risk Tolerance Scale

Moderately Conservative
Willing to accept a small measure of risk in exchange for potentially higher returns, but still primarily focused on protecting the current principal balance.

Moderately Aggressive
Primarily focused on long-term returns for the portfolio, and willing to accept significant levels of risk to achieve them.

Low Risk

High Risk

Conservative
Primarily focused on capital preservation. Willing to forgo potentially higher returns in exchange for protecting current assets.

Moderate
Demonstrates an equal interest in reducing risk and providing higher returns.

Aggressive
Primarily focused on maximizing portfolio returns and performance. The risk level is extremely high, and the loss of capital is likely.

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

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

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

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

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.
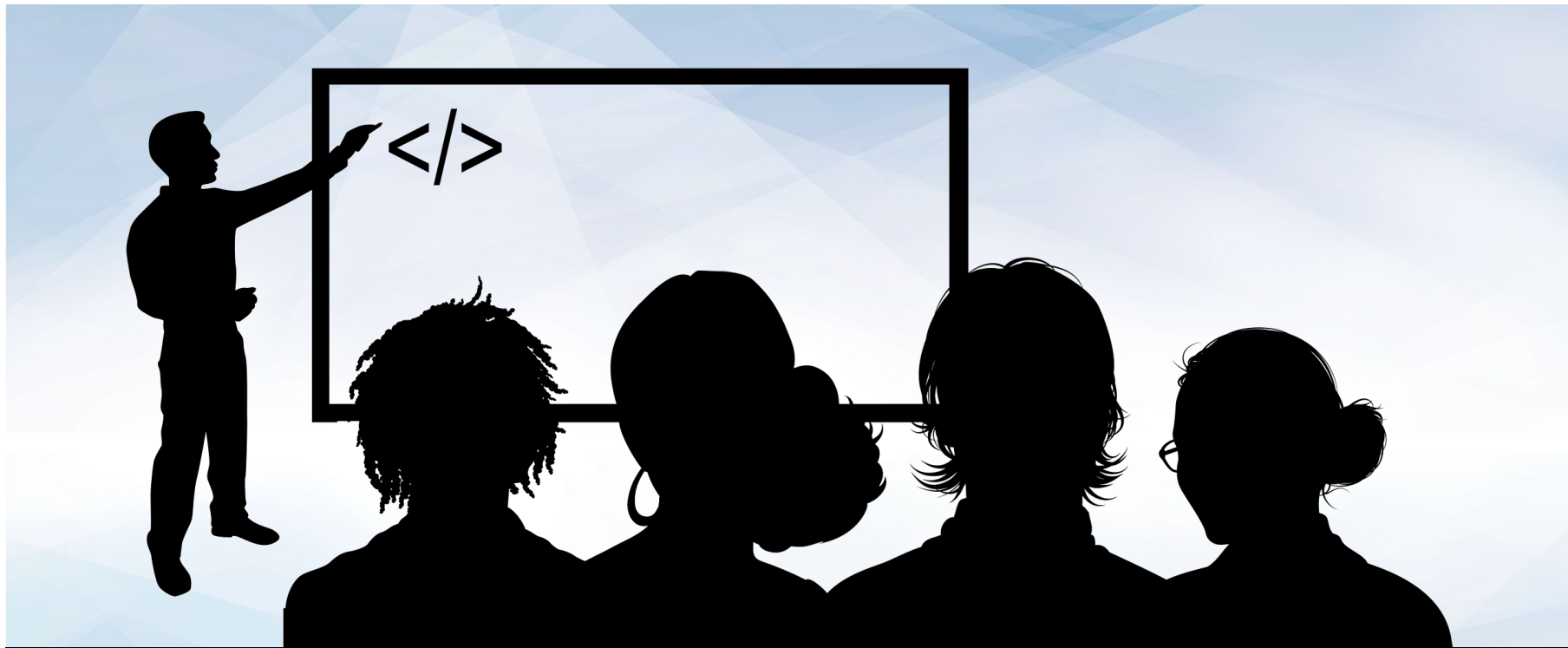
Instructor Demonstration
Assessing the Risk/Reward Characteristics of a Trading Algorithm

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.

01 Annualized Return

02 Cumulative Returns

03 Annual Volatility

04 Sharpe Ratio

05 Sortino Ratio

01 Annual Return

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

Trading Evaluation

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.

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.

Time's Up! Let's Review.

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?