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The Expected Value & Kelly Staking Field Guide

Turning an edge into a stake — EV from first principles, fair-line anchoring, and fractional Kelly

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[redacted]

1 · Expected value from first principles

Expected value (EV) is the probability-weighted average result of a bet — the long-run centre of gravity, not what happens on any single bet. It weighs each outcome by how likely it is and how much it pays.

```
# EV per 1 unit staked
# p = your probability the bet wins
# D = decimal price ; (D − 1) = profit per unit if it wins
EV = p x (D − 1) − (1 − p) x 1

# positive EV: priced in your favour on average
# negative EV: priced against you (true of most posted prices)
```

2 · A worked example

Suppose a two-way market offers decimal 2.10 and your analysis puts the probability at 52 percent. Illustrative numbers — the point is the arithmetic.

```
# D = 2.10, p = 0.52
EV = 0.52 x 1.10 − 0.48 x 1
   = 0.572 − 0.48
   = +0.092    # about +9.2% expected return per unit
```

That edge exists only if 0.52 is a better estimate of the true probability than the market's. Change your estimate to 0.47 and the same price flips to negative EV. The edge lives entirely in the accuracy of p.

3 · Value is the gap, not the result

A bet has value when your fair probability exceeds the price's fair probability — regardless of whether the outcome is likely. A short favourite can be terrible value; a long shot can be good value.

Value depends on the gap, not favourite status (illustrative)

Case	Decimal	Market fair p	Your p	Value?

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Short favourite	1.40	71.4%	70%	No
Even pick	2.00	50.0%	54%	Yes
Long shot	5.00	20.0%	23%	Yes

4 · Anchoring to a fair line

The weak link is always the probability estimate, so disciplined bettors anchor to the fair line of a tight, low-margin market: take the raw implied probability, remove the overround by normalising, and treat that margin-free figure as the market's honest estimate. Your edge is the difference between your number and that fair anchor — not the raw price.

```
# 1. raw:   p_raw = 1 / D
# 2. fair:  p_fair = p_raw / book_pct
# 3. edge:  edge = p_you − p_fair
# positive edge is the precondition for a positive−EV bet
```

5 · The Kelly formula

Kelly answers how much, sizing a bet to maximise long-run bankroll growth, staked against the current balance.

```
# b = profit per unit at decimal odds = D − 1
# p = win probability ; q = 1 − p
f = (b x p − q) / b
# stake = f x current_bankroll
# if f <= 0 the bet has no edge −− do not bet

# worked: D = 2.10 −> b = 1.10 ; p = 0.52 ; q = 0.48
f = (1.10 x 0.52 − 0.48) / 1.10 = 0.0836   # ~8.4% full Kelly
```

6 · Fractional Kelly and the overbet penalty

Full Kelly assumes your probability is exact, which it never is. The growth rate as a function of stake is a hump that peaks at full Kelly and falls faster than it rose. Betting double the Kelly fraction

— a plausible result of overestimating your edge — drives long-run growth back to zero on a genuinely winning bet. Because overestimation is common and its cost is severe, quarter- or half-Kelly is the practical default.

The overbet penalty is asymmetric (schematic, not measured data)

Stake vs full Kelly	Growth kept	Volatility
Quarter Kelly	high	much lower
Half Kelly	high	lower
Full Kelly	maximum	high
Double Kelly	zero	very high

7 · Simultaneous positions and caps

- Shared bankroll: simultaneous bets cannot each claim their full Kelly fraction of the same roll — scale down or cap total exposure.
- Correlation: legs that move together double-count edge if treated as independent; size them down or solve jointly.
- Recompute against the live bankroll every bet — the stake grows after wins and shrinks after losses, which is where the compounding comes from.

8 · Pre-bet checklist

- Estimate a probability you can defend.
- Remove the market's margin to get a fair anchor.
- Confirm your number beats the fair anchor (positive edge).
- Compute EV to confirm the price is worth taking.
- Size with fractional Kelly, respecting exposure caps.