Finance Research and Trading Lab

Rotman

Algorithmic ETF Arbitrage Case

Rotman International Trading Competition (RITC)x

OVERVIEW

The Algorithmic ETF Arbitrage Case challenges participants to combine critical thinking, analytical skills, and programming expertise to manage liquidity risk and exploit arbitrage opportunities. In this case, an ETF – composed of individual stocks – creates recurring arbitrage situations through a series of private tender offers. Participants must make rapid decisions on whether to accept or reject each offer based on profitability and then efficiently unwind large positions to maximize returns while carefully managing liquidity and market risks.

What sets this case apart is its algorithmic focus: participants are required to design and implement trading algorithms using the RIT API to automate their strategies. These algorithms must be capable of submitting orders, responding dynamically to arbitrage opportunities, and adapting to fast-changing market conditions. Success will depend not only on identifying and capitalizing on price differentials between market and tender offer prices but also on building resilient, adaptive code that can handle the high-frequency nature of the environment.

DESCRIPTION

The Algorithmic ETF Arbitrage Case will be 5 minutes long and represent one month of trading.

All trades must be executed by a trading algorithm, so participants will not be allowed to trade manually through the RIT Client once the case begins. However, participants are allowed to modify their algorithms. A base template algorithm will be provided for participants and can be modified for use in the competition. However, participants are encouraged to create their own algorithms using the RIT API.

MARKET DYNAMICS

There are multiple iterations, each with unique market dynamics and parameters. Potential parameter changes include factors such as the spread of tender orders, liquidity, and volatility. The following market dynamics and parameter details that will remain same in each iteration will help participants to formulate trading strategies. This case involves five securities with the following details.

Ticker	CAD	USD	BULL	BEAR	RITC
Security type	Currency	Currency	Stock	Stock	ETF
Quote currency	CAD	CAD	CAD	CAD	USD
Starting Price	n/a	n/a	$10	$15	$25
Fee/share (Market orders)	n/a	n/a	$0.02	$0.02	$0.02
Rebate/share (Limit/Passive orders)	n/a	n/a	$0.01	$0.01	$0.01
Max order size	2,500,000	2,500,000	10,000	10,000	10,000

The base currency in this case will be CAD. Therefore, USD will be quoted in a direct exchange rate as the number of CAD required to buy 1 USD.

Participants will be able to trade two stocks denominated in CAD and one ETF denominated in USD with varying levels of volatility and liquidity. This dynamic exposes participants to the basics of market microstructure in the context of algorithmic trading. In equilibrium, the ETF pricing will reflect the following sum of the two stocks traded, subject to periodic shocks to its price. In other words, in equilibrium, the CAD-converted price of the RITC ETF will be the sum of prices of both BULL and BEAR stocks since the ETF is equally weighted.

$$P_{RITC,USD} * USD = P_{BULL,CAD} + P_{BEAR,CAD}$$

Participants will also receive private tender offers for the ETF. Since the decision time to accept or reject a tender offer is very short, participants should build an algorithm to evaluate the profitability of a tender offer to make a decision to accept it or not. Once a tender offer is accepted, a participant's algorithm should also unwind the positions at a profit while managing the market price impact of trades.

In addition, there will be two Converters[1] available to facilitate a conversion between the underlying stocks and the ETF. Participants should consider using these Converters as an alternative approach to manage the liquidity risk associated with submitting orders directly to the market. Please note that these Converters can only be used by human participants: you will be able to use them from the RIT Client manually but your algorithm will not be able to use them automatically through the API.

Converters	Description	Convert From	Convert To	Cost
ETF-Creation	ETF creation from underlying stocks	10,000 BULL stocks and 10,000 BEAR stocks	10,000 units of RITC	$1,500 USD/use
ETF-Redemption	ETF redemption to underlying stocks	10,000 units of RITC	10,000 BULL stocks and 10,000 BEAR stocks	$1,500 USD/use

TRADING/POSITION LIMITS AND TRANSACTION COSTS

Each participant will be subject to gross and net trading/position limits during trading in each heat. The gross limit reflects the sum of the absolute values of the long and short positions across all securities, and the net limit reflects the sum of long and short positions such that short positions negate any long positions. Trading/position limits will be strictly enforced and participants will not be able to exceed them. Each position in the stocks will be counted towards trading/position limits with a multiplier of one, while each position in the ETF will be counted with a multiplier of two. For

[1] The two Converters are available from the "Assets" tab on the RIT Client.

example, if you long 100 shares of any stocks, your gross and the net limits will increase by 100. If you buy 100 shares of RITC, your gross and net limits will increase by 200 (100 shares * multiplier of two).

The maximum trade size will be 10,000 shares per order for both stocks and the ETF. Transaction fees will be set at $0.02 per share for each stock and the ETF on all market orders filled. A rebate of $0.01 per share for each stock and the ETF will be provided for all submitted limit orders that are filled.

POSITION CLOSE-OUT

Any non-zero position will be closed out at the end of trading at either the last traded price or the correct price if the stock is experiencing a divergence due to market shock. As such, participants are not required to close statistical arbitrage positions as the iteration ends.

KEY OBJECTIVES

- Create an algo model using the provided template to identify the profitability of private tender offers and execute trades accordingly while managing liquidity risk and market risk. Consider utilizing ETF-Creation and ETF-Redemption Converters as an alternative approach to mitigate liquidity risk when working a private tender offer.

- Build a trading algorithm that identifies arbitrage opportunities between underlying stocks and the ETF. Consider trading CAD and USD in order to hedge the currency exchange rate exposure.