EMA "Captain" Crypto Trading Bot (with RSI/MACD "Advisors")

This bot watches multiple crypto markets on Coinbase in real time. It makes simple, explainable trades:

- **EMA crossover** is the "captain": when a short-term moving average crosses a long-term one, that's a buy/sell signal.
- **RSI & MACD** are "advisors": they can veto obviously bad buys/sells.
- Orders are **post-only limit orders** by default (to earn maker rates), with a **daily spend cap** and a **cool-down** between trades per coin. It keeps a lightweight portfolio and P&L.

Quick start (plain English)

1. **Add your API keys** in an env file (default name APIkeys.env) or environment variables:
    - COINBASE_API_KEY, COINBASE_API_SECRET, and optional COINBASE_PORTFOLIO_ID.
2. **Run the bot**:
3. python main.py

It sets up logging, loads keys, starts the bot, and idles until you stop it. Ctrl-C triggers a clean shutdown.

What each file does (in friendly terms)

- **main.py** – The entry point. Loads your keys, wires up Ctrl-C handling, starts the bot, and keeps the event loop alive until you stop it.
- **bot/config.py** – All the knobs. Pick which coins to trade, EMA lengths, spend limits, cool-down, advisor (RSI/MACD) settings, and maker offsets. Includes per-coin overrides and an EMA "dead-band" to avoid flapping.
- **bot/tradebot.py** – The brain. Connects to Coinbase (REST + WebSocket), subscribes to tickers for all chosen coins, updates indicators per tick, decides when to trade, enforces daily cap/cool-down, places orders (maker by default), and updates portfolio/P&L from fills. Also logs a session P&L footer on exit.
- **bot/indicators.py** – Lightweight, streaming indicators:

    - **EMA** (short & long) for the captain signal,
    - **RSI(14)** by default,
    - **MACD(12,26,9)** with signal line & histogram.
- **bot/strategy.py** – Advisor rules. RSI must be within a safe range; MACD must not contradict the side (default: buy only if MACD≥0, sell only if MACD≤0). It can normalize MACD by price (basis points).
- **bot/orders.py** – Builds post-only limit orders near the current bid/ask with an offset, and rounds price/size to the exchange increments. Returns the price & size to place.
- **bot/persistence.py** – The little database:
    - **SpendTracker** (daily spend cap),
    - **LastTradeTracker** (per-coin cool-down),
    - **PortfolioStore** (positions, cost basis, realized P&L),
    - **ProcessedFills** (avoid double-counting),
    - Trade log writer (appends human-readable lines).
- **bot/constants.py** – Points the bot to a .state/ folder and names the JSON/text files it uses.
- **bot/logging_setup.py** – Optional rotating file logs; sets formats and quiets noisy libraries.
- **bot/utils.py** – Thin re-export layer so tradebot.py can import the persistence & constants helpers from one place.

How the bot decides to trade (simple view)

1. **Real-time prices** stream in for every chosen product.
2. For each tick, it updates **EMA/RSI/MACD** for that product. It waits for a minimum warm-up of ticks first.
3. When **short EMA crosses long EMA** (with a small "dead-band" buffer), that's a new buy/sell event.
4. **Advisors can veto** if RSI is out of range or MACD disagrees with the side.

5. It obeys **per-coin cooldown** and a daily **BUY** cap. Once the cap is hit, it writes the session P&L footer and skips further BUYs (for the current **UTC** day) but continues to place SELLs until you stop it (Ctrl+C).
6. **Orders**: by default it places **post-only limit** buys/sells using your maker offset (bps) relative to bid/ask; market orders are optional.

Key settings you'll actually tweak

All of these live in **bot/config.py** unless noted.

What to trade & how much

- product_ids: the coins you want. More coins = more potential trades overall.
- usd_per_order: size of each order in USD.
- max_usd_per_day: daily spend cap; hitting it will stop the bot for the day.
- dry_run: simulate without sending live orders.

Signal sensitivity (frequency dial)

- short_ema, long_ema: shorter numbers react faster (more trades); longer numbers react slower (fewer). Per-coin overrides available in ema_params_per_product.
- ema_deadband_bps: extra buffer around crossovers to avoid choppy flip-flops. Bigger dead-band = fewer signals.
- cooldown_sec: minimum seconds between trades **per coin**. Higher = fewer trades.
- min_ticks (and per-coin min_ticks in overrides): warm-up period (doesn't change steady-state frequency, just how soon it can start).

Advisor (RSI/MACD) guardrails

- Toggle with enable_advisors / use_advisors. Turning them off increases trades.
- **RSI band**: Buys require RSI ≤ rsi_buy_max (default 70). Sells require RSI ≥ rsi_sell_min (default 30). Tighten by **lowering** rsi_buy_max and/or **raising** rsi_sell_min
- **MACD sign-check**: Buys require MACD ≥ macd_buy_min and sells require MACD ≤ macd_sell_max (set in config.py). Use 0.0/0.0 for pure sign-check; increase magnitude (e.g., +3.0/−3.0) to tighten confirmation. Values set in config.py override default values.

Order style (fill behavior)

- prefer_maker: True = post-only limit orders.
- maker_offset_bps (and per-coin map): bigger offset = less aggressive pricing, **fewer fills**; smaller offset = more fills.

Sell guard (risk)

- max_loss_bps: don't sell below cost basis beyond this tolerance (bps). Lower value = fewer loss-taking sells; higher value = more sells allowed when under water.

Tuning cheatsheet

If you're seeing *too many* trades per session:

- **Raise cooldown_sec** (e.g., 720 → 1200).
- **Increase ema_deadband_bps** (e.g., 8 → 12–20 bps).
- **Lengthen EMAs** (e.g., short_ema +10–30%, long_ema +10–30%). Use per-coin overrides if only some assets are noisy.
- **Narrow the RSI window** (raise rsi_buy_floor, lower rsi_sell_ceiling, e.g., 55–65).
- **Increase maker_offset_bps** so limits are less likely to fill in chop.
- **Lower max_usd_per_day** to force the bot to stop sooner once busy.

If you're getting *hardly any* trades:

- **Lower cooldown_sec** (e.g., 720 → 300).
- **Shrink ema_deadband_bps** (e.g., 8 → 4–0 bps).
- **Shorten EMAs** (e.g., short_ema −10–30%, long_ema −10–30%).
- **Widen the RSI window** (lower rsi_buy_floor, raise rsi_sell_ceiling, e.g., 45–75), or **disable advisors** temporarily.
- **Decrease maker_offset_bps** for more fills, or set prefer_maker=False (market orders).
- **Raise max_usd_per_day** if you're hitting the cap early.

Advanced MACD loosen/tighten: In code, the default requires **MACD ≥ 0 for buys** and **≤ 0 for sells**. To make it less strict (more trades), allow small negatives/positives by changing macd_buy_min and macd_sell_max when AdvisorSettings is created in tradebot.py. (Example: set them to −5/+5 bps. macd_buy_min=-5, macd_sell_max=+5)

Where things get saved

- **State folder**: .state/ (configurable via BOT_STATE_DIR).
- **Files**:
  daily_spend.json, last_trades.json, trade_log.txt, portfolio.json, processed_fills.json.
- **Trade log lines** look like: timestamp, side, product, USD, price, qty (and "DRY RUN" if simulated).
- **Session P&L footer** is appended when the session ends.

Order placement (maker vs market)

- **Maker (default):** prices are placed slightly *away* from current bid/ask using your offset (in basis points). This can reduce fees but may not fill in fast markets.
- **Market:** switch by setting prefer_maker=False in config.

Notes & defaults (handy)

- **RSI default period**: 14. **MACD**: 12/26 with 9-period signal.
- **Dead-band meaning**: a small % buffer (in **bps**, where 100 bps = 1%) around the crossover to cut down on noise.
- **Sell guard**: won't sell at a loss beyond max_loss_bps below cost basis unless you relax that number.

Parameter adjustments for preferred Trading Strategies (adjust at your own risk)

A) Quality-first (fewer whipsaws, fewer trades)

- **Mode: Candles (preferred).**
  - **candle_interval:** "1m" (or "5m" if you want even smoother signals)
- **EMA (trend gate):**
  - **1m: short_ema** = 20, **long_ema** = 60
  - **5m: short_ema** = 40, **long_ema** = 120
- **MACD veto (normalized, bps):**
  - **macd_buy_min** = +3.0
  - **macd_sell_max** = −3.0
- **RSI veto (one-sided):**
  - **rsi_buy_max** = 60 (don't buy if RSI > 60)
  - **rsi_sell_min** = 40 (don't sell if RSI < 40)
- **When to use:** Choppy days, tight spreads, or if you're seeing many small losers.

B) Velocity-first (more trades, more whipsaws)

- **Mode: Candles or ticks.**
  - **candle_interval:** "1m" (or ticks if you're experimenting)
- **EMA (trend gate):**
  - **1m: short_ema** = 12–20, **long_ema** = 36–60
  - **Ticks:** consider **short_ema** = 40, **long_ema** = 120
- **MACD veto (normalized, bps):**
  - **Candles: macd_buy_min** = +1.0 to +2.0 / **macd_sell_max** = −1.0 to −2.0
  - **Ticks: macd_buy_min** = +4.0 / **macd_sell_max** = −4.0 (ticks are noisier)
- **RSI veto (one-sided):**
  - **rsi_buy_max** = 65–70

  - **rsi_sell_min** = 30–35
- **When to use:** Strong trends, wide ranges, or if the bot feels too “idle.”

Parameter Reference (how each knob behaves)

- **Candles vs Ticks**
  - Candles greatly reduce noise vs ticks. 1m is a good balance; 5m lowers noise further but reacts slower.
  - Ensure you have enough warm-up bars (≥ long_ema) before trusting EMA/MACD.
- **EMA (trend gate)**
  - Buys are favored when short **EMA > long EMA**; sells when **short < long** (exact gate depends on your strategy wiring).
  - **Longer EMAs** = smoother, slower; **shorter EMAs** = faster, choppier.
- **MACD veto (normalized to price in basis points)**
  - **macd_buy_min:** BUY allowed only if MACD ≥ this value.
  - **macd_sell_max:** SELL allowed only if MACD ≤ this value.
  - **0 / 0 =** pure sign-check (fastest, choppier).
  - Increasing magnitude (e.g., +3/−3) demands more momentum → fewer but cleaner entries.
  - **Tip:** keep thresholds above your typical spread+slippage so you’re not churning.
- **RSI veto (one-sided)**
  - **rsi_buy_max:** cap for buys (don’t buy if overbought). Lower it (70→60) to be stricter.
  - **rsi_sell_min:** floor for sells (don’t sell if oversold). Raise it (30→40) to be stricter.
  - There is no “inside-band only” rule by default; it’s a ceiling for buys and a floor for sells.
- **Cooldown / Daily Cap / Runtime**
  - Cooldown: enforced per-coin to avoid rapid re-entries.

- Daily BUY cap: once hit, the bot skips further BUYs for the rest of the UTC day, logs the P&L footer once, and continues to place SELLs until you stop it (Ctrl+C).
- This lets you harvest exits without increasing exposure.

Suggested Defaults:

```
# config.py (starting point)
mode = "candles"             # "candles" or "ticks"
candle_interval = "1m"       # "1m" | "5m" | etc.

# EMA
short_ema = 20               # 1m: 20/60; 5m: 40/120
long_ema  = 60

# MACD (normalized, bps)
macd_buy_min  = +2.0         # tighten to +3.0 if choppy
macd_sell_max = -2.0

# RSI (one-sided veto)
rsi_period  = 14
rsi_buy_max = 65             # tighten to 60 if many small losers
rsi_sell_min = 35            # tighten to 40 if premature exits

# Risk / Ops
daily_spend_cap_usd = 100.0   # buys stop after cap; sells keep running
per_product_cooldown_s = 300   # adjust per your pace
```