Rotman INTERNATIONAL TRADING COMPETITION

CELEBRATION EDITION

bp

Master of Financial Risk Management

MathWorks®

CASE PACKAGE

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About RITC and RITC-CE

A WARM WELCOME FROM THE ROTMAN COMMUNITY

The Rotman International Trading Competition (RITC) is a one-of-a-kind event hosted annually at the Rotman School of Management at the University of Toronto, in the heart of one of North America's largest financial centres. RITC is the world's largest simulated market challenge and brings together teams of students and faculty advisors representing over 50 top universities across the world.

The competition is predominantly structured around the Rotman Interactive Trader (RIT) market simulator platform (an electronic exchange that matches buyers and sellers in order-driven markets) on which decision cases are run. The cases represent various scenarios for risks and opportunities with a focus on specific investment, portfolio or risk management objectives. Participants will be challenged to handle a wide range of market environments.

This year's edition, RITC 2021, would have been our 18th year of hosting the competition. However, given the challenges of the current pandemic situation around the world, it has proven difficult to host RITC in its original in-person format this year. However, in the spirit of continuity and competition, we are committed to providing a competition experience to our valued participants in this challenging year.

This year the competition will be hosted virtually. Although we will be gathering together online from around the world, RITC-CE has been designed to promote the skill enhancement and competition spirit that is reminiscent of our past RITC events. We hope to re-connect with everyone in person as soon as possible.

This Case Package provides an overview of the content of RITC-CE. We are thrilled that you will be participating!

Important Information

PRACTICE SERVERS

Selected practice servers will be made available starting February 5th. Further information on their release dates can be found below and more information will be posted on the RITC-CE webpage as it becomes available.

Case Name	Release Date
BP Commodities Case	Friday, February 5th by 11:59pm EST
Algorithmic Trading Case	Friday, February 5th by 11:59pm EST
Liquidity Risk Case	Friday, February 5th by 11:59pm EST

Practice servers will operate 24 hours a day, 7 days a week until 11:00pm EST on Thursday, February 18th. Information on how to download and install the RIT v2.0 Client is available on the RIT website: http://rit.rotman.utoronto.ca/software.asp.

The following table details the server address and ports available for RITC-CE practice:

Case Name	Server Address	Port
Liquidity Risk Case	flserver.rotman.utoronto.ca	16600
BP Commodities Case	flserver.rotman.utoronto.ca	16605
Algorithmic Trading Case Server 1	flserver.rotman.utoronto.ca	16610
Algorithmic Trading Case Server 2	flserver.rotman.utoronto.ca	16615
Algorithmic Trading Case Server 3	flserver.rotman.utoronto.ca	16620
Algorithmic Trading Case Server 4	flserver.rotman.utoronto.ca	16625
Special practice sessions (more info below)	flserver.rotman.utoronto.ca	16650

To log in to any server port, except for the BP Commodities Case, you can type in any username and password to create an account if it does not already exist. If you have forgotten your password, or the username appears to be taken, simply choose a new username and password to create a new account. For the BP Commodities Case, your team's login information will be sent to you by email prior to the release of the practice case.

Multiple server ports have been provided for the Algorithmic Trading Case to allow teams to trade in either populated or unpopulated environments. For example, if you are testing your algorithm and there are several other algorithms running, you may want to move to a different port where there is less trading.

Please note that the case structure on practice servers and during the competition will be the same, but market dynamics may be different depending on the participants' trading behaviour. Price paths will also be different during the competition. In addition, market parameters during the competition may be adjusted to better account for over 100 live traders.

The BP Commodities Case on the practice servers will include different sets of news and price paths. This means that server files with different sets of news and price paths will be randomly selected to run on the practice server for the BP Commodities Case. The Liquidity Risk Case and the Algorithmic Trading Case will have new, randomized sets of security paths each time they are run on the practice server.

Special practice sessions

We will be running three "special" practice sessions to trade *all* competition cases: the first session is on Thursday, Feb 11th at 1:00pm EST; the second session is on Monday, Feb 15th at 10:00am EST; the third session is on Thursday, Feb 18th at 4:00pm EST. We will be running one iteration of each case, and all teams are invited to connect to **port 16650** for these special practice sessions (all practice cases will be run on this port during these special practice sessions).

ADDITIONAL SUPPORT FILES

The following support files will be provided on the RITC-CE webpage:

- The "Performance Evaluation Tool" for the Liquidity Risk Case will be released on February 5th (Click here to download file)
- The Algorithmic Trading Case Base Algorithm and other relevant support will be released on February 5th (Click here to download file)

Other documents may be posted on the RITC-CE webpage. If so, participants will be notified via email.

SCORING AND RANKING METHODOLOGY

The Scoring and Ranking Methodology document will be released prior to the start of the competition on the RITC-CE webpage. An announcement will be sent out by email to participants when the document is available.

COMPETITION SCHEDULE

This schedule is subject to change prior to the competition. Participants can check on the RITC-CE webpage for the most up-to-date schedule. Please note that every team will be trading at the same time at RITC-CE, instead of being split into two groups as in RITC's normal format.

TEAM ROLES

Participants must submit team roles by Friday, February 12th at 11:59pm EST. This specifies each team member's role in the BP Commodities Case and who will be trading in the Algorithmic Trading Case. Further instructions on how to submit your team roles will be sent via email.

COMPETITION WAIVERS

Each participant is required to sign and submit a competition waiver prior to his/her participation at RITC-CE. Please Click Here to access the waiver form, to be signed and returned via email by Friday, February 12th at 11:59pm EST).

QUESTIONS

Please send any questions to ritc@rotman.utoronto.ca. To ensure the fair dissemination of information, responses to your questions will be posted online for all participants to see under the FAQ section of the RITC-CE webpage.

Case Summaries

BP COMMODITIES CASE

The BP Commodities Case challenges the ability of participants to trade in a closed supply and demand market for crude oil. Natural crude oil production and its use, coupled with regulatory compliance in the form of carbon credits, will form the framework for participants to engage in trade to meet their objectives. The case will test each participant's ability to understand sophisticated market dynamics and optimally perform his/her role, while stressing teamwork and communication. The case will involve crude oil production, refinement, storage, as well as trading its synthesized physical products and carbon credits.

ALGORITHMIC TRADING CASE

The Algorithmic Trading Case is designed to challenge participants' programming skills by developing algorithms using the RIT API to automate trading strategies and react to changing market conditions. Throughout the case, these algorithms will submit orders to profit from arbitrage opportunities and private tender offers. Due to the high-frequency nature of the case, participants are encouraged to develop algorithms that can adapt to rapid changes in market dynamics using their selected programming languages.

LIQUIDITY RISK CASE

The Liquidity Risk Case challenges participants to put their critical thinking and analytical abilities to test in an environment that requires them to evaluate the liquidity risk associated with large tender offers. Participants will be faced with multiple tender offers throughout the case. This will require participants to make rapid judgments on the profitability, subsequent acceptance and execution, or rejection, of each offer. Profits can be generated by taking advantage of price differentials between market prices and prices offered in the private tenders. Once any tender has been accepted, participants should aim to efficiently close out their large positions to maximize returns and minimize liquidity and market risks.

BP Commodities Case

OVERVIEW

The BP Commodities Case challenges the ability of participants to trade in a closed supply and demand market for crude oil. Natural crude oil production and its use, coupled with regulatory compliance in the form of carbon credits, will form the framework for participants to engage in trade to meet their objectives. The case will test each participant's ability to understand sophisticated market dynamics and optimally perform his/her role, while stressing teamwork and communication. The case will involve crude oil production, refinement, storage, as well as trading its synthesized physical products and carbon credits.

DESCRIPTION

The BP Commodities Case will comprise 4 independent heats with 4 team members competing together. Each heat will be 16 minutes long and represent two months, or 40 trading days, of calendar time. Each heat will involve six tradable securities and four assets. Order submission using the RIT API will be disabled. Data retrieval via Real-time Data (RTD) Links and the RIT API will be enabled.

Parameter	Value
Number of trading heats	4
Trading time per heat	16 minutes (960 seconds)
Calendar time per heat	2 months (40 trading days)
Maximum order size	5 contracts
Mark-to-market frequency	Daily (24 seconds)

TEAM ROLES

In this case, each team member will have 1 of 3 specific roles:

1. Producer (one per team)
2. Refiner (one per team)
3. Trader (two per team)

Example:
Team ROTMAN will have 4 trader-IDs (ROTMAN-1, ROTMAN-2, ROTMAN-3, ROTMAN-4), and roles have been assigned according to the list below.

Trader-ID	Role
ROTMAN-1	Producer
ROTMAN-2	Refiner
ROTMAN-3 and ROTMAN-4	Trader

The team will determine the role of each member. Please remember to submit each member's role in the team schedule by **Friday, February 12th, at 11:59pm EST** as specified in the "Important Information" section above. If a team misses this deadline, roles will be randomly assigned by RITC-CE staff.

Producer

The producer has access to an oil rig that can extract Crude Oil (hereafter referred to as production of Crude Oil) and also to storage facilities that can store Crude Oil. The production of Crude Oil requires a lease cost for an oil rig and the purchase of corresponding units of Carbon Credits. The oil rig lease cost is $32,000 per day but may fluctuate throughout the case because of external factors. Producers are required to have corresponding units of Carbon Credits when producing Crude Oil in order to satisfy regulatory requirement for emissions of carbon dioxide or carbon dioxide equivalents.

Rotman Carbon Allowance (RCA) is a Carbon Credit contract traded in a spot market. Each contract contains 1,000 Assigned Amount Units (AAUs, hereafter referred to as units) of Carbon Credits that allow an entitlement to emit one tonne of carbon dioxide or carbon dioxide equivalent per unit. For every barrel of Crude Oil production, 0.5 tonnes of carbon dioxide is emitted.

Producers will be provided with a weekly allocation of RCA at the beginning of each week, but may decide to purchase additional Carbon Credits in order to have enough units to produce Crude Oil.

Producers will be provided with a total storage capacity of 20,000 barrels for Crude Oil at the beginning of each heat at no cost. However, in the event that a producer exceeds his/her storage limit or leases a storage unit again by clicking on "Lease" in the "Assets" tab on the RIT Client, he

or she will be forced to lease additional storage for the remainder of the heat at a more expensive distressed storage cost (see "Market Dynamics" below for more detailed information).

Refiner

The refiner has access to two separate facilities: New Refinery (N-Refinery) and Old Refinery (O-Refinery). The New Refinery is more efficient and costs $25/barrel while the Old Refinery costs $40/barrel. The New Refinery turns four barrels of Crude Oil into two barrels of Heating Oil and two barrels of RBOB Gasoline, whereas the Old Refinery turns eight barrels of Crude Oil into four barrels of Heating Oil and four barrels of RBOB Gasoline. RBOB Gasoline and Heating Oil are traded in gallons, where **one barrel equals 42 gallons**.

Each refinery asset has a refinery time and a refinery lease time; a refinery time is how long the refinery process takes and a refinery lease time is how often refiners are 'charged' with the lease price. The New Refinery has a refinery time of 84 seconds and a refinery lease time of 120 seconds and the Old Refinery has a refinery time of 108 seconds and a same refinery lease time of 120 seconds. Note that leasing additional refineries will be disabled when the remaining time in the heat is less than the refinery time.

Refiners will also need to make sure that they have enough units of Carbon Credits prior to running the refinery facilities. They will be provided with a weekly allocation of Carbon Credits but may decide to purchase additional Carbon Credits in order to have enough units prior to refining Crude Oil. For every barrel of Crude Oil refined through the New Refinery, one tonne of carbon dioxide is emitted, whereas one and a half tonnes of carbon dioxide are emitted for every barrel of Crude Oil refined through the Old Refinery.

Refiners will receive news impacting the prices of RBOB Gasoline and Heating Oil, and will have to evaluate the impact of these news items in order to decide which refinery, if any, is profitable to operate.

The RBOB Gasoline price will be mainly affected by news items related to market demand. These news items will need to be evaluated by refiners in order to determine their impact and how the future RBOB Gasoline price might change in response to the news.

The primary driver of Heating Oil prices will be fluctuations in temperature, since demand for Heating Oil will increase as expected temperatures fall. Hence, the price impact of changes in temperature will be estimated based on the simplified equation below:

$$P_{HO} = E_{HO} + \frac{\Delta_{HO}}{\sigma_{HO}}$$

Where,

P_{HO} is the final close out price for Heating Oil;
E_{HO} is the expected price for Heating Oil;
Δ_{HO} is the weekly temperature change;
σ_{HO} is the standard deviation of the temperature change.

The expected price of Heating Oil will start at $3.00/gallon. News regarding the weather will be released on a weekly basis. Furthermore, it is possible for Heating Oil prices to be also affected by external shocks affecting market demand and supply. These external shocks must be evaluated by refiners in order to determine their impact and to estimate future Heating Oil prices.

Refiners will need to accurately determine the profitability of running their refineries by evaluating the prices of their inputs (Crude Oil and Carbon Credits) as well as their future outputs (Heating Oil and RBOB Gasoline).

Refiners will be provided with a total storage capacity of 20,000 barrels for Crude Oil at the beginning of each heat at no cost. However, in the event that a refiner leases a storage unit by clicking on "Lease", he or she will be forced to lease additional storage for the remainder of the heat at a more expensive distressed storage cost (see "Market Dynamics" below). Heating Oil and RBOB Gasoline do not require storage.

Traders

Traders have access to Crude Oil markets as well as Heating Oil and RBOB Gasoline futures markets. During the trading period, traders will receive institutional orders from overseas clients who wish to buy or sell Crude Oil. Traders act as the "shock absorbers" for the market. They balance the supply and demand, and help markets achieve equilibrium by filling up their storage tanks when Crude Oil prices are very low and by selling Crude Oil back to the market when prices are relatively high.

Traders will be provided with a total storage capacity of 20,000 barrels for Crude Oil at the beginning of each heat at no cost. However, in the event that a trader leases a storage unit by clicking on "Lease", he or she will be forced to lease additional storage for the remainder of the heat at a more expensive distressed storage cost (see "Market Dynamics" below).

In addition, traders have access to the Carbon Credits spot market and are required to participate in the auction process for Carbon Credits. On a weekly basis, they will be required to provide a bid for a set quantity of Carbon Credits through a *blind, reserve-auction* process. Any traders who bid higher than the hidden reserve price will win the set quantity of Carbon Credits at the price that they bid. Traders may then decide to sell the Carbon Credits in the market.

MARKET DYNAMICS

Producers, Traders, and Refiners will be able to trade the securities according to the table below.

Commodities

Securities	Description	Contract Size	Accessibility	Shortable
CL	Crude Oil Spot	1,000 Barrels	Producer, Refiner, Trader	No
RB	RBOB Gasoline	42,000 Gallons	Refiner	No
HO	Heating Oil	42,000 Gallons	Refiner	No
HO-2F	Month 2 futures contract for HO	42,000 Gallons	Trader	Yes
RB-2F	Month 2 futures contract for RB	42,000 Gallons	Trader	Yes
RCA	Rotman Carbon Allowance	1,000 AAUs	Producer, Refiner, Trader	No

Participants will be able to utilize the following assets, which are required for storing and refining Crude Oil.

Assets*	Description	Capacity (Barrels)	Cost	Conversion Period
CL-PRODUCTION	Production Asset for Crude Oil	4,000	$32,000 per day	0.25 trading days
CL-STORAGE	Storage for Crude Oil	10,000	Endowed storage: Free**	N/A
N-REFINERY	New Refinery to Process Crude Oil	4,000	$100,000 per 5 trading days	3.5 trading days
O-REFINERY	Old Refinery to Process Crude Oil	8,000	$320,000 per 5 trading days	4.5 trading days

* hold up to 10,000 barrels.

**All starting endowments of storage are free. Subsequent storage leased (due to overproduction or the use of the "Lease" button) will be charged at a lease price of $500,000 per storage unit, which can hold up to 10,000 barrels.

Industry-specific news will be released to participants based on their roles. Producers will receive reports of their production and storage facilities (which are subject to changes throughout the case). The lease prices may also fluctuate, influencing the production cost of Crude Oil.

Refiners will receive news information on the RBOB Gasoline and Heating Oil markets, and they must use this information to forecast future prices. Traders will receive "The International Tender Report" which describes the expected institutional orders activity.

The interaction between the different market participants (producer, refiner, and traders) within each team, including their profit maximization objectives, will largely influence the overall profits of each team. Therefore, participants should optimize the dynamics between each member.

The following is a simplified example of the case:
Traders successfully submit a bid for 6 contracts of RCA at $20/unit. Traders are then able to sell 2 contracts of RCA to producers and 4 contracts of RCA to refiners in the market for $30/unit.

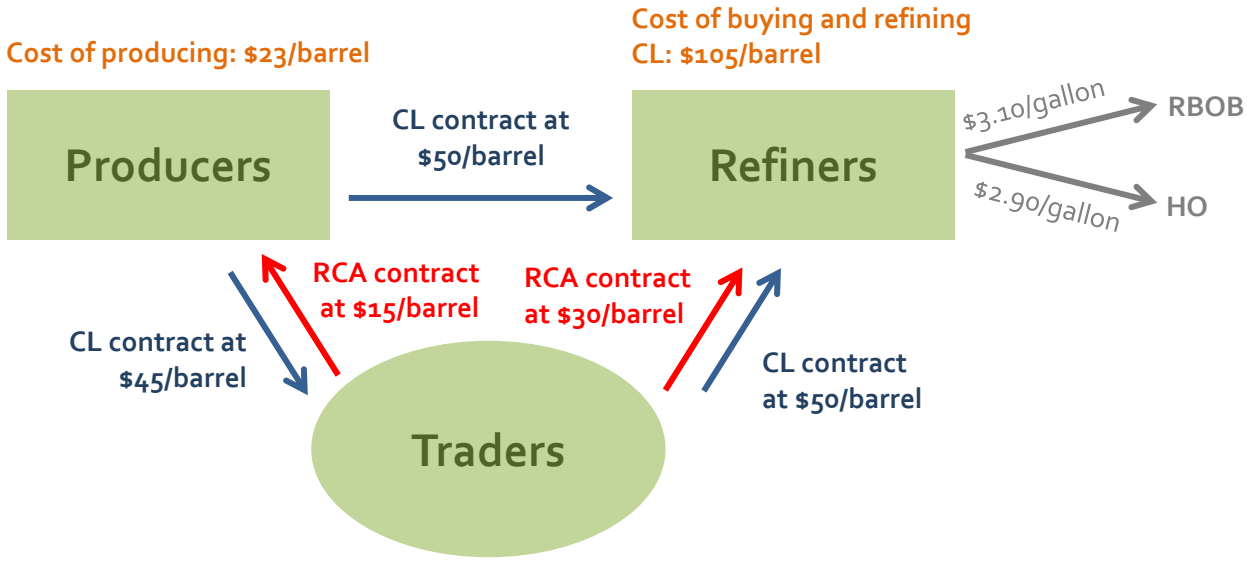
Producers operate the production asset and use 2 contracts of RCA to produce 4,000 barrels of Crude Oil. The production asset costs $8/barrel to lease (assuming a single extraction in the day) and a per-barrel cost for RCA is $15/barrel. Producers sell 2 contracts of Crude Oil to traders at $45/barrel and 2 contracts of Crude Oil to refiners at $50/barrel.

Refiners buy 4 contracts of Crude Oil, agreeing to buy 2,000 barrels of Crude Oil from the producers and 2,000 barrels of Crude Oil from traders at a price of $50/barrel each. In this scenario, refiners choose to operate the New Refinery which requires a lease cost of $25/barrel and 4 contracts of RCA. The per-barrel cost of RCA for the New Refinery is $30/barrel. Refiners are able to sell RBOB and HO at the current market price of $3.10/gallon and $2.90/gallon, respectively. Converting these values into barrels, we get: 42,000 * $3/gallon = $126,000 per 1,000 barrels, or $126/barrel.

Profit generated by each team member (per barrel):

- Traders: (price of RCA contract sold[1] – cost of buying RCA[1]) + (price of CL contract sold – cost of buying CL) = ($22.5 - $15) + ($50 - $45) = $13.50
- Producers: price of CL contract sold - cost of producing oil per barrel = $47.50 – ($8 + $15) = $24.50
- Refiners: value of refined products - cost of buying and refining oil = $126 – ($50 + $25 + $30) = $21

[1] Converted per barrel based on the total output of 8,000 barrels



TRADING/POSITION LIMITS AND TRANSACTION COSTS

Each participant will be subject to trading/position limits. Separate limits will be maintained for Crude Oil (CRUDE), RBOB/HO Products (PRODUCT), and Carbon Credits (RCA). Trading limits will be strictly enforced and participants will not be able to exceed them by trading. However, production and refining assets can and will cause limit breaches if they are not managed properly, resulting in a penalty of $25,000 per contract over each gross and net limit.

The maximum trade size will be 5 contracts, restricting the volume of the contracts transacted per trade to 5. The maximum trade size applies to all tradable securities.

POSITION CLOSE OUT

All futures positions will be marked-to-market every 24 seconds with any profits and losses reflected in the traders' cash balance by the mark-to-market operation.

Each security position, except Crude Oil and Carbon Credits, will be closed out at the last traded price. Crude Oil will be closed out at $30/barrel and Carbon Credits will be closed at $50/unit regardless of the market price.

KEY OBJECTIVES

Objective 1

Design a model to calculate the effect of news releases on the prices of Crude Oil, Heating Oil, and RBOB Gasoline. Using information gathered from news releases and trading data, track the supply and demand of oil throughout the simulation to determine optimal storage usage and trading strategies.

Objective 2

Maximize profits as a team of producers, refiners, and traders by communicating private news information with each other.

Note: Since this simulation requires a large number of participants in order to establish supply/demand, practice sessions for this case will be organized and held at specified times (please refer to the "Important Information" section above). After the practice sessions are completed, this practice case will be running on a loop for model calibration purposes ("trading skillfully" cannot be practiced unless there are 20+ users online).

Algorithmic Trading Case

OVERVIEW

The Algorithmic Trading Case is designed to challenge participants' programming skills by developing algorithms using the RIT API to automate trading strategies and react to changing market conditions. Throughout the case, these algorithms will submit orders to profit from arbitrage opportunities and private tender offers. Due to the high-frequency nature of the case, participants are encouraged to develop algorithms that can adapt to rapid changes in market dynamics using their selected programming languages.

DESCRIPTION

There will be 10 heats with 1 team member competing in each heat. Only one team member shall trade to represent the team for all heats. Each heat will be 5 minutes long and represent one month of trading.

Parameter	Value
Number of trading heats	10
Trading time per heat	5 minutes (300 seconds)
Calendar time per heat	one month of trading

Order submission using the RIT API will be enabled. Data retrieval via Real-time Data (RTD) Links and the RIT API will also be enabled. **All trades must be executed by a trading algorithm**. Participants will not be allowed to trade manually through the RIT Client once the heat begins (but they will be allowed to manually use the RIT Client to use Converters – see "Market Dynamics" section below). Participants are allowed to modify their algorithms in response to prevailing market conditions and competition from the algorithms of other teams. They will have 2 minutes between each heat to re-load their algorithms. A base template algorithm will be provided[2] to participants and can be directly modified for use in the competition. However, participants are encouraged to create their own algorithms.

[2] The "Base Algorithm" will be released on February 5th on the RITC-CE webpage.

MARKET DYNAMICS

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[3] 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 traders: 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.

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

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 trader 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 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 of stocks will be closed out at the end of trading based on the last traded price while the ETF will be closed out at the fair value which is the sum of the component stock prices converted to CAD.

KEY OBJECTIVES

Objective 1

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.

Objective 2

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.

Liquidity Risk Case

OVERVIEW

The Liquidity Risk Case challenges participants to put their critical thinking and analytical abilities to test in an environment that requires them to evaluate the liquidity risk associated with tender offers. Participants will be faced with multiple tender offers throughout the case. This will require participants to make rapid judgments on the profitability, subsequent acceptance and execution, or rejection, of each offer. Profits can be generated by taking advantage of price differentials between market prices and prices offered in the private tenders. Once any tender has been accepted, participants should aim to efficiently close out their large positions to maximize returns and minimize liquidity and market risks.

DESCRIPTION

There will be 5 independent heats with all team members participating in each heat. Each heat will be 10 minutes long and represent one month of calendar time. Each heat will may involve up to four stocks with different volatility and liquidity characteristics.

Parameter	Value
Number of heats	5
Trading time per heat	10 minutes (600 seconds)
Calendar time per heat	1 month (20 trading days)

Tender offers will be generated by computerized traders and distributed at random intervals to random participants. Participants must subsequently evaluate the profitability of these tenders when accepting or bidding on them. Order submission using the RIT API will be disabled. Data retrieval via Real-time Data (RTD) Links and the RIT API will be enabled.

MARKET DYNAMICS

There are five heats, each with unique market dynamics and parameters. Potential parameter changes include factors such as spread of tender orders, liquidity, and volatility. Market dynamics and parameter details regarding each heat will be distributed on **Thursday, February 11th, by 11:59pm EST**, allowing participants to formulate trading strategies. Details for an example heat with two stocks, RITC and COMP, is shown below.

	RITC	COMP
Starting Price	$10	$25
Commission/stock	$0.01	$0.02
Max Order Size	10,000	15,000
Trading Limit (Gross/Net)	250,000/150,000	250,000/150,000
Liquidity	High	Medium
Volatility	Medium	High
Tender Frequency	Medium	Low
Tender Offer Window	30 seconds	15 seconds

During each heat, participants will occasionally receive one of three different types of tender offers: private tenders, competitive auctions, and winner-take-all tenders. Tender offers are generated by the server and randomly distributed to random participants at different times. Each participant will get the same number of tender offers with variations in price and quantity. No trading commission will be paid on tender offers.

Private Tenders are routed to individual participants and are offers to purchase or sell a fixed volume of stocks at a fixed price. The tender price is influenced by the current market price.

Competitive Auction offers are sent to all participants at the same time. Participants will be required to determine a competitive, yet profitable, price to submit for a given volume of stocks from the auction. Any participant that submits an order that is better than the base-line reserve price (hidden from participants) will automatically have his/her order filled, regardless of other participants' bids or offers. If accepted, the transactions will occur at the price that the participant submitted.

Winner-Take-All Tenders request participants to submit bids or offers to buy or sell a fixed volume of stocks. After all prices have been received, the tender is awarded to the participant with the single highest bid or single lowest offer. The winning price, however, must meet a base-line reserve price (hidden from participants). If no bid or offer meets the reserve price, then the trade will not be awarded to anyone (e.g. if all participants bid $2.00 for a $10.00 reserve price stock, nobody will win).

CALCULATION OF THE PROFIT OR LOSS OF TRADERS

The prices generated by RIT for this case follow a random-walk process using a return drawn from a normal distribution with a mean of zero. That is, at any point in the case simulation, the probability that the price will go up is equal to the probability that the price will go down. This means that participants cannot predict the future price of the stocks without "taking a bet". Therefore, the RITC-CE scoring committee will consider trading stocks for reasons other than

reducing the exposure associated with accepting a tender offer to be equivalent to speculating (taking a bet) on the price movement. These types of trades will be flagged as "speculative trades".

Participants will have time to think about the tender offer before they choose to accept it or decline it and the time may be different for each security. For example, one may receive a tender offer at time $t = 0$ and will have until $t = 30$ to decide whether to accept or decline. Any trades for that security made by a participant during this time without accepting or declining the tender offer will be considered as "*front-running*"[4] since the participant had the advance knowledge of a pending institutional order. The RITC-CE scoring committee will flag these trades as "front-running trades".

This case is designed to only reward participants for identifying, accepting, and closing out[5] tender offer positions at a profit, while managing liquidity risk and execution risk. Any other strategy will not be considered. In particular, the total profit of each participant[6] will be categorized into two parts: "profits from tender offers" and "profit from speculation"; the latter category includes the profits that are a result of speculative trades and/or front-running trades.

Profits from tender offers are the profits (or losses) gained from efficiently closing out the position from accepted tenders into the market. Profits from speculation are profits (or losses) generated through trades that are not associated with tenders (speculative trades or front-running trades). An "Adjusted P&L" will be calculated based on the following formula:

$$Adjusted\ P\&L\ =\ P/L\ From\ Tenders\ +\ Min(0, P/L\ From\ Speculation)$$

Participants will be **ranked and scored** based on their $Adjusted\ P\&L$.

For example, consider a participant who has made $\$10{,}000$ from tenders and $\$50{,}000$ from speculation, the total profit is $\$60{,}000\ (= \$10{,}000\ +\ \$50{,}000)$ but the $Adjusted\ P\&L$ will only be $\$10{,}000\ [= \$10{,}000\ +\ min(0, \$50{,}000)]$. In another example, consider a participant who has made $\$35{,}000$ from tenders and lost $\$20{,}000$ from speculation $(Profit\ From\ Speculation\ = -\$20{,}000)$; the total profit is $\$15{,}000\ (\$35{,}000\ -\ \$20{,}000)$ and it is equal to the $Adjusted\ P\&L$ $[\$15{,}000\ =\ \$35{,}000\ +\ min(0, -\$20{,}000)]$. Any losses from speculation will be included while profits from speculation will **not** be included.

The $Adjusted\ P\&L$ will be calculated by the RITC-CE scoring committee at the end each heat and will **not** be included in the P&L calculation in RIT. However, participants will be provided with an

[4] Front-running is the unethical and illegal practice of trading a security for your own account while taking advantage of the information contained in the pending orders from your institutional clients.

[5] "Closing out" a position means that a participant is executing a trade that is the opposite of the current position in order to eliminate the exposure.

[6] Total profit of each participant is the profit (or loss) that you can observe in the RIT Client at the end of a heat.

Excel tool[7], the "Performance Evaluation Tool", that will allow them to calculate their $Adjusted\ P\&L$ while practicing.

TRADING LIMITS AND TRANSACTION COSTS

Each participant will be subject to gross and net trading limits as specified in the case description distributed prior to each heat. The gross trading limit reflects the sum of the absolute values of the long and short positions across all stocks, while the net trading limit reflects the sum of long and short positions such that short positions negate any long positions. Trading limits will be strictly enforced and participants will not be able to exceed them.

The maximum order size and commissions will be specified in the case description distributed prior to each heat. See the table above for an example.

POSITION CLOSE-OUT

Any open position will be closed out at the end of each heat based on the last traded price. This includes any long or short position open in any security. Computerized market makers will increase the liquidity in the market towards the end of trading to ensure the closing price cannot be manipulated.

KEY OBJECTIVES

Objective 1

Evaluate the profitability of tender offers by analyzing market liquidity. Participants should accept tenders that are expected to generate positive profits while rejecting unattractive tender offers.

Objective 2

Submit competitive, yet profitable, bids and offers for competitive auction and winner-take-all tenders to maximize potential profits while managing liquidity and market risk.

Objective 3

Use a combination of limit orders, market orders, and marketable limit orders to mitigate liquidity and price risks from holding open positions. There is a chance that the market may move away from your transaction prices, so maintaining large open positions may result in losses.

[7] The "Performance Evaluation Tool" will be uploaded on the RITC-CE webpage on February 5th.