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News

ALGO CAPM Forecasting Case

OVERVIEW

The Algorithmic CAPM Forecasting Case is designed to challenge participants' progra
developing algorithms using the RIT API to forecast future asset prices and automate
Throughout the case, these algorithms will capture the historical prices of the securitie
sensitivities with beta, forecast future asset return using CAPM model, identify price tr
orders to profit from private information about the changing market movement. Due to
nature of the case, participants are encouraged to develop algorithms that can adapt t
market dynamics using their selected programming languages.

KEY OBJECTIVES

- Develop a forecasting algorithm model using the provided template to assess the i
  news on the future prices of both the market index and individual stocks. Explore th
  by-tick historical last prices to gauge the sensitivity of stock prices to market risk. In
  into the CAPM model to predict future stock price movements.

- Construct a trading algorithm designed to identify profitable investment opportunitie
  future returns earned on individual tradable stocks. Compare these forecasts acros

stocks to pinpoint potentially profitable investment avenues.

Support Scripts - Python

The Algo CAPM case includes one basic algo script written in Python script. be aware scripts are basic and you need to develop them to support your trading strategy.

Click below to download the scripts in one zip compressed folder:

- One script file as basic algo script.

Base Algo Scripts
Click Here to Download

TEAM ROLES

In this case, only one team member will have Trader role:

ABCD-1: Role of Algo Trader

Algorithmic Trading Case: Any one member may represent the team in the single r

DESCRIPTION

There will be 6 heats with 1 team member competing in each heat. Only one team me represent the team for all heats. Each heat will be 10 minutes long representing three where 50 ticks represent 1 trading week.

- Number of trading heats: 6
- Trading time per heat: 600 seconds (10 minutes)
- Calendar time per heat: One quarter year (three months) of trading

Order submission using the RIT API will be enabled. Data retrieval via Real-time Data the RIT API will also be enabled. **All trades must be executed by a trading algorith** not be allowed to trade manually through the RIT Client once the heat begins. Particip modify their algorithms in response to prevailing market conditions and competition fr

other teams. They will have 1 minute between each heat to re-load their algorithms. A
algorithm will be provided [1] to participants and can be directly modified for use in the
However, participants are encouraged to create their own algorithms.

At the beginning of each heat, participants are provided with information about the pre
rate derived from the 10-year Government bond yield, along with the initial beta coeffi
stock. This information aids in assessing potential excess returns relative to the marke
facilitating the initial determination of assets' correlation or sensitivity to the market inc
coefficient is subject to change based on market movements and evolves over the cou

Throughout the trading simulation, participants will receive various insights from privat
outlining expectations for future market index prices. These updates must be leverage
anticipated return on the market index. Subsequently, participants integrate this inform
calculated beta into the predictive CAPM model to forecast future price movements in
asset. Profit opportunities can be captured by executing algorithmic limit or market orc
their forecasted price outcomes.

[1] The "Base Algorithm" will be released on the RITC webpage as outlined in the "Imp
section above.

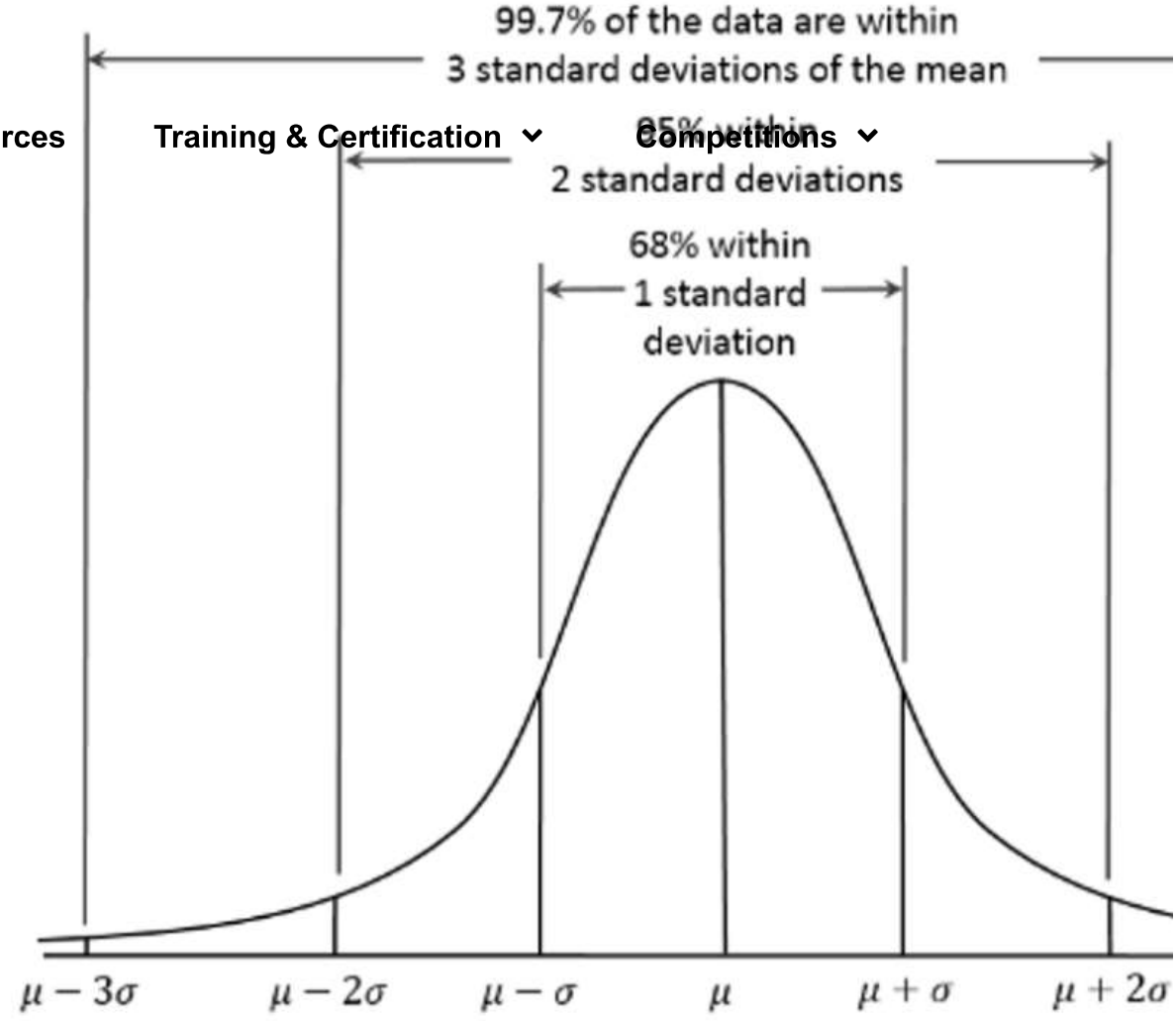
MARKET DYNAMICS

This case involves four securities with the following details:

Ticker	RITM	ALPHA	GAMMA
Security type	Index	Stock	Stock
Quote currency	CAD	CAD	CAD
Price	High	Medium	Medium
Volatility	Low	Low	High
Beta	n/a	Low	High
Max Trade Size	n/a	10000	10000
Trading Fee	n/a	0.02	0.02
Trading Limit/Fine (Gross)	n/a	250000/0.5	250000/0.5
Trading Limit/Fine (Net)	n/a	100000/0.5	100000/0.5

Throughout the simulation period, participants will receive weekly confidential updates projected future price of the RIT Market Index (RITM). A total of 12 private news releas distributed at various intervals of each week, providing details about the expected RIT upcoming day.

Participants can leverage this information to calculate the future return on the market subsequently use it to make predictions about the future prices of securities with the u The precision of these predictions depends on the margin of error associated with the of the market index price. It is important to recognize that analysts' predictions may nc when forecasting market index prices. Therefore, participants should consider a certa their asset return calculations. This margin of error, denoted as X, follows a standard r as outlined below:



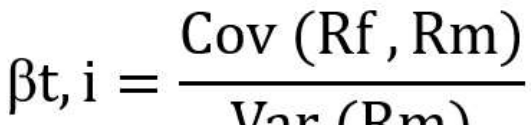
For instance, a perfect forecast of the market price implies that the margin of error will approaching zero. There is a 99.7% likelihood that the error falls within the three stand the mean of the error distribution.

Participants can use the expected market return along with their estimated time-varyir fundamental CAPM model to project the expected return from a particular stock. The l is represented by the following equation:

$$E[R_i] = R_f + \beta_{t,i}\,(E[R_m] - R_f)$$

where:
$E[R_i]$ is the expected return of investment on stock i
R_f is the risk-free rate
$\beta_{t,i}$ is the beta of stock i at time t
R_m is the forecasted market return on RITM

To calculate beta sensitivity of the stock, participants need to gather historical prices f Historical prices can be collected from the inception, and participants can estimate be following function:



Alternatively, beta is equal to the slope coefficient when the historical return of market on the historical returns of a stock.

The expected return predicted by the CAPM model serves as a valuable tool for partic potential price shifts in each tradable security. This enables participants to formulate ir strategies by evaluating the predicted price against the market price and conducting a across all stocks. The projected price serves as a basis for generating profits through limit or market orders. It is advisable to refrain from employing market-making strategi large orders, as these actions can cumulatively impact asset prices and indirectly influ investment strategies derived from predictive analysis.

TRADING/POSITION LIMITS AND TRANSACTION COSTS

Participants can be assured about the liquidity of securities, as computer-generated tr place buy and sell orders marked as 'ANON' in the order book. These computer trade calibrated parameters to meet specific market requirements and lack foreknowledge c movements. Consequently, they place buy and sell orders with equal probability, acco randomly generated from a normal distribution centered around the mid-market price.

In addition, there is a trading limit set at 250,000 shares gross and 100,000 shares ne surpassed, participants are unable to execute additional trades, and a penalty of 50 c incurred. The maximum order size for any single order, whether long or short, is capp shares. Furthermore, a commission of 2 cents per share is applied to each transactior tradable stocks.

POSITION CLOSE-OUT

All non-zero stock positions will be liquidated at the conclusion of the trading session, traded price as the reference price of the asset.

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Location and operating hours

Lab operating hours
Monday to Friday, from 9:00 AM to 5:00 PM

Lab location
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Graduate Rotman students access
24/7 access using the fob

Undergraduate Rotman students access
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