

Introduction

- Build system to detect unusual volume spikes in crude oil futures

Chapters in this lecture

1. Lecture resources
2. What inspired this lecture?
3. How to detect unusual volume spikes?
4. Parts of the system
5. Part 1: Filter down the most traded contract (6 steps)
6. Part 2: Get reference point to determine volume spikes (5 steps)
7. Part 3: Setup and filter alerts (5 steps)
8. Bonus: Send alerts to Discord channel and add trading logic (2 steps)

Lecture resources

Resource:	Price:	Time limit:	Where to get it:
Real-time alerts	Free	Limited	Discord
Slides	Free	Unlimited	Website
Code files	Free	Unlimited	Website

How to get real-time alerts?

1. Download Discord App on your phone
2. Create Discord account (if none)
3. On your phone, click on real-time alerts link in description below
4. Long press **"Alerts → crude-oil"** channel
5. Click "Notification Settings"
6. Click "All messages"

How to download slides and code files?

1. Go to www.tradingbotssimplified.com
2. Go to “Resources” page
3. Find this lecture
4. Click on “Download Files”
5. You’ll get a zipped folder
6. Open it and you’ll find another folder
7. That folder contains all files from this lecture

How to run an a code file from this lecture?

- Code files only run on QuantConnect

How to run an a code file from this lecture?

- QuantConnect accounts are free and backtesting is free as well (affiliate link in description)

How to setup your QuantConnect account?

1. Login to your QuantConnect account
2. Click on your name at the top right-hand corner
3. Click "My Account"
4. Scroll down to "Account Settings"
5. Under "What is your preferred language?"
6. Click Python

How to run an a code file from this lecture?

1. Click "Projects Home" at top left-hand corner
2. Click "I have an idea I want to test"
3. Click "Implement Idea Manually with Python or C#"
4. Delete default code
5. Paste code from code file in
6. Run a backtest/deploy for live-trading

What inspired this lecture?

- Unusual trades in crude oil futures before US President Trump's Truth Social post

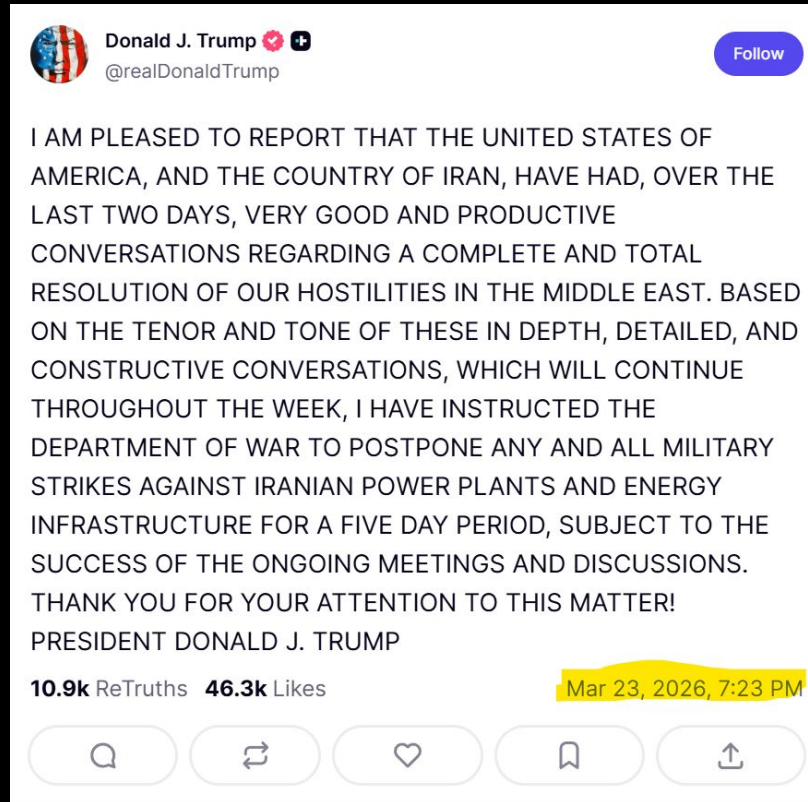
What inspired this lecture?

Status:	Value:
Time of post	7:04 AM
Date of post	23rd March 2026
Timezone	Eastern Time

What inspired this lecture?



What inspired this lecture?



What inspired this lecture?

- I'm in Singapore, which is 12 hours ahead of Eastern Time (before daylight savings ends)

What inspired this lecture?

- Truth Social takes into account my timezone where dates and times are displayed

What inspired this lecture?

- If I were in Eastern Time, time shown on the screenshot would be 7:23 AM

What inspired this lecture?

- However, if memory serves me right, the post was made at 7:04 AM

What inspired this lecture?

THE WALL STREET JOURNAL.

Economy Tech Markets & Finance Opinion Free Expression Arts Lifestyle Real Estate Perso

March 24, 2026 10:32am ET

Mystery Jump in Oil Trading Ahead of Trump Post Draws Scrutiny



By Alexander Osipovich, Reporter

Minute-by-minute volumes in oil futures

What inspired this lecture?



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MARKETS

Volume in stock and oil futures surged minutes before Trump's market-turning post

PUBLISHED MON, MAR 23 2026-12:19 PM EDT | UPDATED MON, MAR 23 2026-5:27 PM EDT



Yun Li
@YUNLI626

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What inspired this lecture?



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Oil traders bet millions minutes before Trump's Iran talks post

5 days ago

Share  Save 

Nick Marsh

Business reporter

What inspired this lecture?

Source:	Link:
WSJ	https://www.wsj.com/livecoverage/stock-market-today-dow-sp-500-nasdaq-03-24-2026/card/mystery-jump-in-oil-trading-ahead-of-trump-post-draws-scrutiny-56sgwdXtlOlonqIKDsL6
CNBC	https://www.cnbc.com/2026/03/23/volume-in-stock-and-oil-futures-surged-minutes-before-trumps-market-turning-post.html
BBC	https://www.bbc.com/news/articles/cg547ljepvzo

How to visit links from slides?

1. Download files from lecture
2. Open slides (PDF)
3. Scroll to slide where link is found
4. Click on it

When did the unusual trades happen?



When did the unusual trades happen?

Status:	Value:
Time of trade	6:50 AM
Date of trade	23rd March 2026
Timezone	Eastern Time

What asset was traded?

Status:	Value:
Product	WTI Crude Oil futures
Product code	CL

How to detect such a trade?

- Unusual volume spikes in the **most traded** crude oil futures contract

What's an unusual volume spike?

- Volume spikes happen very often

What's an unusual volume spike?

- Many are expected and occur at predictable times

What's an unusual volume spike?

- An unusual volume spike is one that's **unexpected**

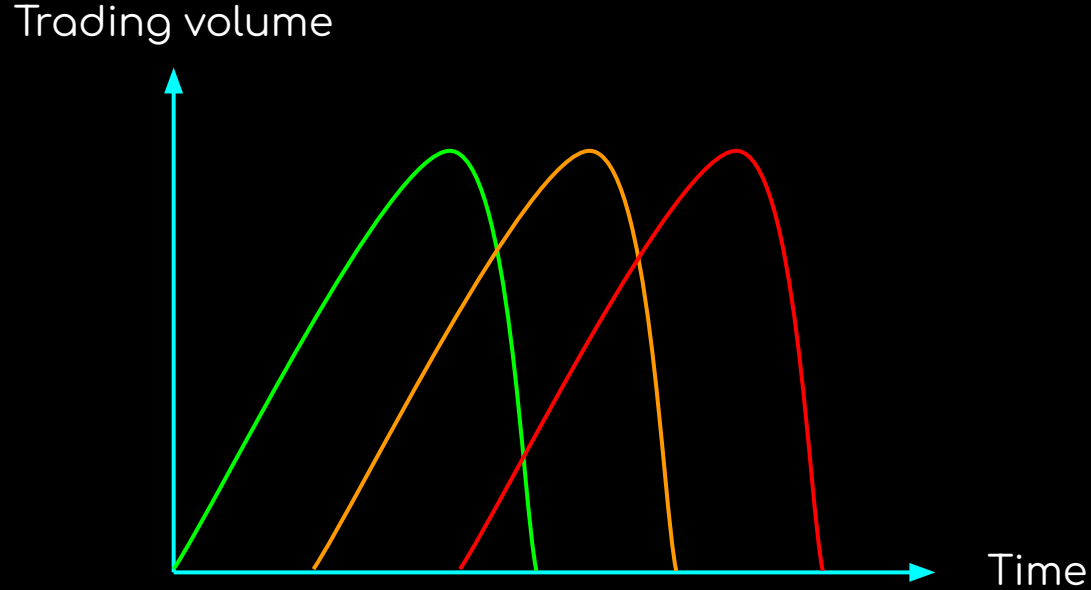
Which is the most traded crude oil futures contract?

- Typically the one that expires closest to today's date, except when it's about to expire

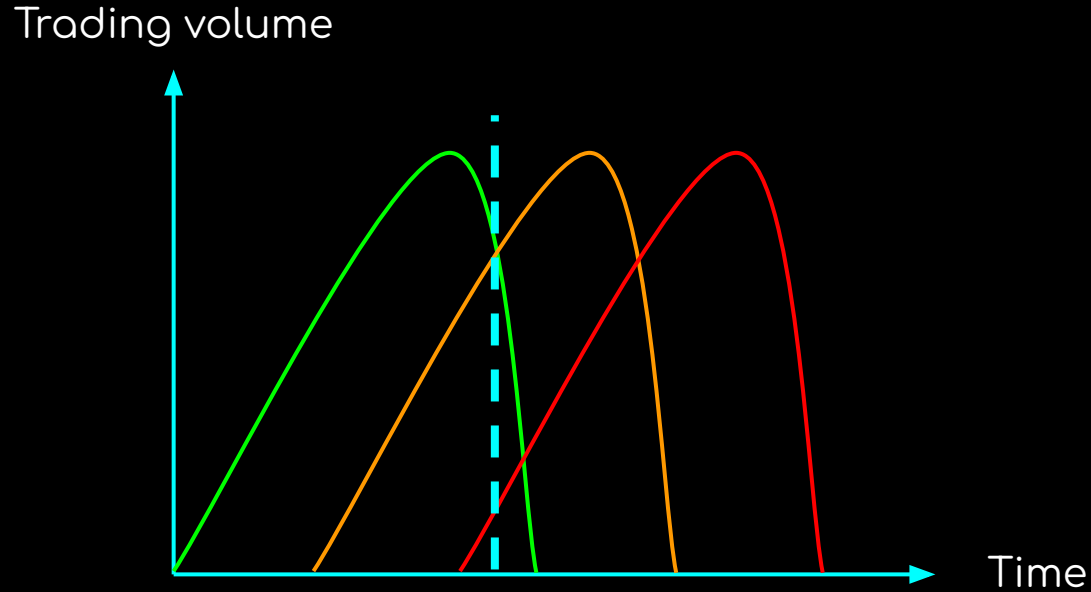
Which is the most traded crude oil futures contract?

- Crude oil futures calendar - <https://www.cmegroup.com/markets/energy/crude-oil/light-sweet-crude.calendar.html>

Which is the most traded crude oil futures contract?



Which is the most traded crude oil futures contract?



Parts of system

Part 1: Filter down the most traded contract



Part 2: Get reference point to determine volume spikes



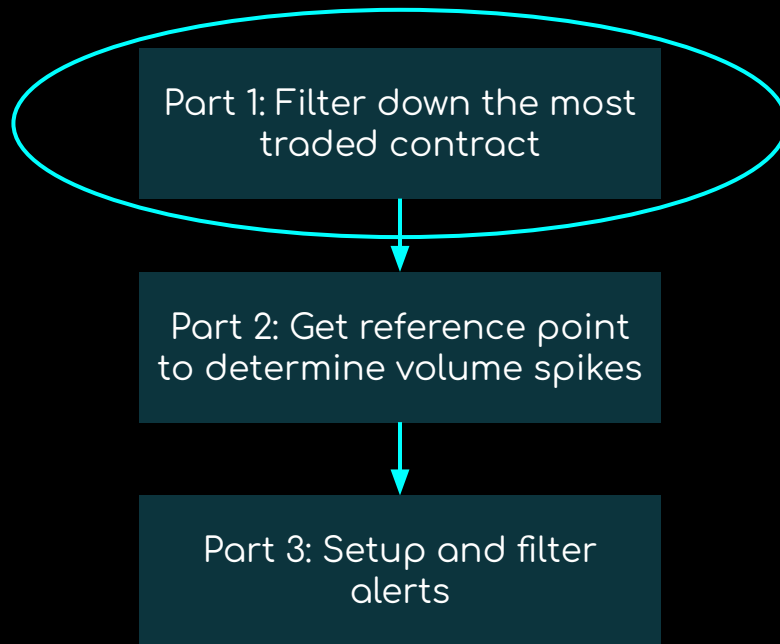
Part 3: Setup and filter alerts

Bonus

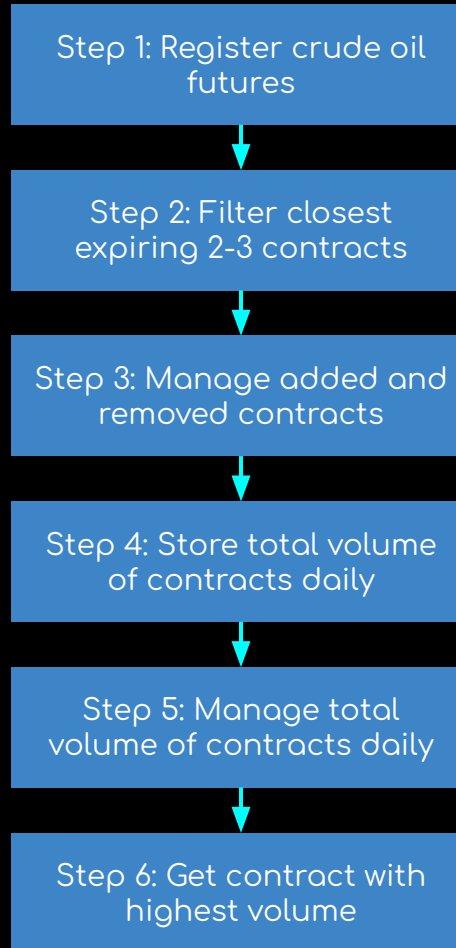
A yellow starburst graphic with multiple points, centered on the slide.

Send alerts to
Discord channel and
add trading logic

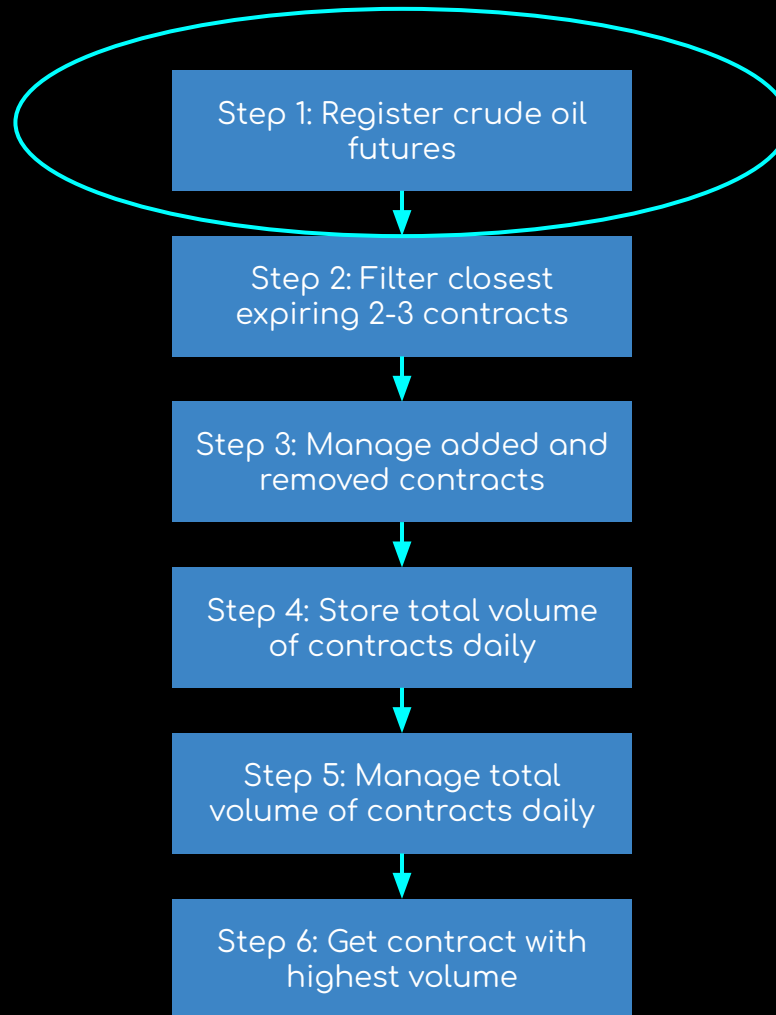
Parts of system



Part 1



Part 1



self.add_future() parameter inputs

Parameter:	Value:
ticker	Futures.Energy.CRUDE_OIL_WTI
resolution	Resolution.MINUTE
fill_forward	False
extended_market_hours	True













Why minute resolution?

- Resolution is high enough to capture volume spikes, not so high that we're getting a lot of noise

Why not fill forward?





















- Recall, fill forward means repeating the last candlestick if there's no new data

Data in real life

	10:01 AM	10:02 AM	10:03 AM	10:04 AM	10:05 AM
Contract 1					
Contract 2					
Contract 3					
Contract 4					

Filled forward data

*Green circle represents
candlestick from last minute
copied forward

	10:01 AM	10:02 AM	10:03 AM	10:04 AM	10:05 AM
Contract 1					
Contract 2					
Contract 3					
Contract 4					

Why not fill forward?

- We only want true trading volume to trigger volume spike alerts

Why enable extended market hours?

- The unusual volume spike happened outside of regular trading hours (at 6:50 AM)

Start date of backtest

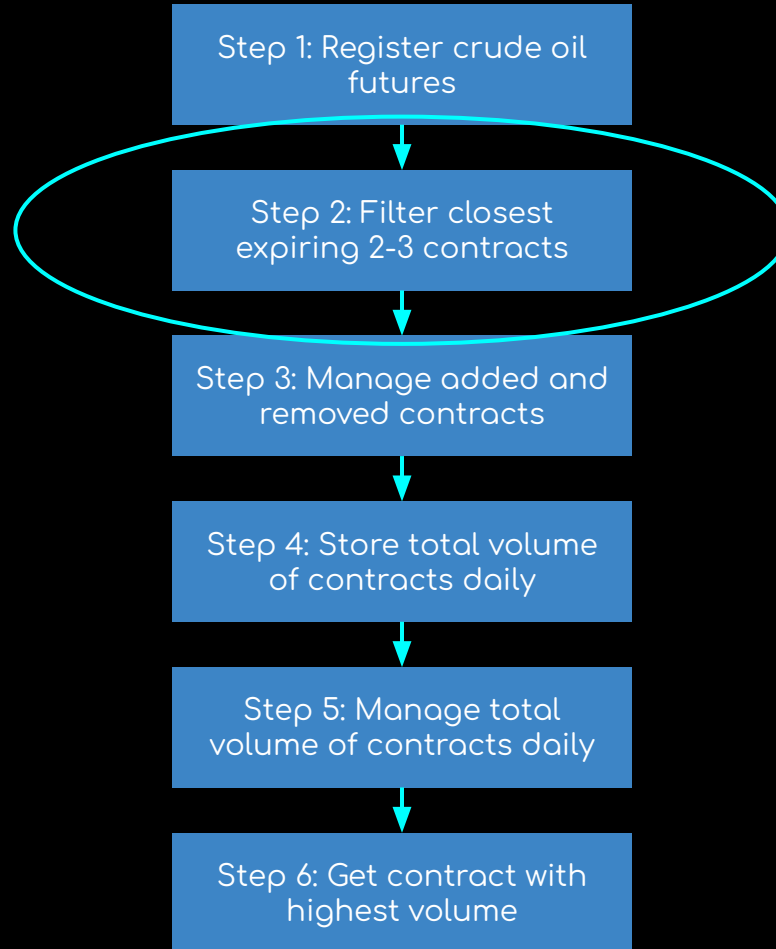
- To check if the system is working correctly, we'll see if it captures that spike (23rd March 2026)

Start date of backtest

- Let's set our start date to a few days before, to 20th March 2026

Part 1 Step 1: Register crude oil futures

Part 1



Why filter the closest expiring 2-3 contracts?

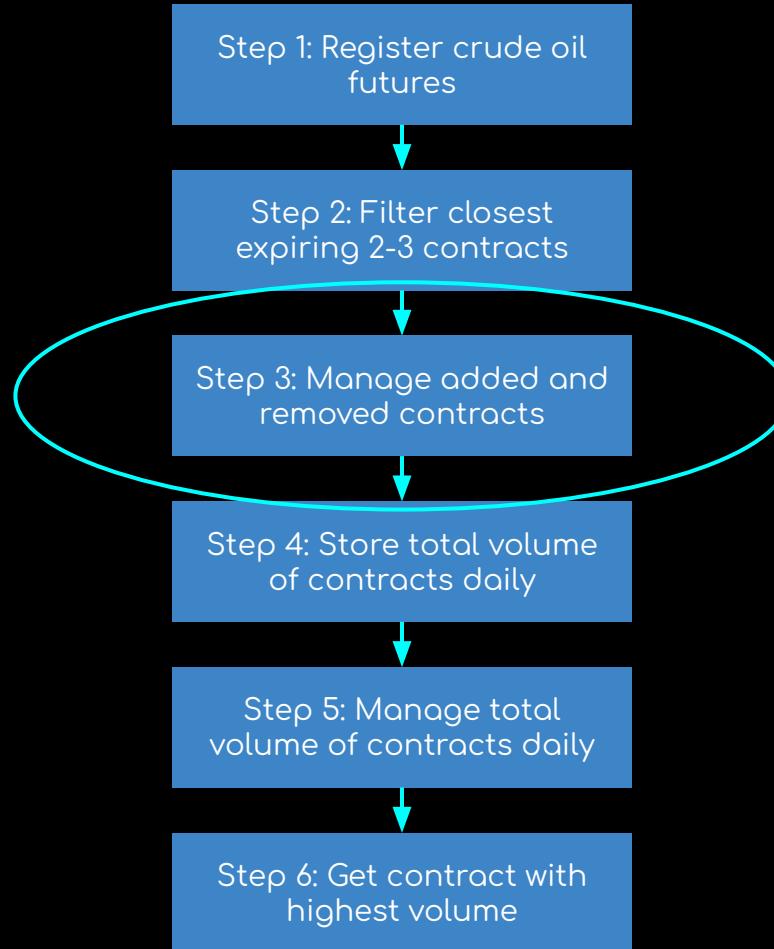
- When the closest contract expires, having the next 2 locked and loaded allows the alert system to quickly replace it so alerts don't get interrupted

How to run the filter?

- To filter down the closest expiring 2-3 contracts:
 - Minimum expiry is 0
 - Maximum expiry is 60

Part 1 Step 2: Filter closest expiring 2-3 contracts

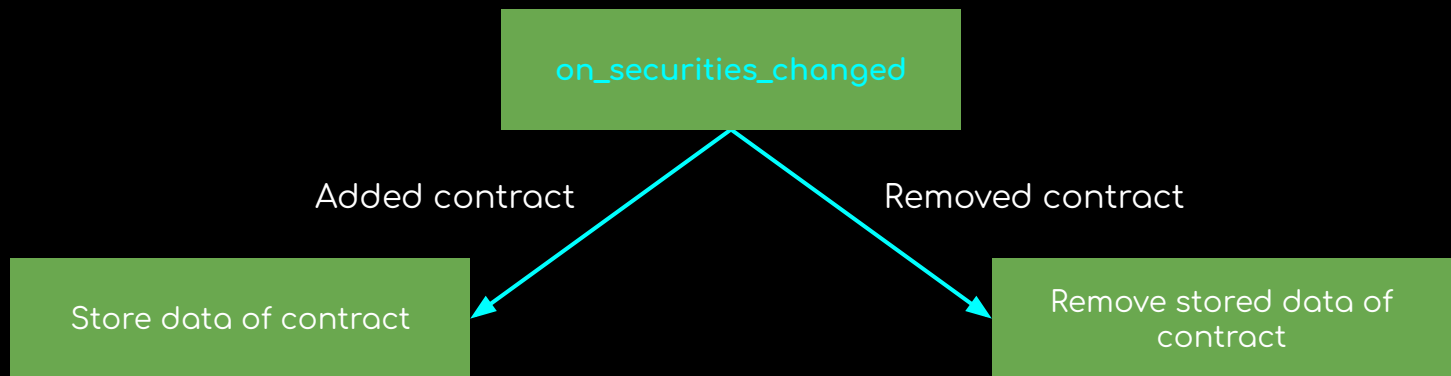
Part 1



Why manage added and removed contracts?

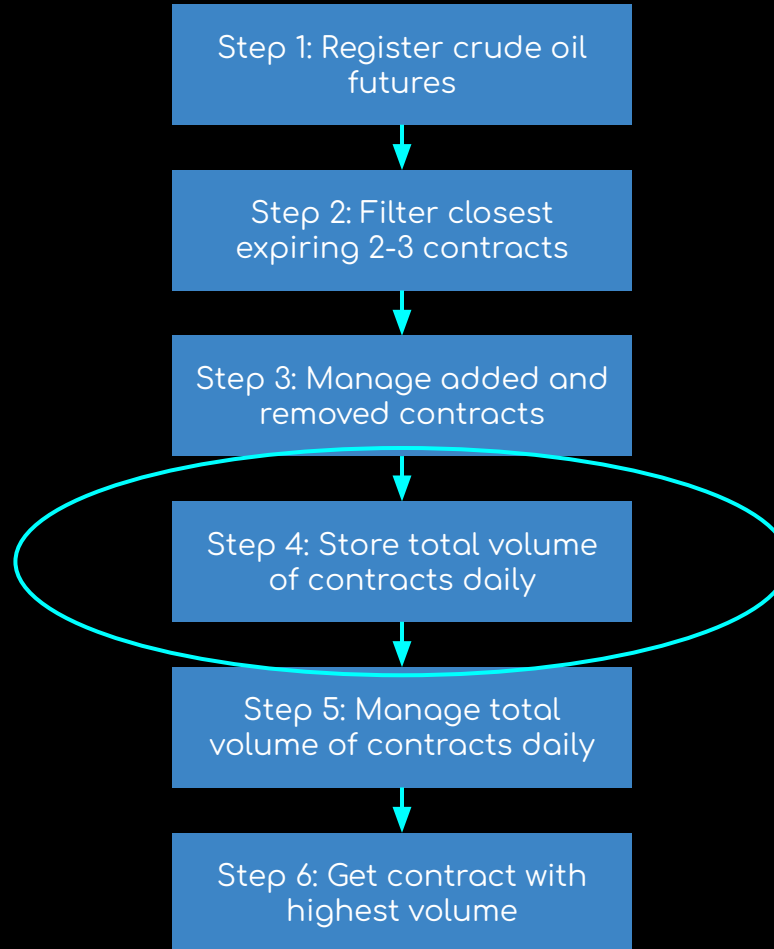
- We'll be storing a lot of data for each contract (e.g. volume, candlesticks)

How to manage added and removed contracts?



Part 1 Step 3: Manage added and removed contracts

Part 1



Important note

- Data management for non filled forward data is different from filled forward

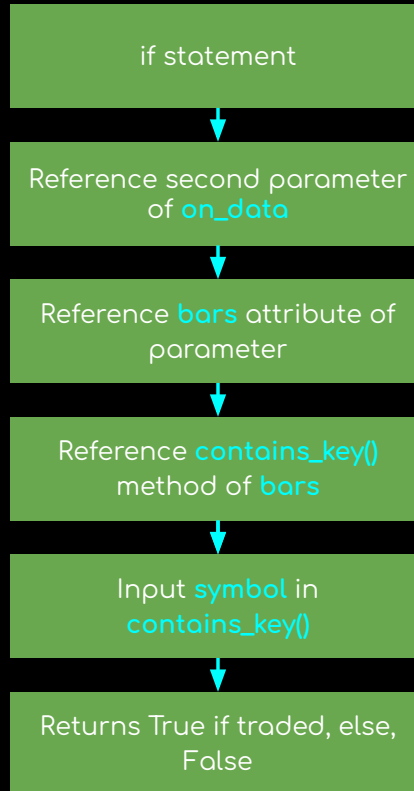
Important note

- Need to take into account that some contracts are traded in a given minute, while others aren't

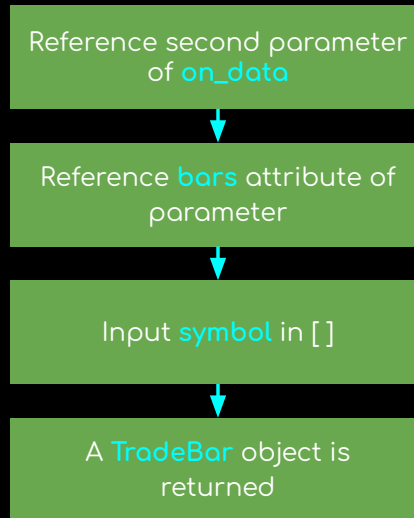
Important note

- We only want the volume of a contract when it's traded

How to check if a contract is traded?



How to get volume of contract if traded?



Attributes of TradeBar objects

- <https://www.quantconnect.com/docs/v2/writing-algorithms/securities/asset-classes/futures/handling-data#02-Trades>

Part 1 Step 4: Store total volume of contracts daily

Part 1



Trading hours of crude oil futures

Status:	Time (Eastern Time):
Weekly start	Sunday 6:00 PM
Weekly end	Friday 5:00 PM
Daily break	5:00 PM - 6:00 PM

How to manage total volume of contracts?

Schedule event for 5 PM daily



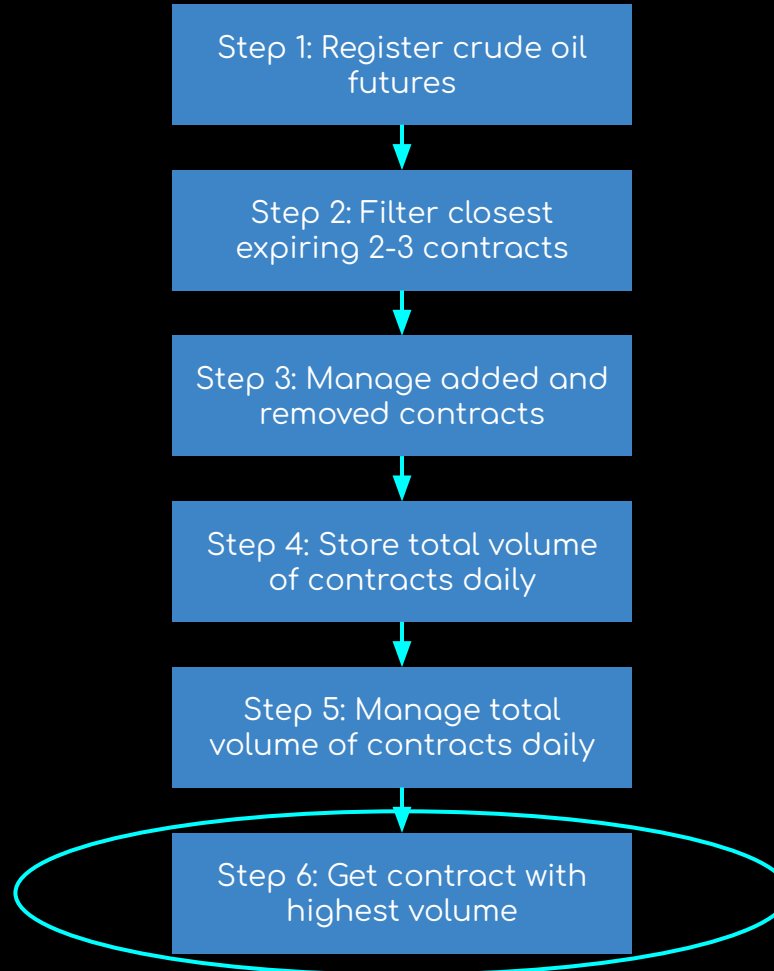
In event, reset total volume stored

Part 1 Step 5: Get contract with highest volume

How to create scheduled events?

- <https://www.quantconnect.com/docs/v2/writing-algorithms/scheduled-events#02-Create-Scheduled-Events>

Part 1



How to get contract with highest total volume?

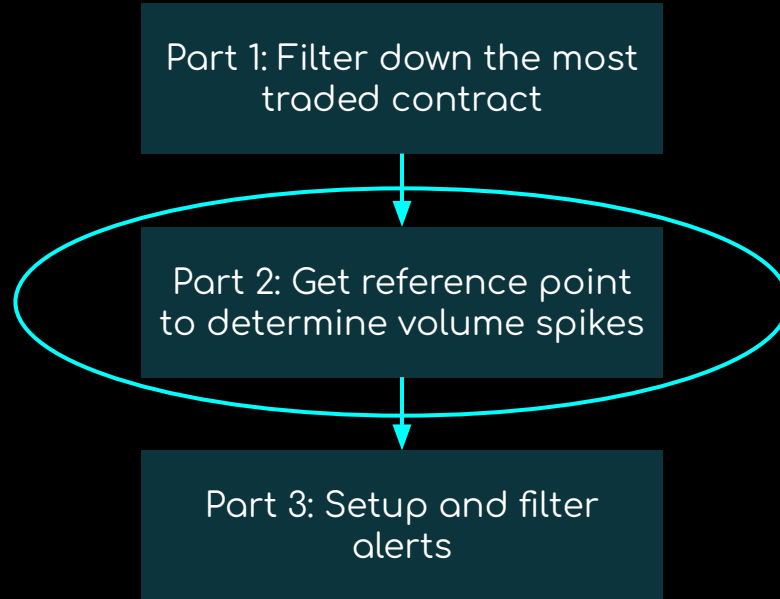
Total volume stored in dictionary



Get `symbol` with highest value

Part 1 Step 6: Get contract with highest volume

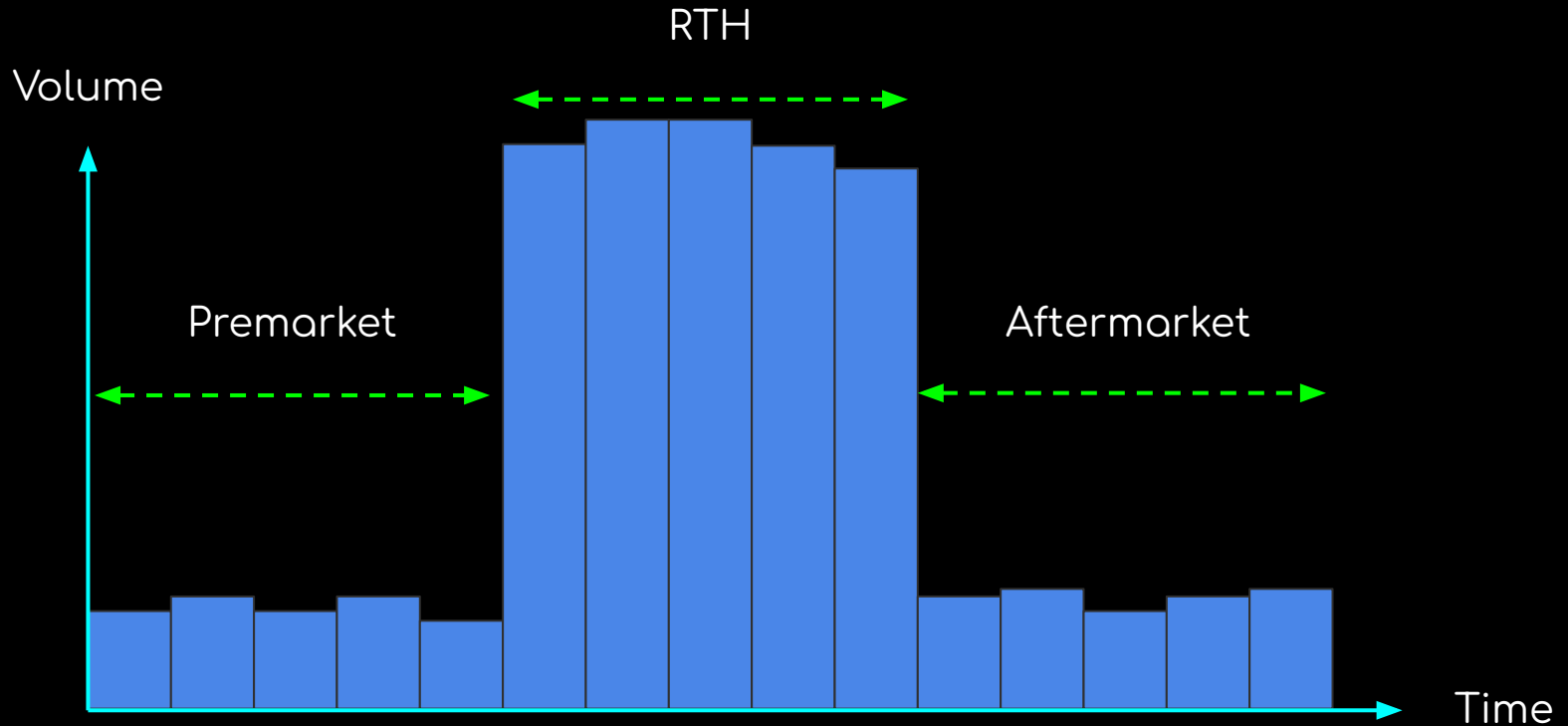
Parts of system



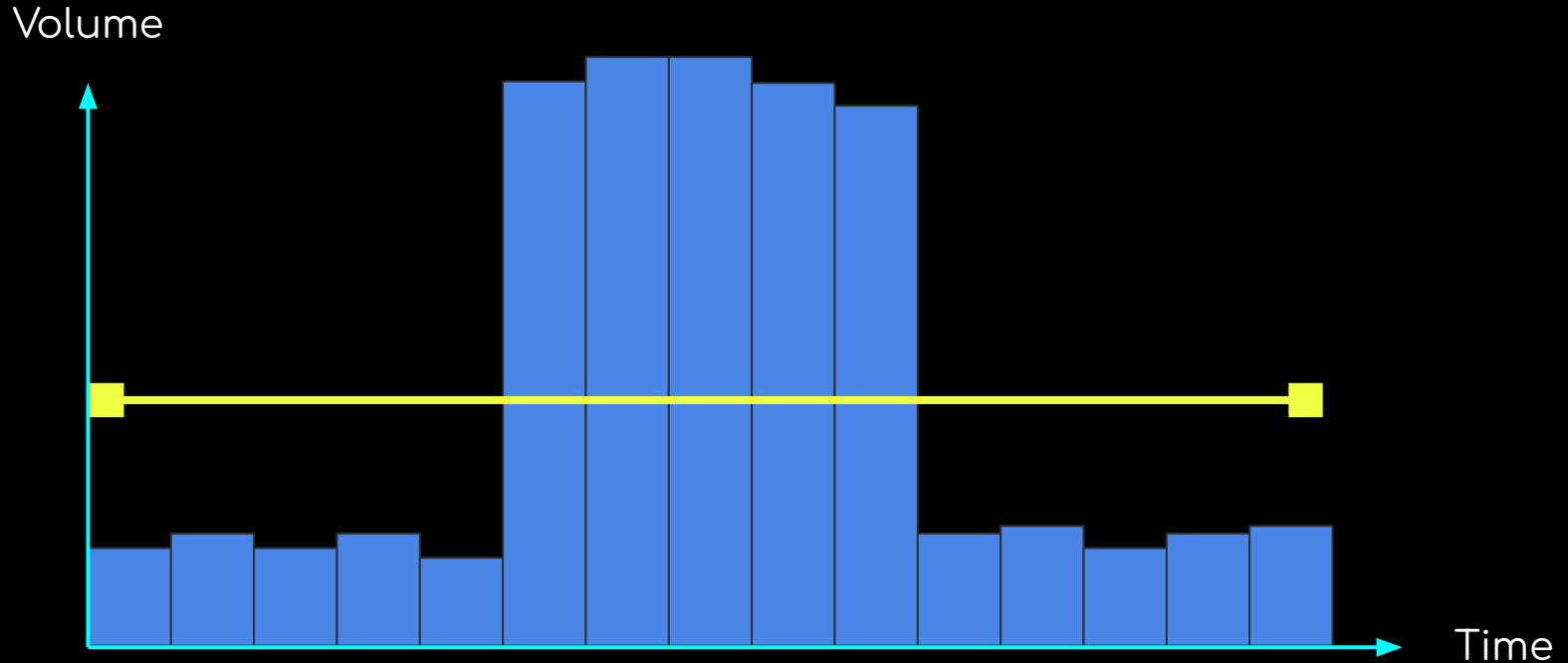
What reference point will we use?

- A value that represents the average 1-minute volume of most traded contract

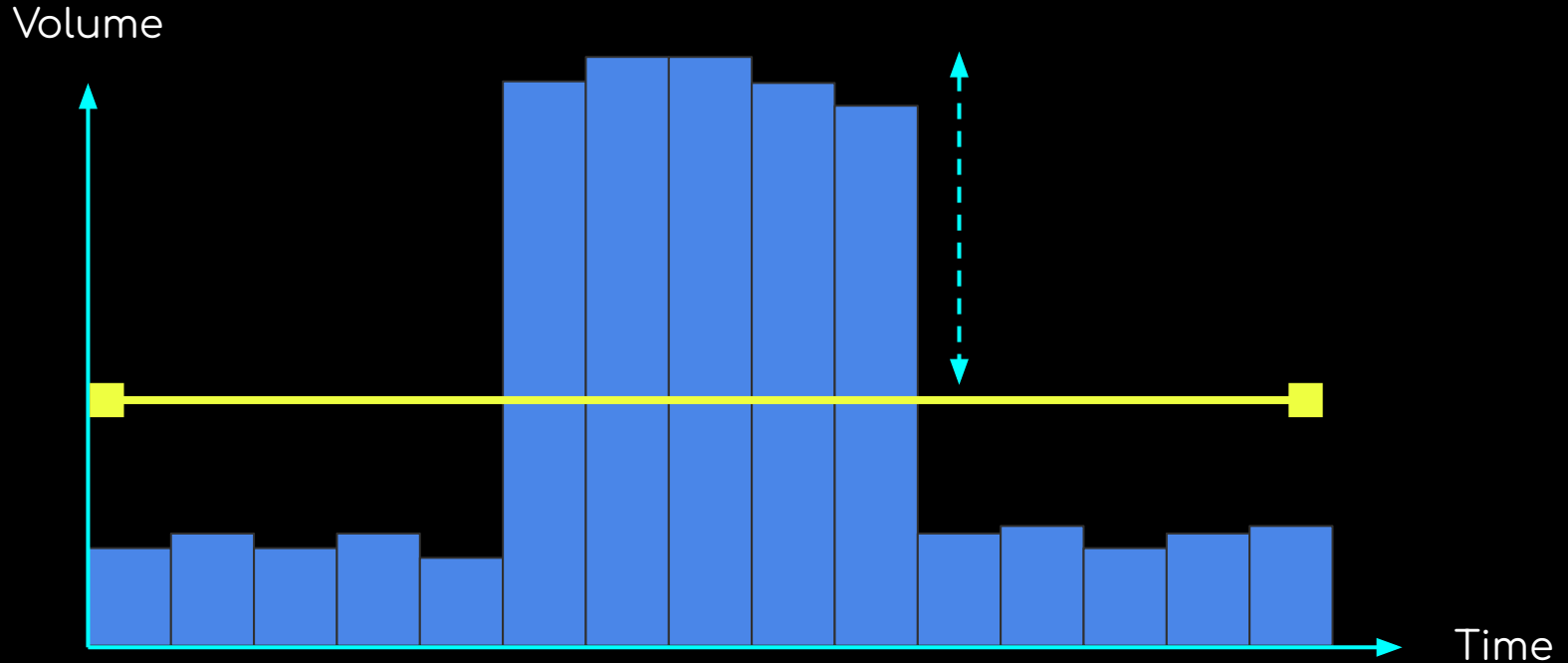
Trading volume in a typical trading day



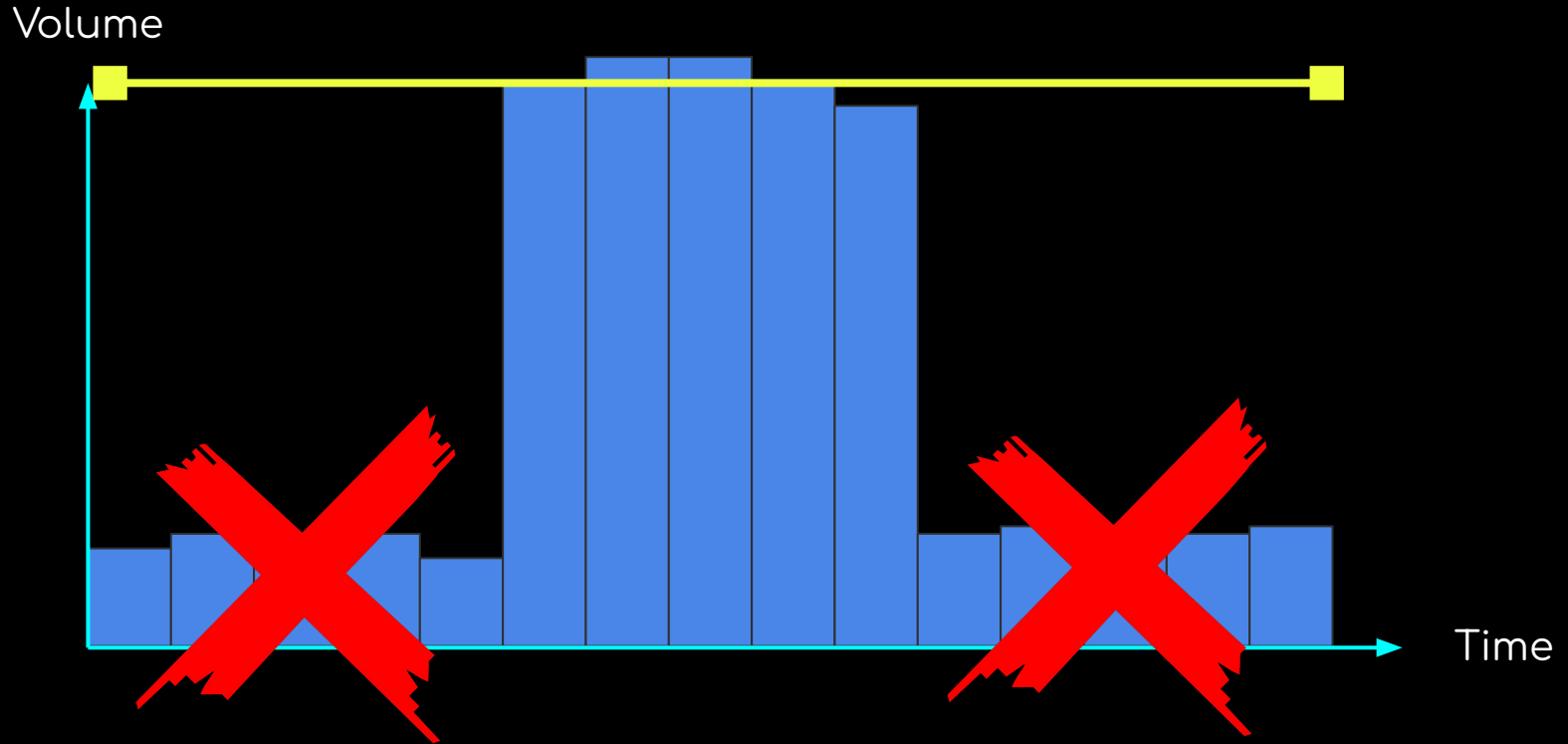
Trading volume in a typical trading day



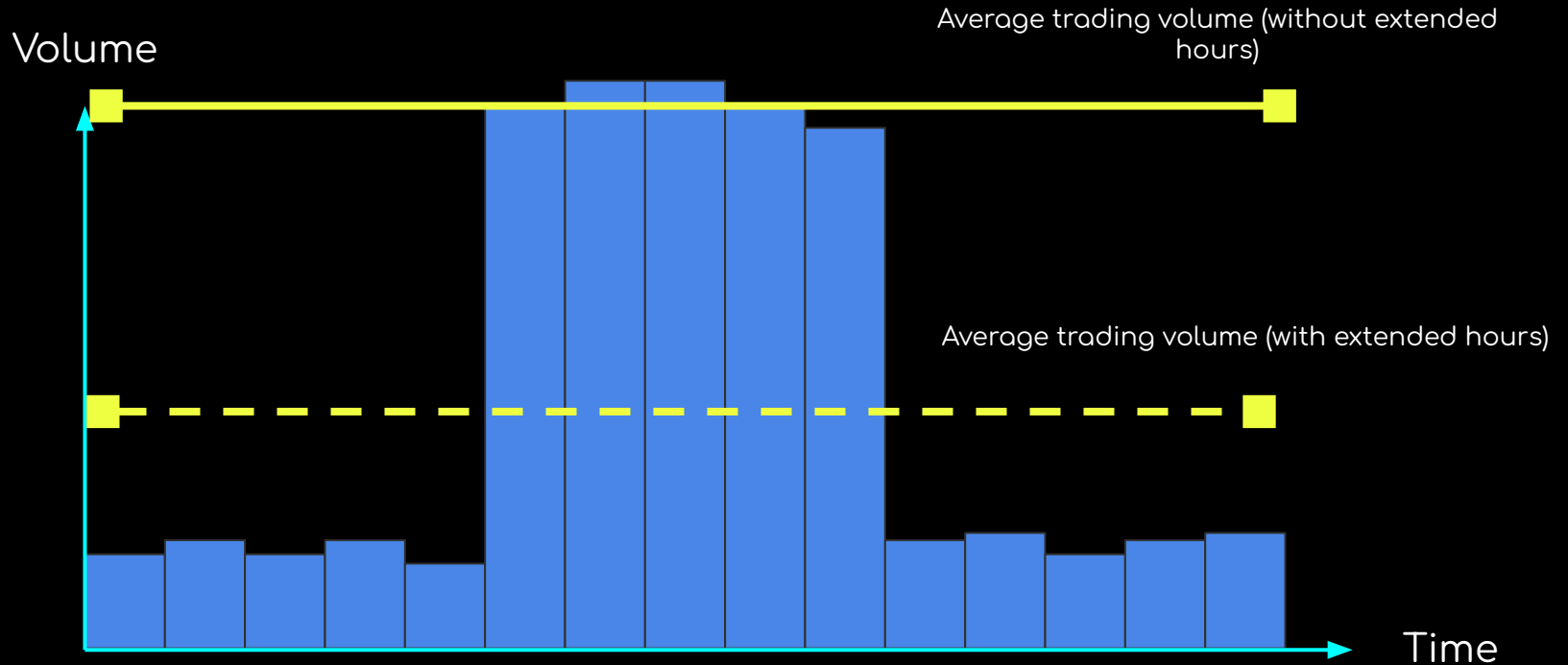
Trading volume in a typical trading day



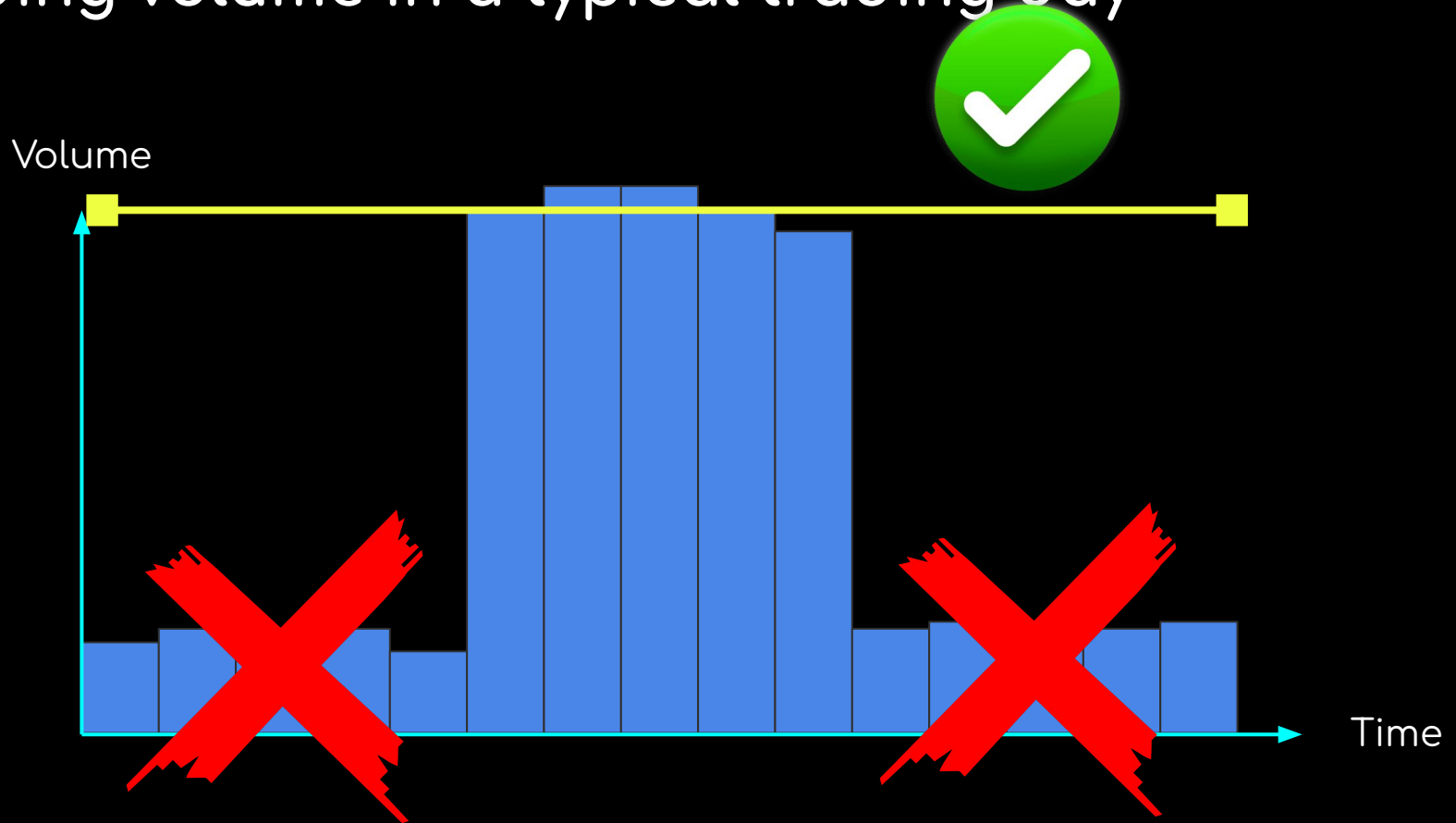
Trading volume in a typical trading day



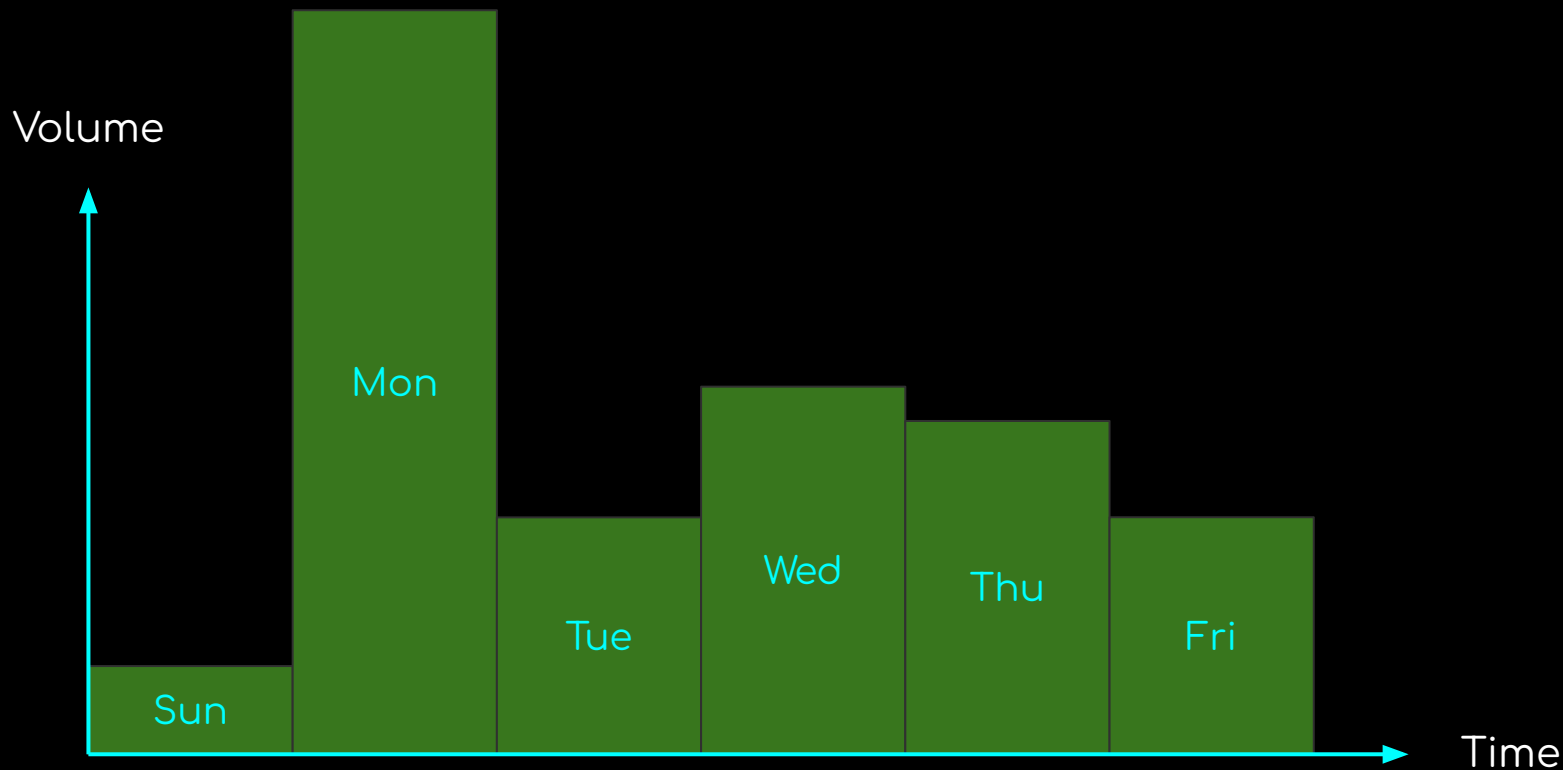
Trading volume in a typical trading day



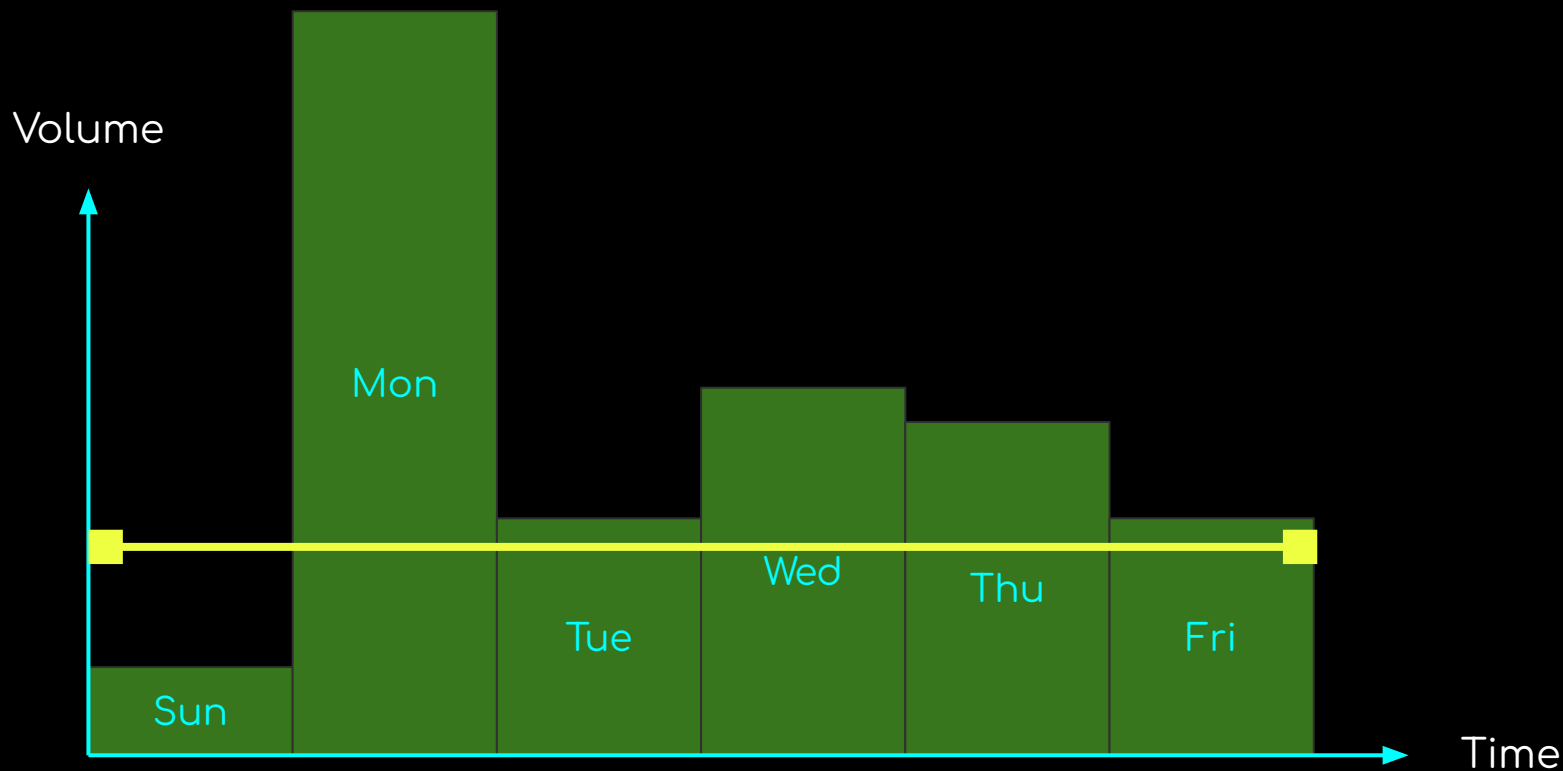
Trading volume in a typical trading day



Trading volume in a typical trading week



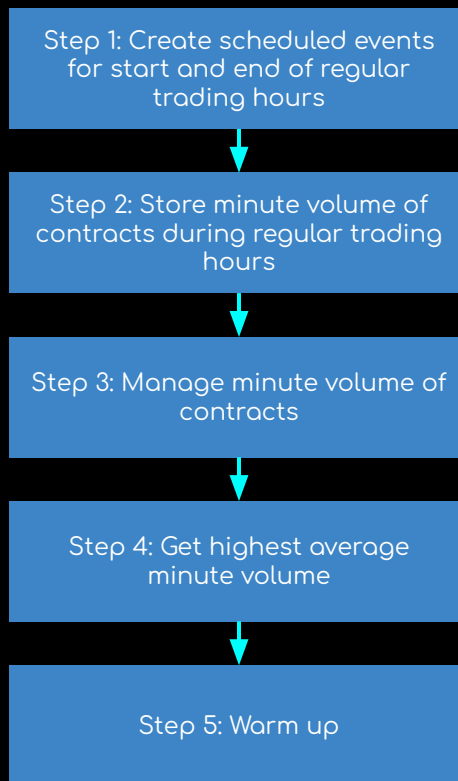
Trading volume in a typical trading week



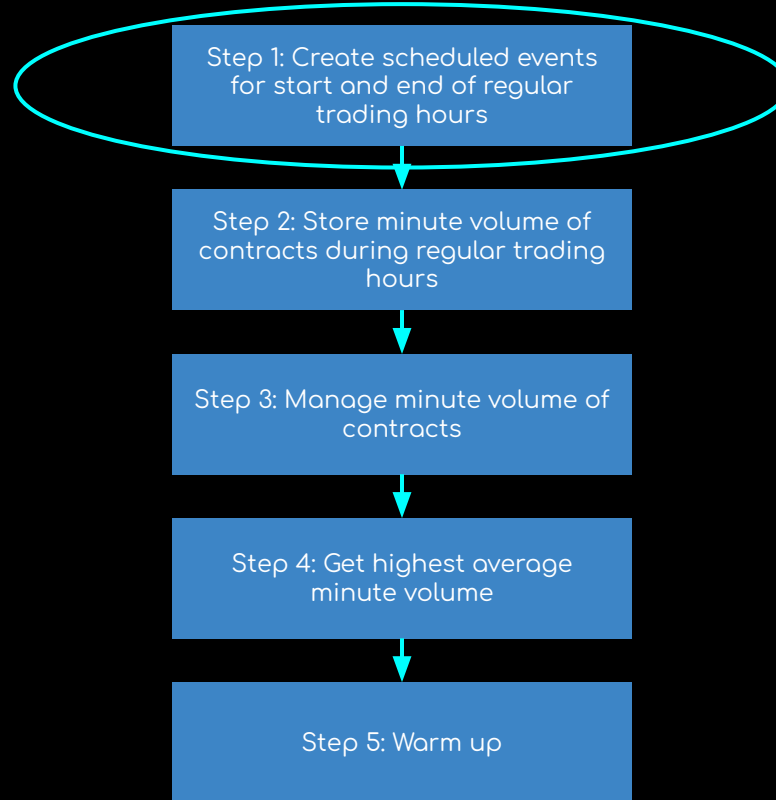
What reference point will we use?

- 1 week of regular trading hours average minute trading volume of most traded contract

Part 2



Part 2



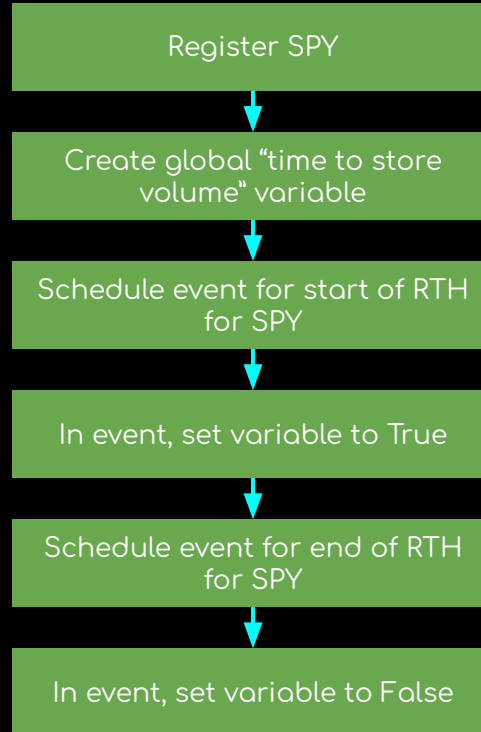
Important note

- Futures don't have distinct regular and extended trading sessions like equities do

Important note

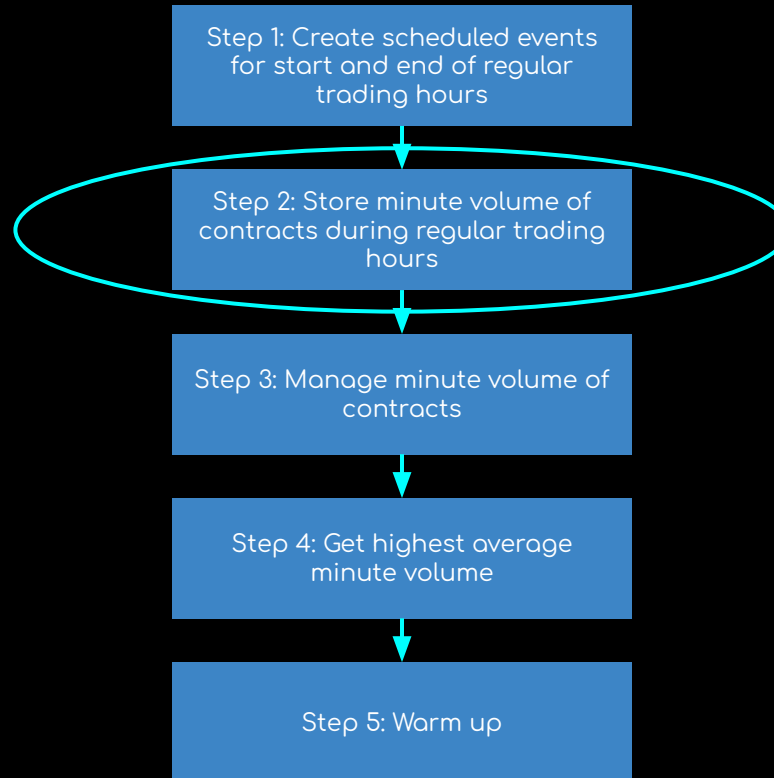
- To schedule events in accordance to regular trading hours, we'll need to use an equity

How to create scheduled events for start and end of RTH?



Part 2 Step 1: Create scheduled events for start and end of regular trading hours

Part 2

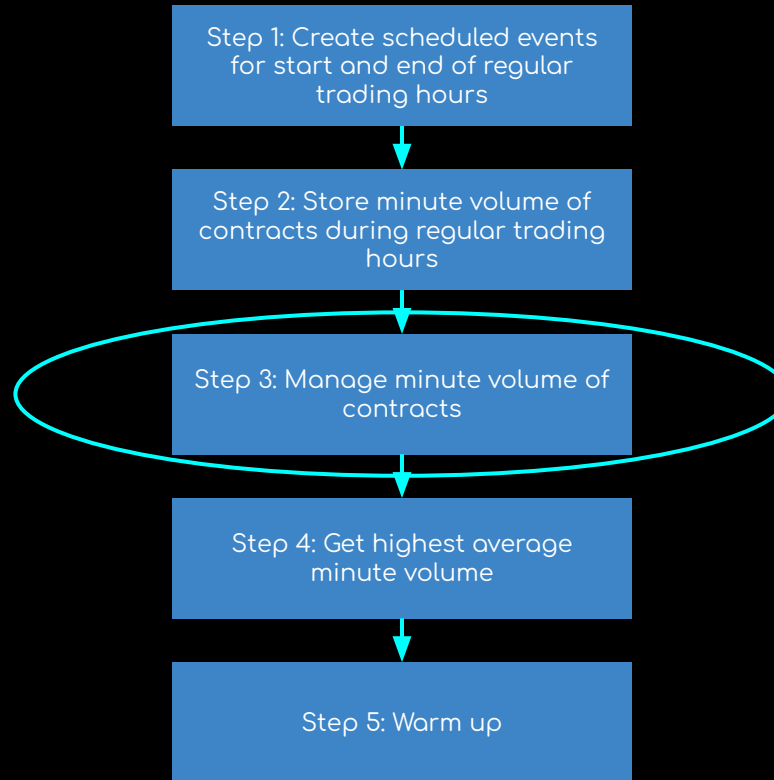


How to store minute volume of contracts during RTH?



Part 2 Step 2: Store minute volume of contracts during RTH

Part 2



Trading hours of crude oil futures

Status:	Time (Eastern Time):
Weekly start	Sunday 6:00 PM
Weekly end	Friday 5:00 PM
Daily break	5:00 PM - 6:00 PM

How to manage minute volume of contracts?

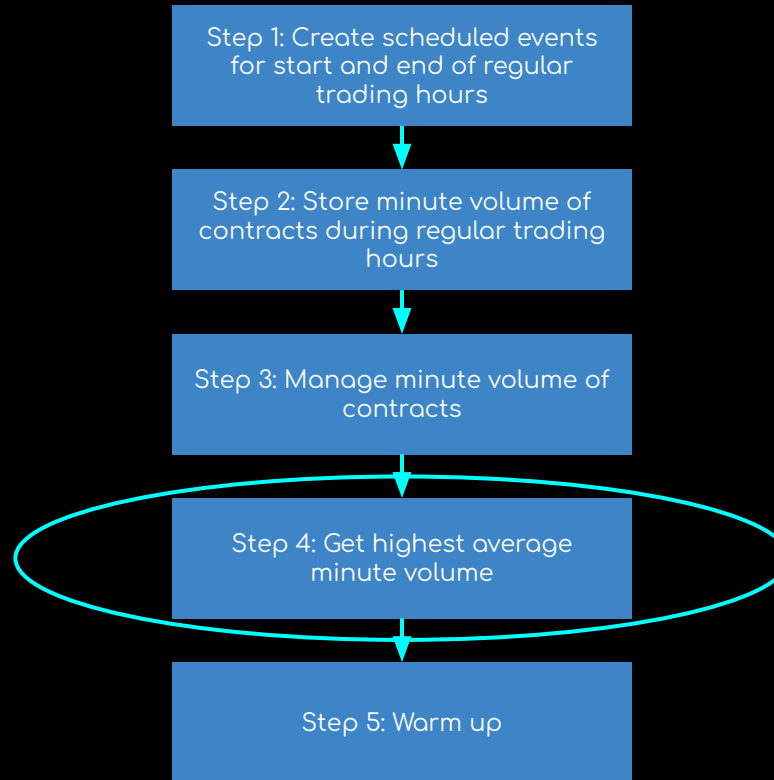
Schedule event for 5 PM on Fridays



In event, reset minute-by-minute
volume stored

Part 2 Step 3: Manage minute volume of contracts

Part 2

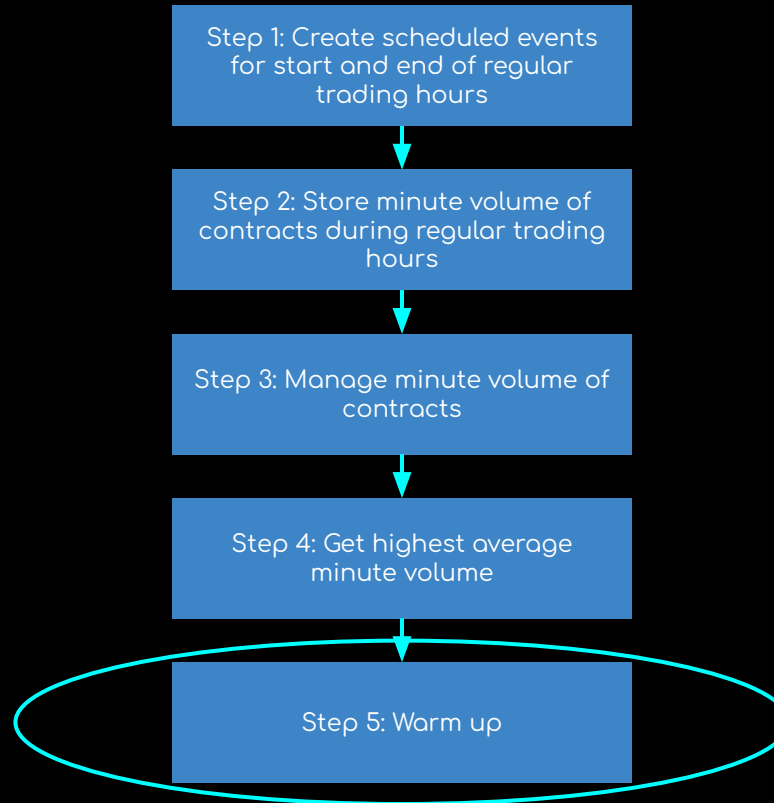


How to get highest average minute volume?



Part 2 Step 4: Get highest average minute volume

Part 2



Why warm up?

- It takes 1 week to get the first highest average minute-by-minute volume value

How long to warm up?

- Let's warm up for 2 weeks

How to warm up?

Import `datetime` library



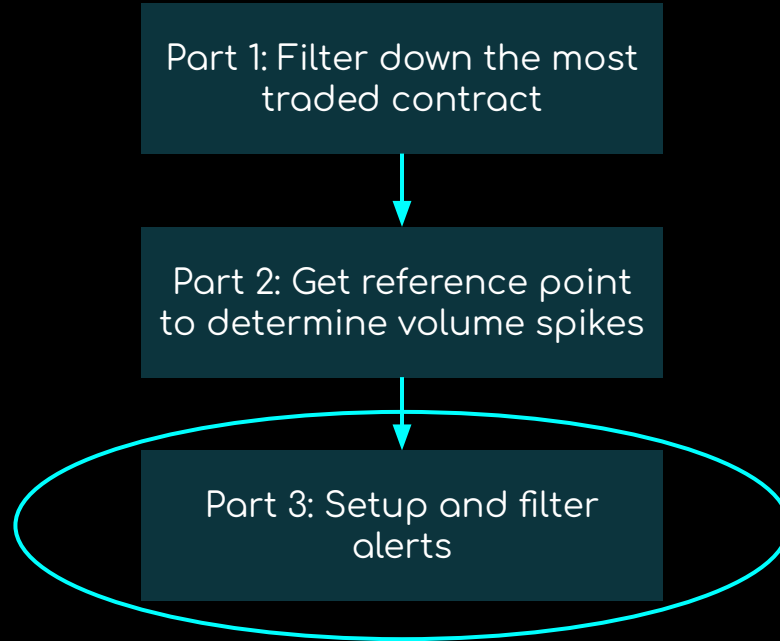
Run `self.set_warm_up()`



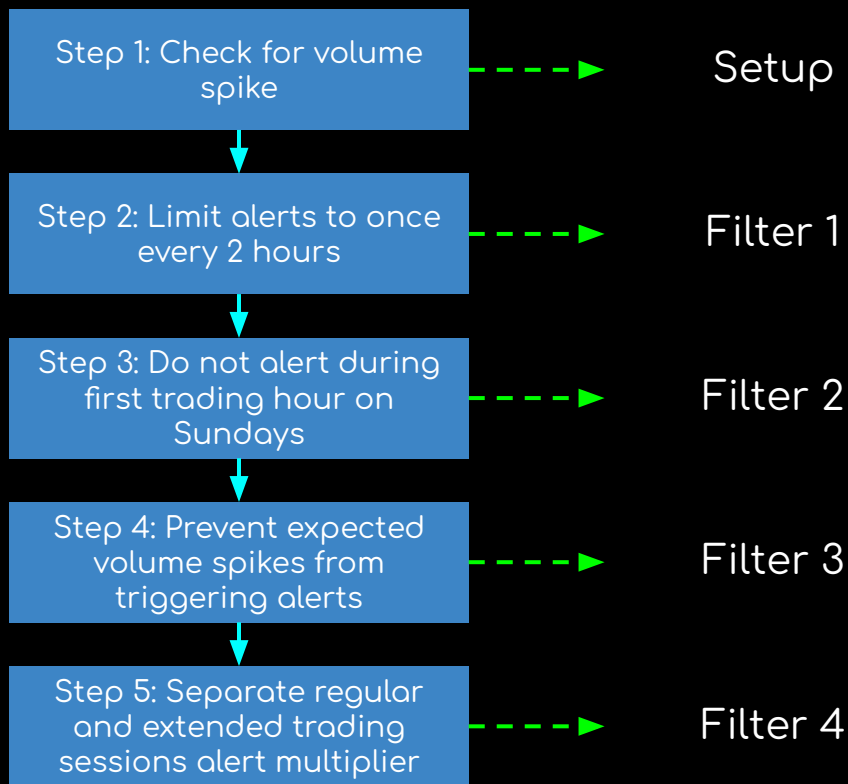
Input `datetime.timedelta(days = 14)`

Part 2 Step 5: Warm up

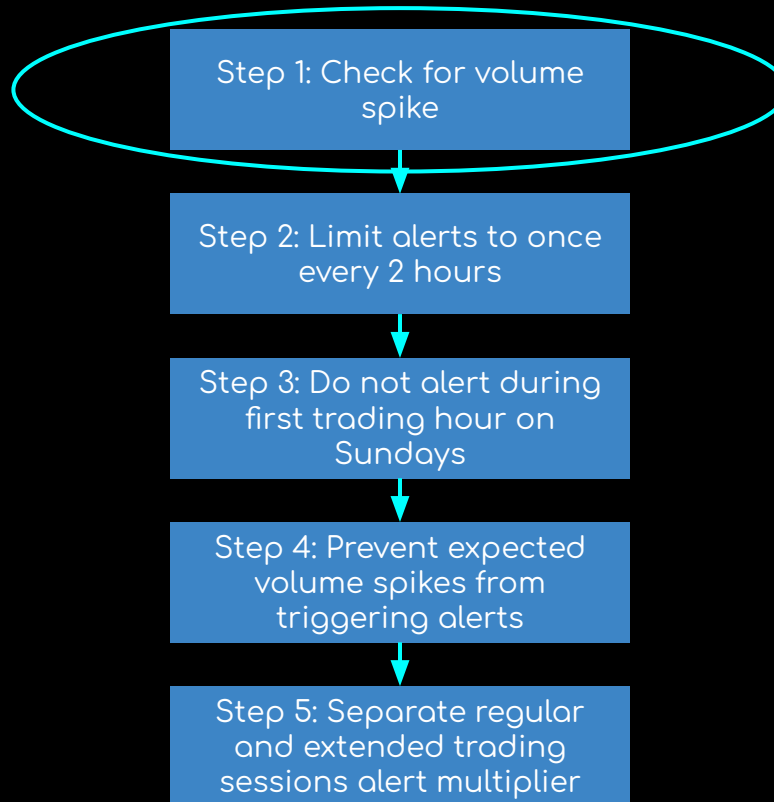
Parts of system



Steps in part 3



Steps in part 3



How to check for volume spike?

If current minute volume of most traded contract is 3x greater than highest average minute volume



Log volume spike

Part 3 Step 1: Check for volume spike

Important note

- It takes between 24-48 hours for QuantConnect to make live data available in backtesting

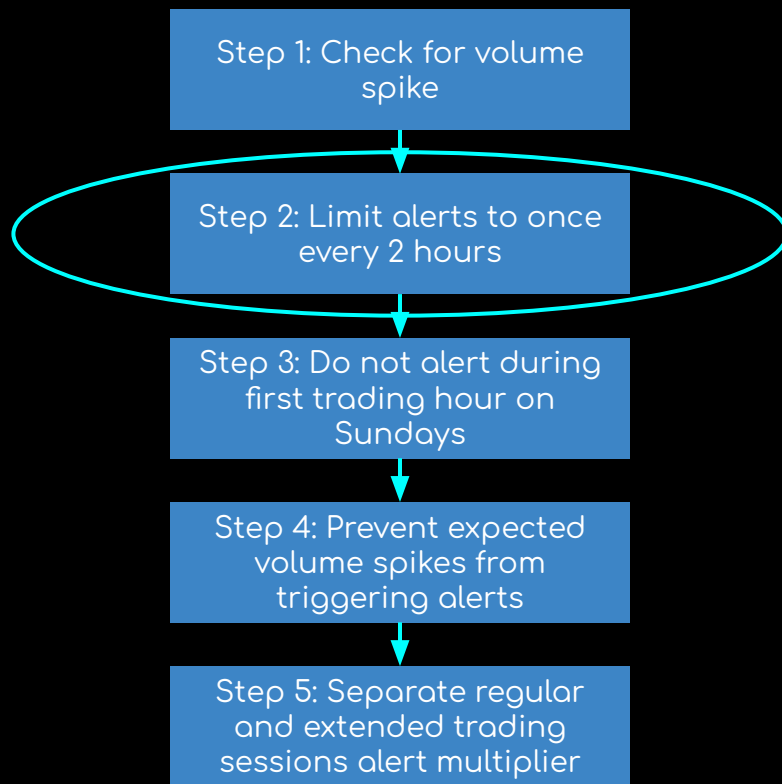
Important note

- Therefore, when backtesting, alerts within that period will not be logged

Important note

- However, alerts will still be triggered and logged normally when live trading

Steps in part 3



Why limit alerts to once every 2 hours?

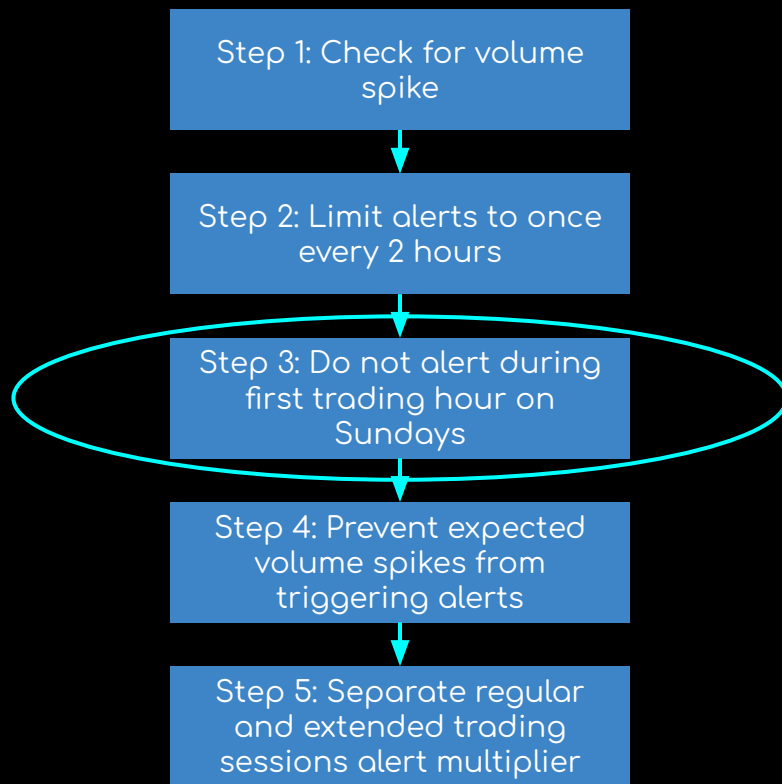
- When something big happens, a flood of orders triggers many alerts within a short period of time, so most of the alerts after the first quickly become outdated

How to limit alerts to once every 2 hours?



Part 3 Step 2: Limit alerts to once every 2 hours

Steps in part 3



Why not alert during first trading hour on Sundays?

- A lot happens between Friday (when trading stops) and Sunday (when trading starts)

Why not alert during first trading hour on Sundays?

- In the first hour of trading on Sunday, orders flood in to react to those events

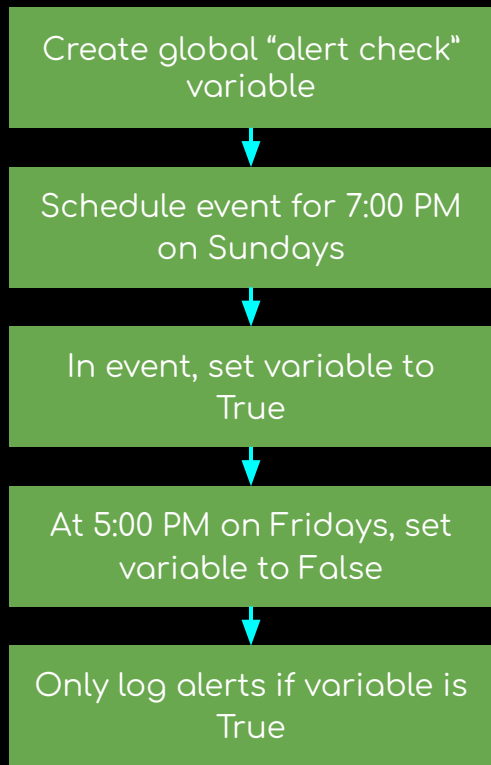
Why not alert during first trading hour on Sundays?

- Alerts sent within that time are inactionable, hence, should be removed

Trading hours of crude oil futures

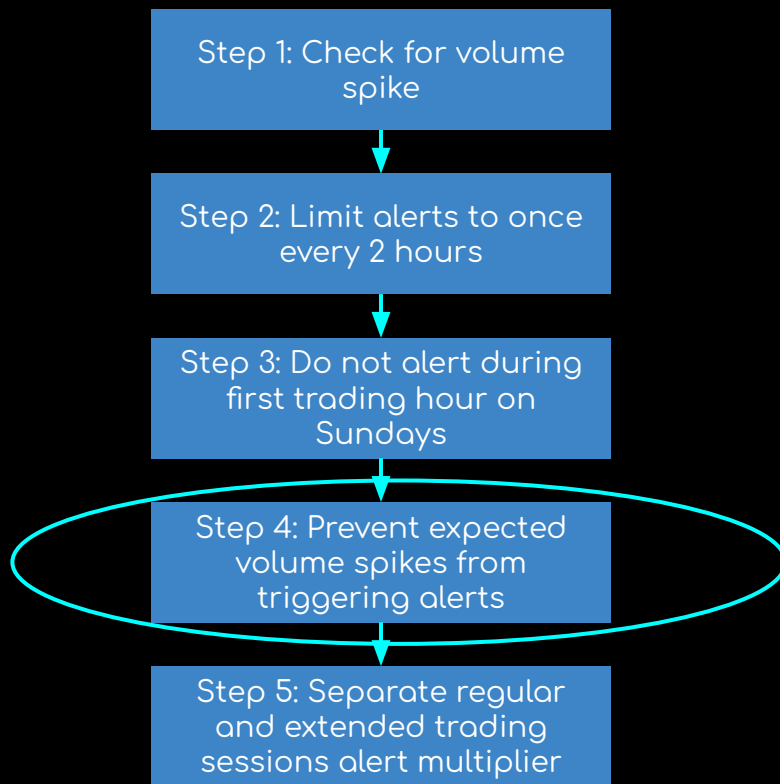
Status:	Time (Eastern Time):
Weekly start	Sunday 6:00 PM
Weekly end	Friday 5:00 PM
Daily break	5:00 PM - 6:00 PM

How to prevent alerts from first trading hour on Sundays?



Part 3 Step 3: Do not alert during first trading hour on Sundays

Steps in part 3



What are some expected volume spikes?

Time:	Cause:
Open of regular trading hours (weekdays)	Market participants are most active
2:29 and 2:30 PM (weekdays)	Daily reference price checkpoint
Near end of regular trading hours (weekdays)	Traders want to close positions before the day ends
Fridays	Traders do not want to hold risk over the weekend

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Open of regular trading hours (weekdays)	Market participants are most active
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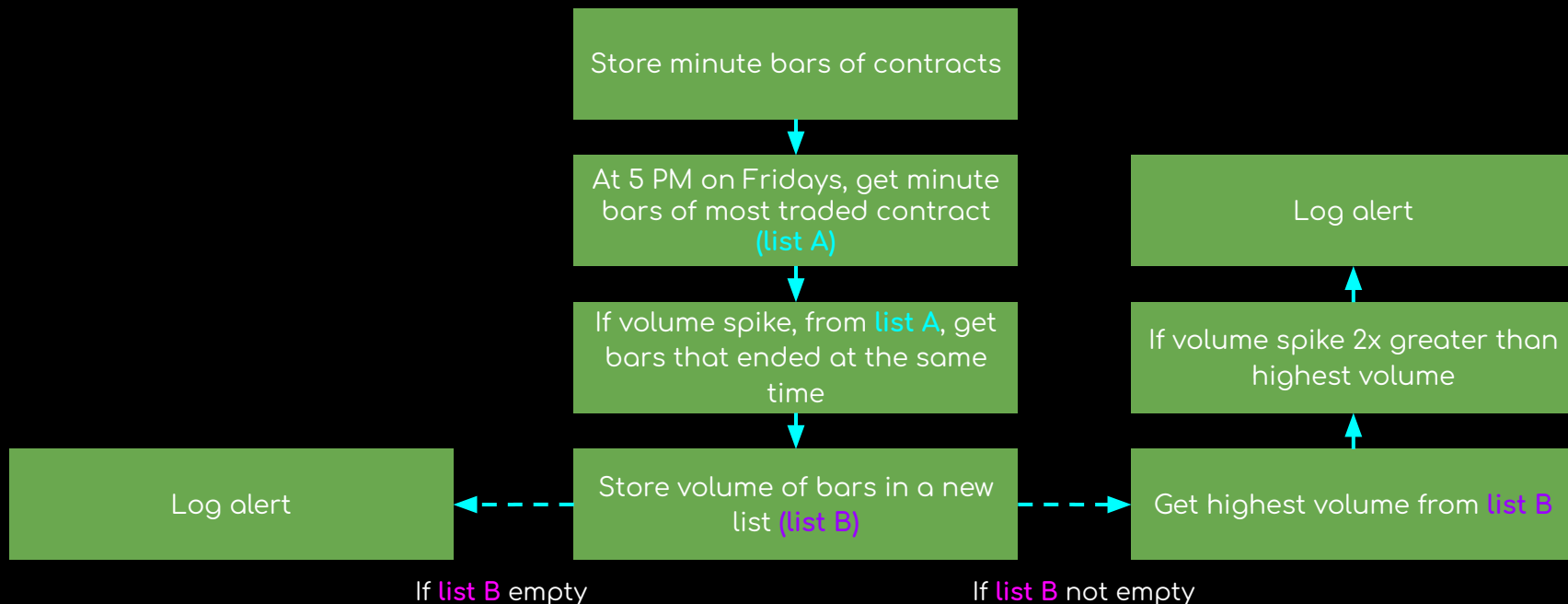
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Why prevent these volume spikes from triggering alerts?

- They are inactionable

How to prevent expected volume spikes from triggering alerts?



How can list B be empty?

- Since we're working with non filled forward data, there will be times where a volume spike happens but no bars are found for the same time from list A

How can list B be empty?

- This tends to happen when there's less activity in the market (e.g. 6 PM - 8 AM)

How can list B be empty?

- Since content in list B depends on bars found from list A, when no bars are found, it will be empty

Why log alerts even when list B is empty?

- Alerts that happen when list B is empty (low activity hours) are the most valuable (the unusual volume spike happened during these times)

Part 3 Step 4: Prevent expected volume spikes from triggering alerts

Steps in part 3



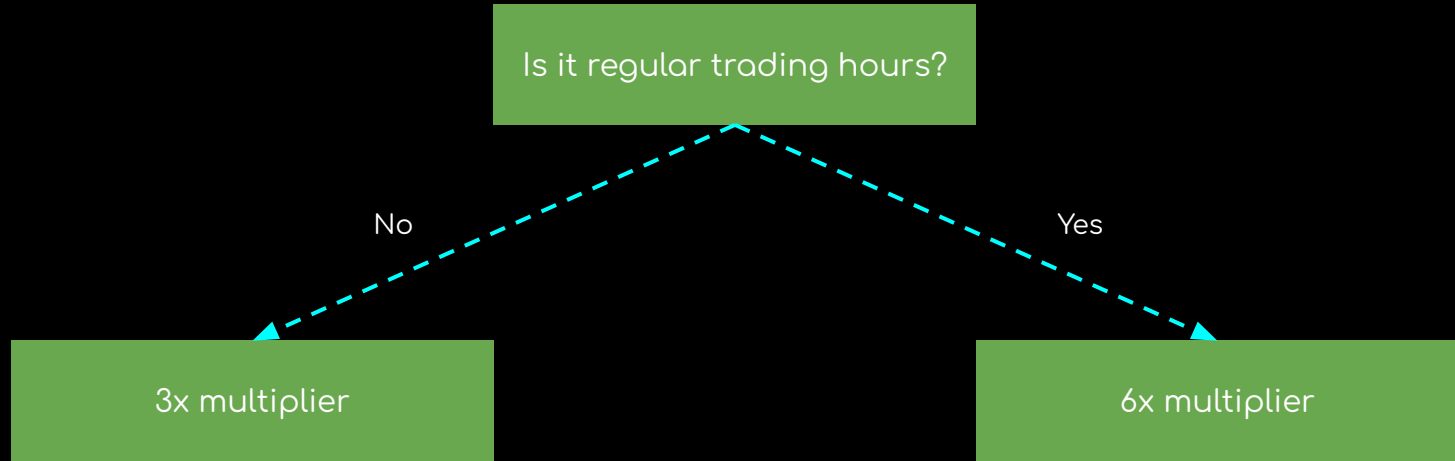
Why separate regular and extended trading sessions alert multiplier?

- Volume during regular trading hours is significantly higher than other sessions

Why separate regular and extended trading sessions alert multiplier?

- What constitutes a volume spike must be adjusted accordingly

How to separate regular and extended trading sessions alert multiplier?



Part 3 Step 5: Separate regular and extended trading sessions alert multiplier

Alert system is ready

- It's able to filter out a lot of market noise, giving us higher quality volume spike alerts

Important note

- System still lets in a lot of inactionable alerts, don't trust it completely and **use it at your own risk!**

Bonus

A yellow starburst graphic with multiple points, centered on the slide.

Send alerts to
Discord channel and
add trading logic

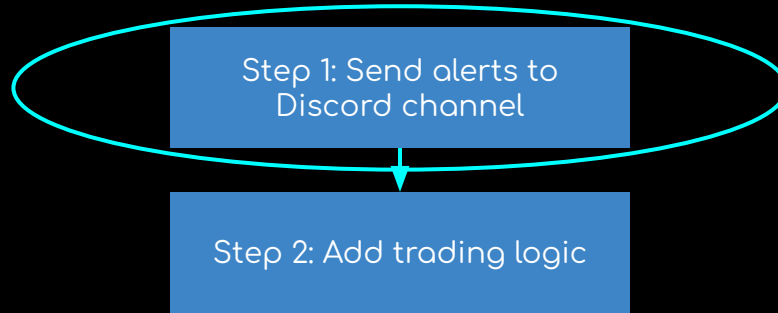
Steps in BONUS

Step 1: Send alerts to
Discord channel



Step 2: Add trading logic

Steps in BONUS



How to send alerts to Discord channel?

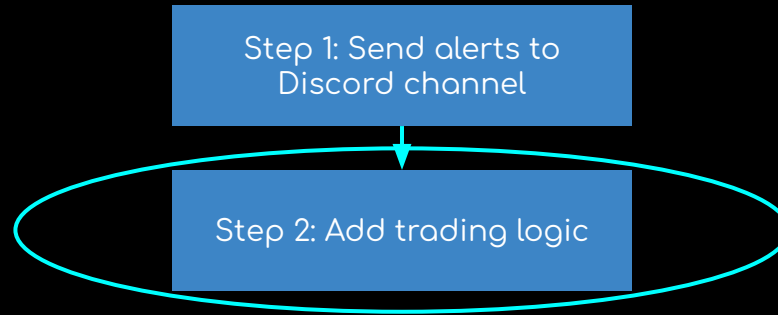


BONUS Step 1: Send alerts to Discord channel

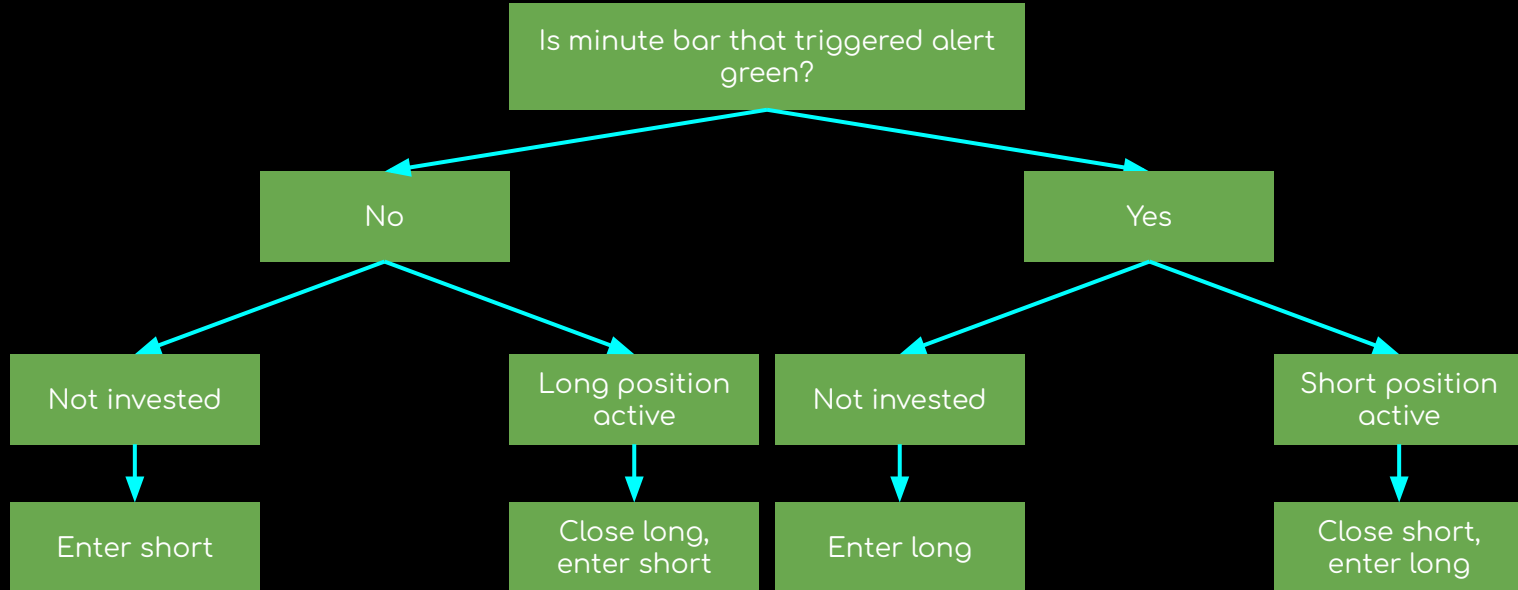
Important note

- Alerts will not be sent to the specified Discord channel when backtesting, only live-trading

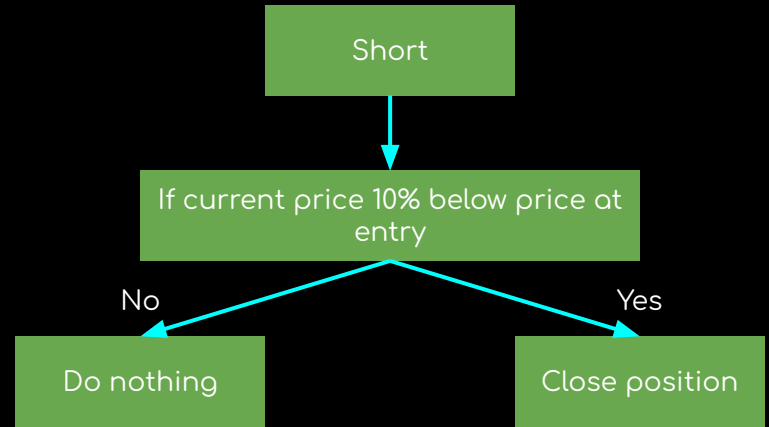
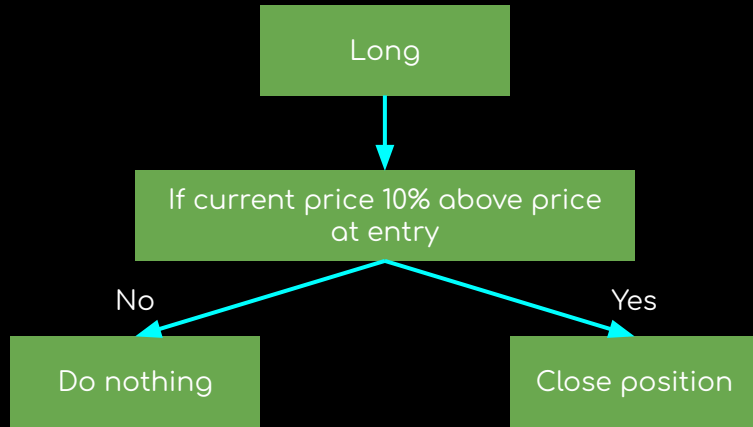
Steps in BONUS



Entry logic



Exit logic



BONUS Step 2 - Add trading logic

Important note

- Don't be fooled by the performance of the backtest

Important note

- There's typically a difference between backtesting and live-trading performance

Important note

- The more people that run this trading bot, the less profitable it'll be due to the crowding effect, **use it at your own risk!**

Want to learn to build and deploy trading bots?

- Check out my [algorithmic trading with AI for beginners](#) course (link in description)