OX212

The science of OX212

How we measure, forecast, and stop the behavior that costs a trader the most money

The OX212 team[1]

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Summary

Between 74% and 89% of retail CFD accounts[2] in Europe lose money [1]. Among all day traders in Taiwan[3] over fifteen years, fewer than 1% earn reliable profits after fees [2]. Thirty years of research point to a recurring cause: the trader's behavior at their worst moments, more than their reading of the market. They overtrade, hold on to losses, increase size to win the money back, and break from their own plan [4–10].

OX212 measures that behavior, session by session, using each trader's real trades. Before each session it writes a forecast of what the trader is likely to do. During the session it sends alerts and, only if the trader has authorized it in advance, pauses their account.

Every forecast is sealed in the Bitcoin blockchain **before** anyone knows whether it is correct. It is then checked against what happened. This is the same principle science uses to register a hypothesis before the experiment [20]. Anyone can verify the record independently.

OX212 gives no signals, does not say what to buy or sell, and does not forecast price. It forecasts the trader.

Keywords: behavioral finance; behavior forecasting; commitment devices; calibration; Bitcoin timestamping.

JEL classification: G41, D91, C53.

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2. CFD: contract for difference. A derivative that lets you gain or lose on the rise or fall of an asset without owning it, usually with leverage.

3. *Day trader*: someone who opens and closes their trades within the same day.

1 The problem: behavior costs money

1.1 Most traders lose, consistently

- **Europe, CFDs.** When it restricted CFDs for retail clients in 2018, the European Securities and Markets Authority (ESMA) gathered the analyses of national supervisors: between 74% and 89% of retail accounts lose money, with average losses per client of between €1,600 and €29,000 [1].
- **Taiwan, day trading.** Barber, Lee, Liu, and Odean studied all day traders on the Taiwan Stock Exchange between 1992 and 2006. Fewer than 1% earn positive returns predictably and reliably after fees [2].
- **Brazil, futures.** Chague, De-Losso, and Giovannetti followed every individual who began day trading Brazilian index futures between 2013 and 2015 and persisted for at least 300 days. Of these, 97% lost money, and only 0.4% earned more than a bank teller's wage [3].

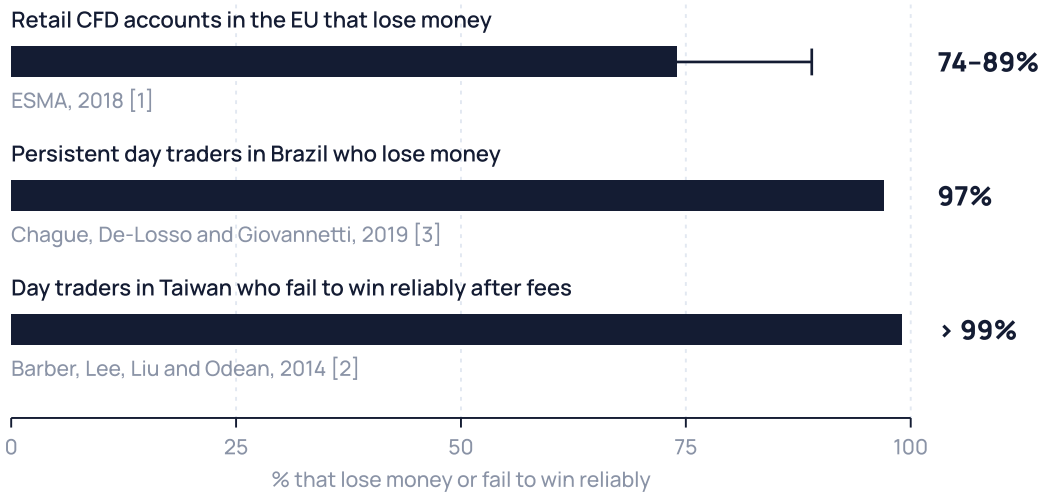


Figure 1. Who loses

1.2 They do not lose for lack of analysis

The most cited studies of individual investors point to behavioral patterns. These patterns repeat within each person, and they can be measured.

- **Overtrading.** Barber and Odean analyzed 66,465 households at a US brokerage. Those who traded most earned 11.4% a year, against 17.9% for the market. Their own trading accounted for the difference. The authors attribute it to overconfidence [4, 5].
- **Holding losses and cutting gains.** Odean showed that investors realize their gains more often than their losses, even when this costs them money. This is known as the

disposition effect[4] [6].

- **The pain of losing.** Kahneman and Tversky's prospect theory explains why: we evaluate each outcome as a gain or a loss relative to a reference point, and a loss weighs more than a gain of the same size [7].
- **Winning it back.** Thaler and Johnson observed that after a gain, people take more risk ("house money"). After a loss, they take more risk when there is a chance to break even [8]. In the Chicago Treasury bond futures market, traders who lost in the morning took on more risk in the afternoon [9].
- **Emotional intensity.** In a clinical study of day traders, those who reacted more intensely to gains and losses had significantly worse results [10].

1.3 The body trades too

Trader behavior has a measurable physical basis. Several studies of professional traders on real trading desks show this.

- Physiological responses (skin conductance, pulse) track market events in real time, even in experienced traders [11].
- On a London trading floor, morning hormone levels were linked to the day's results, and cortisol rose with the volatility of the market and of the traders' own results [12].
- Traders who perceive the signals of their own bodies more accurately earned more and lasted longer in the profession [13].
- Higher heart rate variability (HRV)[5] is associated with better self-regulation [14], including in professional traders [15].
- Short sleep shifts decisions toward risk: in the laboratory, sleep deprivation raises the expectation of gains and dampens the response to losses [16, 17].

These studies have small samples and are mostly correlational. They do not prove that sleep or pulse causes a bad session. They do justify measuring both alongside each trader's behavior, with the trader's own history as the reference.

2 The idea: forecast the trader, not the market

Forecasting price is the problem the whole market is trying to solve at once. Forecasting the behavior of one specific person is a different problem, and behavioral science offers good reasons to think it can be tackled.

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4. The name comes from the «disposition» to sell winners early and hold on to losers.
5. HRV: the variation, in milliseconds, of the time between one heartbeat and the next. It is often read as an indicator of recovery.

1. **Behaviors repeat.** Trading after a loss, increasing size, and breaking from the plan appear again and again in the same person [4–9].
2. **They leave a trace.** Each one is written into the trader's trade history, with its time, its size, and its result.
3. **They have context.** They show up more on some days than on others: after a streak, after a bad night, at certain hours.
4. **We decide better cold than hot.** Loewenstein described the "hot-cold empathy gap": when calm, we underestimate how strongly an intense state will carry us away [18]. That is why rules set in a cold state protect us in the hot moment.

OX212 builds on these four ideas. It learns from each trader using their own data and always compares them with themselves.

3 What OX212 measures

With the trader's permission, OX212 reads the real trades from their platform. If the trader wishes, it also reads their watch or band (sleep, recovery, heart rate variability). From this it calculates, for each session:

- **the result**, account by account;
- **the behaviors outside their plan** and what they have cost: trading too much, re-entering after a loss, increasing size after losing, carrying on after hitting their maximum loss, and stringing losses together;
- **session pressure**, on a scale from 0 to 212 °F[6]. 212 °F is the boiling point of water: the moment a session stops being under control;
- **the day's traffic light**, a simple reading of whether they can trade within their limits, trade with caution at base size, or should open no more trades today.

Everything is measured against the trader: their plan, their limits, and their history. OX212 does not compare a person with a market average.

6. 212 °F is 100 °C, the boiling point of water at sea level. Hence the name OX212.



Figure 2. The journey of a trade

OX, the voice. The trader can ask OX about their day, their limits, or their history. OX answers only with the trader's data and with what the engine calculates: every figure it gives comes from there. It never gives signals, never offers a view on where the market is heading, and never diagnoses emotions. If it detects a situation of serious personal risk, it responds with a fixed safety message and helpline numbers, without involving artificial intelligence.

4 How it acts: commitments made in a cold state

The OX212 pause applies an idea with strong evidence behind it: **commitments a person chooses in advance, while calm**.

- **The idea is old.** Ulysses had himself tied to the mast so he could hear the Sirens without wrecking the ship. Economics formalized it: what we prefer changes with the moment, and whoever knows this binds themselves in advance [37, 38].
- **Commitment devices work.** In a randomized trial in the Philippines, a group of bank clients was offered a savings account with restricted withdrawals, on terms each one set. A year later, that group's savings had grown 81 percentage points more than the control group's, even though only about one in four opened the account [19]. The literature on these devices sums it up this way: binding yourself in advance helps when you know your future self will falter [21].
- **Concrete plans work.** A meta-analysis of 94 tests found a medium-to-large effect of "implementation intentions," plans of the form "if X happens, I will do Y," on goal attainment [22].
- **Voluntary limits work in risky settings.** In online gambling, the most intense players who set themselves a voluntary time limit reduced their playing time [23]. Well-timed messages led more players to end their session, although the effect was small [24].
- **Timing matters.** Mobile health research proposes intervening just when a person is vulnerable and able to receive help [25]. OX212 applies that principle to the trading

session.

How OX212 applies it:

- The trader defines their plan and limits while in a cold state.
- They authorize OX212, account by account, to pause that account. They can withdraw permission at any time.
- If they want a firmer commitment, they turn on **Firm Mode**, built for their worst moments: if a pause locks their account and they want to lift the lock early, they first wait a few minutes and read the sentence they wrote while calm. Then they can lift it. No lock lasts more than 24 hours.
- If they want the firmest commitment of all, they use **Ulysses Lock**. They tell OX212 they do not want to trade any more today and accept a sentence: “I confirm I do not want to trade any more today. I will not be able to lift this pause until 00:00.” OX212 cancels their orders, closes their positions and blocks new entries until midnight. This lock cannot be lifted early. The sentence is kept word for word, with its time, in the pause receipt, and sealed. It is Ulysses' mast brought to the trading session: decide while calm to protect yourself in the heat of the moment.
- Every pause is logged and sealed.

OX212 never opens trades or loosens the limits set by the broker or the firm. It only adds the ones the trader chooses.

5 How it is proven

This is the part that sets OX212 apart. A tool that claims to forecast behavior has to be able to prove it, and third parties have to be able to check the proof.

5.1 The principle: record before knowing

In science, preregistration[7] separates predictions from after-the-fact explanations: the hypothesis is fixed before the data are seen, so no one can adjust it afterward [20]. OX212 applies the same principle to every forecast.

5.2 The four steps

1. **It is written.** Before each session, OX212 writes a forecast based on days already closed: the probability of each behavior and the expected pressure band. During the session, after a loss, it also writes whether the trader is likely to re-enter or increase size.

7. Preregistration: writing down a study's hypothesis and method before collecting the data. It is standard practice in clinical trials.

2. **It is sealed.** Every hour, everything new goes into a Merkle tree[8] [26]. Its root, a fingerprint of a few bytes, is anchored in the Bitcoin blockchain with OpenTimestamps[9] [27, 28]. A public copy lives on GitHub. From that moment, any change to a forecast would be visible to independent verification.
3. **The session happens.**
4. **It is checked.** The forecast is compared with what happened. Each trader's record of correct forecasts is visible in their app.

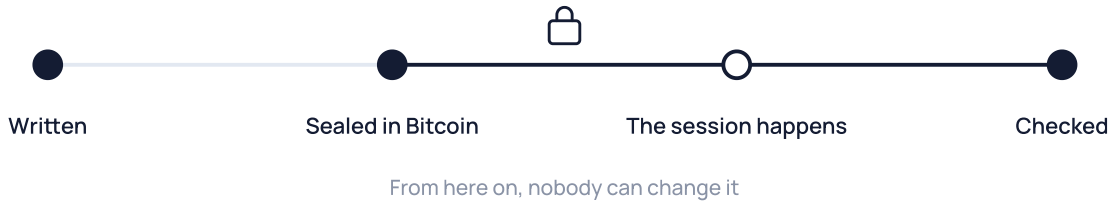


Figure 3. The life of a forecast

5.3 How accuracy is measured

A probabilistic forecast does not simply hit or miss: what matters is whether it is **well calibrated**, that is, whether the outcomes OX212 rates as 70% likely happen roughly seven times out of ten. This is measured with proper scoring rules, such as the Brier score[10], which meteorology has used since 1950 [29, 30]. They are the standard for judging probabilistic forecasts, because they reward honesty and penalize both overconfidence and underconfidence.

The accuracy record will be published once there are enough checked sessions from real traders. Every forecast is already sealed before anyone knows whether it is right.

8. Merkle tree: a structure that sums up many records in a single fingerprint. If one record changes, the fingerprint changes.
9. OpenTimestamps: an open protocol that records in the Bitcoin blockchain that a document existed at a given date, without publishing its content.
10. The Brier score is the mean squared difference between the forecast probability and the outcome (1 if it happens, 0 if not). Lower is better.

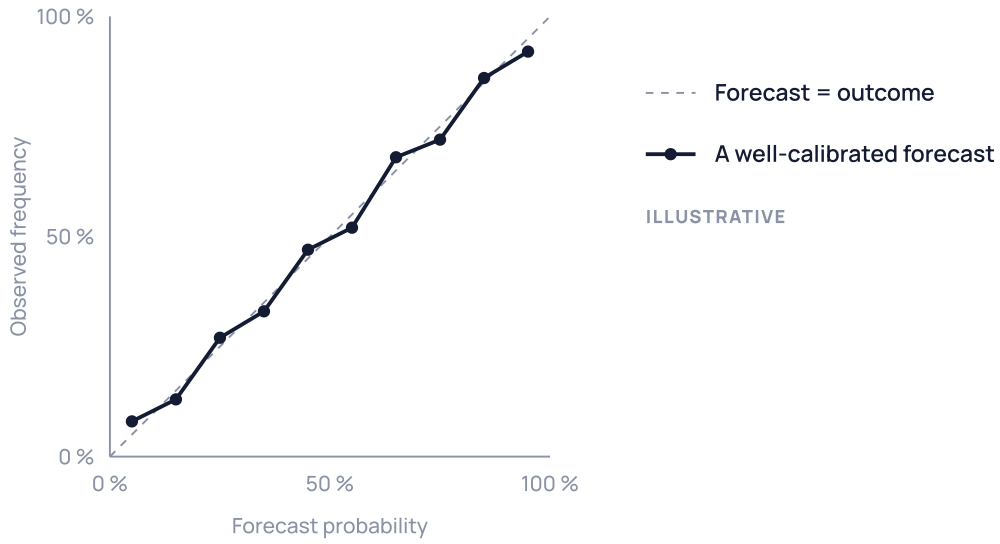


Figure 4. How to read a calibration curve

5.4 How we validate the engine

A sealed forecast proves it was not changed afterwards. It does not prove it is a good one. For that, the OX212 engine follows the rules that forecasting science demands of any model.

- **It learns only from the past.** Each forecast is evaluated with what was known before the session, and no session is ever used to predict itself. This is out-of-sample evaluation in time order, regarded as the honest test of a forecasting model [31].
- **It has to beat the simple benchmarks.** A forecast is only worth something if it improves on two benchmarks:
  • what usually happens (the base rate[11]);
  • repeating what happened in the last session (persistence)[12].

These are the same benchmarks meteorology has used to judge its forecasts for decades [32, 33]. The reading based on sessions similar to the last one is used only while it beats the base rate in the self-test. Otherwise OX212 uses the base rate, always with its sample.

- **It is scored with proper rules.** The Brier score and calibration are computed in the engine's self-test and in the sealed record. A good probabilistic forecast has to be calibrated and, at the same time, as sharp as possible [29, 30, 34].
- **Every figure carries its sample.** OX212 never says «70%» on its own. It says how many times something happened and out of how many («X out of Y times»). With little history, OX stays silent.

11. How often a behavior appears in the trader's history. It is the simplest possible forecast.
12. Forecasting that the next session will repeat the last one.

- **Ready to learn from many.** A new trader has little data of their own. The engine is ready to start them close to what usually happens to traders in the same situation, once enough of them allow it, using partial pooling[13], a standard technique of hierarchical models [35]. The more history of their own they have, the more it counts. What the trader did in their other accounts is used only if it does not worsen their self-test.
- **It measures behavior, not emotions.** The labels are facts observable in the trading history, such as increasing size after a loss or re-entering very quickly. OX212 never labels anyone with an emotion and never makes diagnoses.
- **It measures what happens after each intervention.** The intervention log records whether the trader stopped in the hour after each pause or alert. It is the basis for measuring, rigorously, which interventions help most (§8).

5.5 Anyone can verify it

- Since October 2026, the seal has anchored a batch in Bitcoin every hour with activity.
- The public seal page shows each batch, its root, and its anchor in Bitcoin: https://app.ox212.com/api/public/seal.
- The copy on GitHub makes it possible to check without relying on our servers.
- The OpenTimestamps tools are open [28].

This is independent verification, as in an audit.

6 Data and privacy

- **We read; we do not move money.** OX212 reads trades and, with permission, pauses. It never opens trades or transfers funds.
- **The pause exists only with permission.** The trader authorizes it account by account and can withdraw it. Every pause is logged, with its reason.
- **No one's data is on Bitcoin.** Only a salted cryptographic fingerprint[14] is published. OX212 keeps the salt, and each trader receives the salt for their own records so they can check them themselves. Without it, no one can tell what the fingerprint contains.
- **Health data is optional and kept apart.** Watch data is read only if the trader connects it, under its own permission. It is not shared with anyone, including a firm.
- **The trader is in control.** They can download their data or delete their account.

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13. Combining what is known about one person with what is known about the group, giving more weight to their own data the more history they have.
14. A salted fingerprint (*hash*) is made by passing the data, with a secret value, through a function that cannot be reversed.

- **We do not sell data.**

7 What OX212 is not

- It does not give buy or sell signals.
- It does not forecast the price of any asset.
- It does not manage money or trade for anyone.
- It is not financial advice, nor medical or psychological treatment.

It is a behavior tool: it measures, forecasts, alerts, and, with permission, stops.

8 Where we are heading

Each trader's reading improves with their own history. With each person's express permission, the behavior of many traders together will improve the reading for everyone: which patterns precede a bad session and which interventions work best. That behavioral dataset, sealed and verifiable, does not exist anywhere else today.

Always under the same rules:

- never raw data;
- only large groups;
- health data never leaves the trader;
- new permission before any different use.

The next study: a micro-randomized trial[15]. It is the design science uses to learn which intervention works best at each moment [36]:

- at moments of risk, with each participant's permission, the type of help is drawn at random: reminding them of their own history, adding one more step before trading, repeating their plan back to them, or a short pause;
- what they do in the following hour is then measured;
- protection is never withdrawn.

This is how «OX212 protects» will move from a well-founded thesis to publishable causal evidence.

15. A design in which the same person receives, at different moments and at random, different types of help, to measure the effect of each.

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