

A zero-edge trader against a proprietary-trading evaluation: pass rate, lifetime payout, and the finite bankroll

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Abstract

A trader with no edge can still buy a prop-firm evaluation, trade a fair coin once a day, and collect a share of whatever the funded account pays before it ends. We ask what the rulebook of Prime Academy FX pays such a trader, and answer in three layers. The *theory* gives the pass rate as a barrier-crossing probability: exactly one half before cost at a reward-to-risk of one, and 48.66% once the firm's commission and a conservative spread are charged. It puts the ratio at one and the risk at the tightest rule, and leaves the stop, the account size and the funded risk to choose. The *real prices* confirm it: on 813 trading days of hourly EURUSD the same bracket passes 48.58%, and the pair behaves as a fair game at this horizon. The *real strategy*, replayed through the framework's historical broker, agrees with both at the level of the trade and of the account. The deployed plan risks 3% a trade to pass and 1.575% once funded, on the near-optimal range where the chance of any payout peaks, on a random side, with the target and the stop placed on the account's own barriers. It buys nothing yet. A firm either pays its funded traders or it does not, and the trader stops buying at the first refused payout, so a purchase is worth making when the trader's belief that the firm pays exceeds a breakeven: 51% at the assumed spread and the random side's swap. But obeying the firm's news rule costs a round trip at every release. At the rate measured on every currency's releases a purchase returns 0.99 times its fee even when the firm pays, and on a calendar of the pair's two currencies alone 1.21 times, where the \$1,000 bankroll still shrinks. The live spread and the firm's own list of releases are what can change that. What the data cannot settle is whether the firm pays.

Words used in this paper

bracket order	One trade with a stop and a target placed at entry.
r, RR	The risk of one trade as a share of the account balance, and the reward-to-risk ratio: the target's distance over the stop's.
gain per win u	What a winning trade adds to the account, $RR \cdot r$.
assessment	The firm's evaluation account, bought for a fee. It is passed by reaching its profit target before its loss limit.
funded account	The account given after a passed assessment. It pays out.
bankroll	The trader's own cash, outside any account. It pays assessment fees and receives payouts.
profit split α	The trader's share of each payout.
cost-to-risk ratio	Spread, commission and swap of one trade, as a share of its risk.
drift	The account's mean change a trade after cost.
Markov chain	The account balance modelled trade by trade as a Markov chain under every rule, which gives exact probabilities and durations.
configuration	One set of choices (risk, ratio, stop, account size) run through the account.
parameter sweep	The rates and durations computed over a grid of ratio and risk.
days per trade	Calendar days between trades, as measured on the broker replay.
capped target,	The target shortened so a win lands exactly on the profit target, and the stop
capped stop	placed exactly on the loss limit.
corner solution	An optimum at the edge of the range allowed.
near-optimal range	The risks whose chance of any payout is within one percentage point of the best.
Pareto front	The configurations that no other configuration beats on days to first cash, cash a year and drawdown together.
lifetime payout	The cash an account pays out over its life, as a share of the account balance.
risk of ruin	The chance the trader's bankroll runs out of money to buy assessments.
breakeven	The smallest probability that the firm pays at which the trader's bankroll
probability p^*	grows.
purchase condition	Buy only if p^* plus two standard errors is below the trader's belief that the firm pays.
news window	The ten minutes before and after a high-impact release, inside which the firm forbids opening or closing a trade.
exit for news	Closing before a news window and opening again after it, which pays the round trip again.
unbracketed	Holding through a news window with the stop and target cancelled.
buffer	The distance the price may pass the stop before the daily loss limit ends the account.
early close	Closing at the bar before a news window when the price already sits within one buffer of the stop.

1 The answer

This section is the paper's decisions. Each is stated in one table: the decision, the inequality that explains it, its numbers, and the check against something independent. A reader who stops at the end of this section has the plan and the reasons for it. Every number in it is derived or measured in the section named beside it, and none is new here. Every proposition the later sections state is proved in Appendix A.

The plan. Buy a Prime Academy FX evaluation. Each day, place one bracket order on EURUSD: a stop and a target the same distance from entry, so the trade wins or loses the same amount with even odds. Pass the assessment by making 9% before losing 9%; then draw payouts from the funded account until it ends. No forecast is made. The profit comes from the rulebook's asymmetry: the fee is small and fixed, the payout is a share of a funded account's gains, and the account can be replaced.

setting	value	where it comes from
instrument	EURUSD	Section 9
trades	one a day, entered on the first bar outside every news window 07:00–10:00 UTC	Sections 12, 13
reward-to-risk	1 in both stages	Section 14.10
risk per trade	3% of the account balance in the assessment, 1.575% once funded, delivered on average: lots are floored to 0.01, so the risks are set at 3.07% and 1.61%	Section 14.10
stop	$\max(0.75 \sigma_{t-1}, 30)$ pips, σ the daily volatility: a 34.8-pip mean	Corollary 10
account rules	the target shortened to land on +9%, the stop placed on the loss limit, both net of the round trip	Section 14
direction	a random side each trade, which pays the average swap	Section 14.10
lot size	risk over stop, floored to 0.01 lots	Section 11
high-impact news	exit for news: flat through the release hour, then back in	Section 13
account size, accounts	\$3,000, one account; a second after the first paid payout (Table 2)	Sections 7, 15
purchase	not yet: the purchase condition below	this section

Table 1: The plan.

configuration	stop	accounts	days to first cash	cash a year	drawdown, p90	ruin	breakeven probability
run now	34.8 pips	1	126	\$135	\$342	0.3%	51%
after the first paid payout	45 pips	2	96	\$249	\$494	1.7%	49%

Table 2: The plan’s two configurations on the Pareto front of Section 15, with the random side’s swap charged and the firm paying. The first is run now. The second follows the first paid payout: a second evaluation, entered 16:00–19:00 UTC, and both accounts on the stop $\max(0.75 \sigma_{t-1}, 44.3)$.

The numbers that decide it. Table 3 gives them at the deployed configuration, with the random side’s swap in the cost, 3.45% of the risk. Each is a fraction of the account balance or a probability, the same at every account size by Proposition 1, except where the \$100 minimum payout enters.

quantity	value	how it was found
pass rate, before any cost	50%	exact, optional stopping (4)
pass rate at 3% risk	44.5%	exact Markov chain (14.10)
days to pass, given a pass	21	the broker (14.11)
funded: chance of any payout	52.8%	exact Markov chain (14.10)
funded: days to the first payout	28, median	exact Markov chain, broker days per trade (14.10)
funded: account life	94 days, mean	exact Markov chain, broker days per trade (14.10)
purchases that ever return cash	23.5%	pass rate $\times$ any payout
expected cash per \$38 purchase	1.59 times the fee	if the firm pays
the belief that the firm pays at which buying breaks even	51%	the bankroll (below)

Table 3: The numbers that decide the plan, at the deployed configuration, without the exits for news. With them, see the purchase condition below. Funded durations are the Markov chain’s trades at the broker’s 2.0 calendar days a trade.

How precise they are. Given the per-trade win rate, the cost-to-risk ratio and the reading of each rule, every rate in the table is exact: it comes from solving the Markov chain, not from sampling. What is uncertain is those inputs. One point of win rate moves the drift as much as two points of cost-to-risk ratio, and 2.8 years of one pair cannot pin the win rate closer than a couple of points, so the numbers are exact consequences of assumptions that are themselves known only roughly. The broker confirms the Markov chains wherever the history holds enough independent accounts to check them (Section 14.11).

How the numbers are made. Every rate on a table comes from the rulebook account walked trade by trade: the trades, the capped legs, the loss limit, the daily rule, the payout clock, the split. A rate over n simulated accounts carries the standard error

$$se = \sqrt{p(1-p)/n},$$

and a mean the standard deviation over accounts divided by $\sqrt{n}$. The assessment uses 120,000 accounts, the funded stage 60,000. Every configuration of a table is run on the same random numbers, so configurations are compared with less noise than their levels carry. Beside each simulated rate sits the exact answer of the same model solved without sampling, an absorbing Markov chain (Section 14); over every configuration the largest gap is 2.8 standard errors. The cost is the random side’s with the swap charged, 3.45% of the risk, and the funded risk is 1.575%. Two checks reach outside the model. On 813 trading days of real hourly EURUSD the same bracket passes 48.58% against 48.66% for the Markov chain, with a standard error of 0.35%. The strategy that trades the account, replayed through the framework’s broker, exits every one of its 467 trades on the same bar for the same reason as the model (Section 19).

1.1 Reward-to-risk 1

Why. A bracket with stop ℓ and target $RR\ell$ risks r and wins $u = RRr$, the gain per win. What drives the pass rate is the gain per win (Proposition 14). At a fixed gain per win a larger

ratio means a smaller risk and a longer trade, which by Wald's identity lasts in proportion to the product of the legs:

$$E[\tau] = \frac{RR \ell^2}{\sigma^2}.$$

So the ratio buys nothing and costs days. At a ratio of one, a random side is also an exact coin whatever the price does.

Numbers. At a fixed gain per win of 3%, Table 4.

ratio	risk	pass	Markov chain	trades to pass	calendar days
0.75	4%	43.8% $\pm$ 0.1	44.2%	8.0	14
1	3%	44.2% $\pm$ 0.1	44.5%	10.0	20
1.5	2%	44.4% $\pm$ 0.1	44.6%	13.7	33

Table 4: The assessment at a fixed gain per win, by simulation ($\pm$ one standard error) and by the Markov chain. Calendar days use the broker's measured days per trade at each ratio.

Check. Through the broker, plain brackets hit the target within 1.4 points of the fair rate at every ratio (Section 14.11).

1.2 Assessment risk 3%

Why. Each trade pays a share γ of its risk in cost, a drift against the trader. The pass rate rises with the gain per win u because fewer, larger trades pay that drift fewer times:

$$\frac{\partial P}{\partial u} > 0,$$

until a rule stops it. The first rule to bind is the 35% single-day cap: one win at most $0.35 \times 9\% = 3.15\%$.

Numbers. Table 5. The cap gains a fraction of a point over 3% and leaves no margin under the rule.

risk	pass	Markov chain	trades to pass	calendar days	
2%	42.0% $\pm$ 0.1	42.1%	21.0	42	
2.5%	43.4% $\pm$ 0.1	43.5%	13.6	28	
3%	44.2% $\pm$ 0.1	44.5%	10.0	20	the plan
3.15%	44.3% $\pm$ 0.1	44.7%	8.9	18	the cap

Table 5: The assessment at a ratio of one, by simulation ($\pm$ one standard error) and by the Markov chain.

Check. The real-price pass rate above, and the broker's assessment at this configuration, 47.6% against 47.7% for the Markov chain.

1.3 Cap the target and the stop

Why. An uncapped win overshoots the target and an uncapped loss overshoots the loss limit; with cost, three 3% wins also land just short of 9% and need a fourth. Shortening the target to land exactly on it, and the stop on the loss limit, removes both overshoots (Corollary 2).

Numbers. At 3%: uncapped $41.7\% \pm 0.1$ in 12.9 trades to pass; capped $44.2\% \pm 0.1$ in 10.0. The cap is worth 2.5 points.

Check. The strategy carries the caps, and the broker replay scores them (Section 14.11).

1.4 Funded risk 1.575%

Why. A payout needs equity at least the minimum request $m_1 = \$100/(0.7 \times \$3,000) = 4.76\%$. After n trades with j more wins than losses the equity is $j r - n \gamma r$, so one fewer net win suffices once

$$r \geq \frac{m_1}{j - n \gamma}.$$

The chance of any payout therefore jumps at those risks, a sawtooth, and is highest just above a jump. The pick is the largest risk within a point of the best, where the account also withdraws the most.

Numbers. Table 6.

funded risk	any payout	Markov chain	gross withdrawn	Markov chain
1.2%	$52.1\% \pm 0.2$	52.5%	$5.92\% \pm 0.03$	5.97%
1.375%	$52.9\% \pm 0.2$	53.3%	$6.20\% \pm 0.04$	6.26%
1.575% (the pick)	$52.4\% \pm 0.2$	52.8%	$6.42\% \pm 0.04$	6.49%
1.8%	$49.7\% \pm 0.2$	50.2%	$6.54\% \pm 0.04$	6.64%
2%	$47.3\% \pm 0.2$	47.8%	$6.63\% \pm 0.04$	6.74%

Table 6: The funded stage, by simulation ($\pm$ one standard error) and by the Markov chain. Gross withdrawn is a share of the account balance over the account's life.

Check. The Markov chain's jumps sit where the inequality puts them (Figure 7).

1.5 One trade a day

Why. With up to k trades a day, either the day's gain (k wins) meets the 35% cap or its loss (k losses) meets the daily rule, so the risk falls as $1/k$. The trades taken have mean $2(1 - 2^{-k})$, so the variance a day, which sets the days per trade, falls with k :

$$V_k = r^2 \mathbb{E}[n_k], \quad r \propto 1/k.$$

Numbers. Table 38 in Section 15: every $k > 1$ is slower.

1.6 A random side

Why. At a ratio of one the side does not change the odds, only the swap (Proposition 17). Always short collects it (-0.38% of the risk); a random side pays the average (0.48%) over 0.74 swap nights a trade.

Numbers. Cost-to-risk ratio with the swap, 3.45% against 2.97% without.

1.7 Stop and accounts

Why. A tighter stop costs more of the risk, $cE[1/\ell_t]$, and buys little speed, because a trade that resolves within its day still waits for the next day's entry. A second account halves the wait for the first of two payouts and puts a second fee at risk. Days to first cash, cash a year and drawdown conflict, so Section 15 treats them as three objectives with no weights and computes the configurations no other configuration beats on all three.

Numbers. With commission and spread, the fastest configuration on the Pareto front is 30 pips, 2 accounts: 72 days, \$310, \$582 and the richest 45 pips, 3 accounts: 76 days, \$411, \$634. With the swap, the fastest configuration on the Pareto front is also the richest: 30 pips, 2 accounts: 72 days, \$282, \$608. The plan's two configurations are Table 2, and Figure 10 draws every configuration. The number of accounts held at once moves the days to first cash; the stop hardly does. With the exits for news at the measured rate no configuration is feasible. A fixed 20-pip stop, replayed on 5-minute bars over one summer, is fair (target share $52.4\% \pm 2.2$) and days per trade 1.60 calendar days a trade; at the account's measured 0.1-pip spread it reaches first cash in 104 days against 126, for \$413 of drawdown against \$343, at the same breakeven probability (Table 42). Over every configuration (Section 16), on every currency's calendar at 0.1 pip only that stop at one account is on the Pareto front: 104 days to first cash, \$143 a year, \$418 of drawdown, ruin 0.8%.

1.8 The \$3,000 account size

Why. A bankroll of \$1,000 buys $\lfloor W_0/F \rfloor$ attempts before the first cash; a larger account size pays more per payout and affords fewer attempts. A run of that many purchases with no cash empties the bankroll, so

$$P(\text{ruin}) \geq q^{\lfloor W_0/F \rfloor},$$

with q the chance a purchase returns no cash (Proposition 12). A bankroll can also run out after some cash, so the ruin probability itself is simulated: the share of bankroll paths that cannot pay a fee when a purchase comes due within three years. The account size is the largest with that share under 5%.

Numbers. The account size with the most growth at \$1,000, \$25,000, ruins 31% of bankroll paths; the \$3,000 account size is the largest under the cap.

1.9 The purchase condition

Why. A firm either pays its funded traders' requests or it does not, and the trader stops buying at the first refused payout. So there are two cases. If the firm pays, every request is paid, and the bankroll's expected log growth over three years is g_{pays} . If it refuses, the trader loses the fees paid up to the first request and stops: g_{refuses} . With p the trader's belief that the firm pays, the growth is

$$g(p) = p g_{\text{pays}} + (1 - p) g_{\text{refuses}},$$

which is positive above the breakeven probability

$$p^* = \frac{-g_{\text{refuses}}}{g_{\text{pays}} - g_{\text{refuses}}}.$$

Buy only if p^* plus two standard errors is below the trader's belief, 80%.

Numbers. With the spread, the commission and the random side's swap, $g_{\text{pays}} = +0.193$, $g_{\text{refuses}} = -0.200$ after 4.3 purchases on average, and $p^* = 51\%$ (standard error 0.6%): the purchase condition passes. Exiting for news costs a round trip each time, 1.33 a trade on the cohort, which raises the cost-to-risk ratio to 7.39% of the risk. There a purchase returns 0.99 times its fee even when the firm pays, the bankroll shrinks in both worlds, and the purchase condition fails whatever the belief. On a calendar of the pair's two currencies alone the strategy exits for news 0.78 times a trade (Section 13): the cost-to-risk ratio is 5.76%, a purchase returns 1.21 times its fee when the firm pays, the bankroll's growth there is -0.068 , and the purchase condition fails. What can still move it is the live spread, which every round trip pays: the purchase condition passes up to a spread of 0.3 pip on the pair's calendar and 0.1 pip on every currency's (Table 31). The firm's own list of releases is the other. Table 7 gives every scenario.

cost scenario	cost-to-risk ratio	funded risk	pass	any payout	P(cash)	cash / fee	growth if it pays	growth if it refuses	breakeven probability	purchase condition
commission only	1.48%	1.45%	47.6%	57.9%	27.6%	2.04	+0.338	-0.163	33%	passes
commission and spread	2.97%	1.55%	45.2%	53.8%	24.3%	1.69	+0.233	-0.193	45%	passes
random side, swap charged	3.45%	1.575%	44.5%	52.8%	23.5%	1.59	+0.193	-0.200	51%	passes
random side, with the exits for news	7.39%	1.725%	38.2%	43.8%	16.7%	0.99	-0.327	-0.329	none	fails

Table 7: The deployed configuration at each cost scenario: assessment at 3%, funded at the scenario's pick, \$1,000 on the \$3,000 account size. Growth is the bankroll's expected log growth over three years when the firm pays every request and when it refuses the first, 20,000 paths; the breakeven probability is p^* , and the purchase condition passes when p^* plus two standard errors is below 80%. Cost shares are $cE[1/\ell]$ over the deployed stops. The payout clock is fourteen calendar days, 7 trades at the deployed days per trade.

1.10 What could make it wrong

In order of how much each matters.

1. **The cost of obeying the news rule.** It fails the purchase condition at the rate measured on every currency's releases and at the rate on the pair's own (above).
2. **Whether the firm pays.** The purchase condition needs the belief that it does above 51%. The firm has no payout record and its documents give it discretion over each request.
3. **The readings of two rules.** If the 35% single-day rule does not apply in the assessment, the assessment risk rises to 4% and passes a point more often, in about nine fewer days. If the daily loss rule counts open profit given back overnight, a trade up at the day boundary that then stops out can breach it; at 3% risk that needs a gain of 0.63 of the stop distance.
4. **The live spread.** Assumed at 0.5 pip. With no spread the funded pick is 1.45%, the purchase returns 2.04 times the fee and the breakeven probability falls to 33% (Table 7).

How the paper is ordered. Sections 2 and 3 set out the rules and the single trade. Sections 4 to 7 state the assessment, the funded stage, expected value and the finite bankroll in general. Section 8 settles the stop and the risk by calculus, Section 9 chooses the instrument and Section 10 the ratio and the account size. Section 11 puts numbers on the chosen configuration, Section 12 moves the stop to daily sigmas on the pair, and Section 13 adds the news rule. Section 14 sweeps the rates and durations over the ratio and the risk for each stage, Section 15 computes the Pareto front of speed, cash and drawdown over the stop and the number of accounts, Section 16 reports every configuration, Section 17 the chosen configuration for daily use, Section 18 three futures firms under the same play, Section 19 shows how every number was checked, and Section 20 lists what is still assumed. Appendix A proves every proposition in the order stated, Appendix B derives the single trade and its cost-to-risk ratio, and Appendix C derives the Markov chains' durations and a trade's length in days.

2 The plan and the rules

Prime Academy FX sells access to a simulated trading account. The account opens with a balance B , the account balance, and the five sizes on offer are the account sizes. The buyer pays a one-time fee F , must grow the account by a target T without ever being D below the starting balance, and on passing receives a funded account with the same loss limit from which real payouts are made. Table 8 lists the rules that enter the model. T , D , the risk per trade and every cost below are fractions of B unless the text says dollars. All of them are read from the firm’s own documents [1, 2, 6, 7], fetched 2026-09-09 and re-read 2026-09-10, and reproduced in `rules.json` beside this paper. What the documents do not settle is listed in Section 20.

profit target T	9% of the initial balance, assessment only
maximum drawdown D	9% of the initial balance, static, equity-based, both stages
daily loss limit	5% of the previous day’s equity, both stages; a breach eliminates
news trading	no open and no close within 10 minutes of a high-impact release; a breach eliminates
minimum trading days	3 in each stage; no time limit; 30 idle days close the account
profit split α	70%, or 90% for a fee $1.35\times$ the standard fee
payout cadence	every 14 days, minimum \$100 after the split
distribution cap	no single day may contribute more than 35% of a payout
concurrency	several accounts in your own name, up to \$300,000 in aggregate
size B / fee F	\$3,000 / \$38; \$10,000 / \$99; \$25,000 / \$158 \$50,000 / \$298; \$100,000 / \$560

Table 8: The rules that enter the model.

symbol	meaning	unit
B, F	account balance of the account, fee paid for it	dollars
T, D	profit target, maximum drawdown	fraction of B
r	risk per trade: what one stop-out loses	fraction of B
RR	reward-to-risk: target distance over stop distance	ratio
c, γ	cost of one round trip; the same cost as a share of the risk, $\gamma = c/r$	fraction of B ; ratio
ℓ, σ	stop distance; daily standard deviation of the price	pips
k, s, w	commission per lot; spread; swap per night	dollars; pips; pips
S_n, τ	equity after n trades; the trade that ends the account	fraction of B ; trades
P	probability of passing the assessment	
W	gross amount withdrawn over a funded account’s life	fraction of B
α	the trader’s share of a payout	fraction
$P(\text{paid})$	probability the firm pays a payout request	

Table 9: Notation. Every quantity in money is a fraction of the account balance unless the text says dollars.

The funded stage is simulated too. The rulebook defines the Funded Stage as the stage in which the participant “becomes eligible to receive a percentage split of simulated net profits generated from their simulated trading activities” [1], and the general terms state that trades in any stage “are virtual only” and do not comprise real trading [2]. No document grants access to a broker or to the firm’s capital. Marketing copy that describes the funded stage as trading the company’s real money through a partner broker describes a different product from the one the contract sells. For the trader the distinction changes nothing in this paper: the payout is real money, its size is the split of a simulated profit, and whether it arrives is at the firm’s discretion. What the funded stage carries over from the assessment is the same 9% static loss limit, the same daily rule, the same three-day minimum, and no profit target. The 14-day payout clock runs

from account opening or from the previous request; whether the opening is the assessment's or the funded account's is not settled by the documents, and this paper counts from the funded account's.

The trader in this paper has no edge at all. That is not a pessimistic assumption but the object of study: the question is what the rulebook alone pays a coin flipper. Any real edge adds to every figure below.

3 The trade

Each day the trader places one bracket: a stop at distance r below entry and a target at distance $RR \cdot r$ above it, both as fractions of the account balance. The target is hit with probability p and the stop with probability $1 - p$. A round trip costs c of account balance whichever way it ends.

Zero edge fixes p . Write X_0 for the cost-free step, $+RRr$ on a win and $-r$ on a loss. Zero edge means the bracket is fair before cost, $E[X_0] = 0$, and that fixes the win probability:

$$p = \frac{1}{1 + RR}.$$

So a two-to-one bracket wins one time in three, a one-to-one bracket one time in two, and a bracket that risks two to make one wins two times in three. Every ratio is the same bet before cost, and the rest of this paper is about what the rulebook and the cost do to the differences between them.

The step with cost. The cost comes off both outcomes, so the daily increment is $X = X_0 - c$,

$$X = \begin{cases} +RRr - c & \text{with probability } p, \\ -r - c & \text{with probability } 1 - p, \end{cases}$$

with mean and variance

$$E[X] = -c, \quad \text{Var}(X) = RRr^2.$$

Write $\sigma^2 = RRr^2$ for it. The cost sits in the mean of a trade and nowhere in its variance.

The equity after n trades. Equity is the sum $S_n = X_1 + \dots + X_n$ of independent trades with the same law, so

$$E[S_n] = -cn, \quad \text{Var}(S_n) = n\sigma^2.$$

The second is Bienaymé's identity, which needs the trades independent: for correlated trades it fails. Appendix B derives all four.

Proposition 1 (Scale invariance). *Under continuous lot sizing the cost fraction c does not depend on the account balance, so the walk S_n , and with it the pass rate and every other quantity computed from the walk, is the same at every account size.*

The proposition treats L as continuous. The platform's minimum lot is 0.01, so the true position is L floored or rounded to that grid and the true risk is whatever that position loses at the stop. Table 19 in Section 11 does the arithmetic account size by account size once the stop is fixed, and finds the deviation small enough that the proposition holds in practice. That is what reduces the choice of account size to the ratio of fee to account balance.

The numbers that go into γ . Two of the three are read off the firm's documents. The commission is \$5 per lot at opening on forex [1], and the account is raw with spreads quoted from 0.0 pips [6], the live figure being visible only behind the login, so a conservative 0.5 pip is used for s . The third, the stop ℓ , is not a quoted number at all. It is derived in Section 8 from the traded instrument's own daily volatility, and only there does γ become a number. As a stress case the paper also carries 5% of the risk, the measured cost floor for MNQ futures over an 80-tick stop.

One instrument at a time. The pip is worth \$10 per lot on a pair quoted in dollars, which is the arithmetic above. Sections 11 onward run on EURUSD, and every measured figure in them is that pair's. Which instrument makes this play cheapest is settled in Proposition 19, which restates the cost-to-risk ratio without the \$10, and ranked in Section 9.

4 Passing the assessment, in general

Let τ be the first n at which $S_n \geq T$ or $S_n \leq -D$, and let P denote the probability of the first event. With one trade a day the daily loss limit never binds as long as a single loss $r + c$ stays under 5% of the previous day's equity, which is at least $1 - D$ while the account is alive; Section 8 turns that into a cap on r . So P is a two-barrier crossing probability and nothing else. This section derives it three ways, from the least to the most exact, without fixing RR , r or c .

4.1 Two facts about fair games

Definition 1 (Martingale). A sequence $M_0, M_1, \dots$ built from the trades is a martingale if the expected next value, given everything up to now, is the current value: $E[M_{n+1} \mid X_1, \dots, X_n] = M_n$. The bar reads "given": the mean is taken over the next trade alone, with the first n trades held at the values they took. With $c = 0$ the equity S_n is one. Given the first n trades, S_n is a known number, and the next trade does not depend on them, so $E[S_{n+1} \mid X_1, \dots, X_n] = S_n + E[X_{n+1}] = S_n$.

Taking expectations on both sides of the defining equation gives $E[M_{n+1}] = E[M_n]$, so $E[M_n] = M_0$ at every fixed n . The fact this paper leans on is that the same holds at a random stopping time.

Proposition 2 (Optional stopping). *If M is a martingale whose one-step changes are bounded, and τ is a stopping time with $E[\tau] < \infty$, then $E[M_\tau] = M_0$.*

A stopping time is a rule that decides whether to stop at n from the first n trades alone, which the first barrier crossing is. The proposition says a fair game stays fair however one decides when to stop, provided one cannot wait forever and no single step is unbounded. The proof is in any text on martingales [8]; the first crossing of two barriers by a walk with bounded steps has finite expected time, because from any state there is a fixed positive probability of reaching a barrier within a fixed number of steps.

4.2 The optional-stopping identity

Proposition 3 (Exact identity, cost-free). *With $c = 0$, write $o_u = E[S_\tau - T \mid \text{pass}] \geq 0$ and $o_d = E[-D - S_\tau \mid \text{fail}] \geq 0$ for the mean overshoots beyond each barrier. Then*

$$P = \frac{D + o_d}{T + D + o_u + o_d}.$$

The familiar form $P = D/(T + D)$, here 50.0%, is the case $o_u = o_d = 0$, which holds for a continuous path and for a lattice on which both barriers are reachable exactly. The overshoots decide which side of it a real walk lands on.

Corollary 1 (Which side of the familiar value). *$P - D/(T + D)$ has the sign of $o_d T - o_u D$. With $T = D$ it has the sign of $o_d - o_u$.*

Corollary 2 (Aiming at the target). *A trade whose gain per win is shortened to $\min(u, T - S_n)$, with $u = RRr$, lands exactly on T when it wins, so $o_u = 0$, and the trade is still fair. Since P is strictly decreasing in o_u , capping the target raises the pass rate whatever o_d is.*

The overshoot past the target is profit the rulebook does not pay for: the account passes at T and the excess goes nowhere. Capping converts it into probability. An account one half-step below the target passes on that trade with probability $\frac{1}{2}$ uncapped and $r/(r + r/2) = \frac{2}{3}$ capped, against an identical losing branch. The same choice does not exist at the loss limit, where the overshoot is the firm's to impose rather than the trader's to choose; Section 20 records what turns on how it is imposed.

Numerical check. At the traded configuration the Markov chain gives 48.66% uncapped against 55.03% with the target capped, and on the real path of Section 11 48.58% against 54.56%. Table 10 carries the four treatments on both. Neither is deployed: the strategy of Section 13 sets its target from the stop alone and is blind to the account's remaining distance to T .

barrier treatment	Markov chain: P	trades	real path: P	trades
neither capped, as published	48.66%	8.60	48.58%	8.63
target capped	55.03%	7.36	54.56%	7.44
limit on every tick, stop capped	41.63%	6.96	41.91%	6.99
both capped	47.84%	5.97	47.83%	6.11

Table 10: The pass rate under the four barrier treatments, on the Markov chain and on the real EURUSD path, at 4% risk and $RR = 1$ with cost 1.67% of the risk. Capping the target gains about the same amount whichever way the loss limit is read, which is Corollary 2; the loss limit reading moves the level.

An overshoot is what is left of the last step beyond the barrier, so the target overshoot is part of an gain per win RRr and the loss limit overshoot part of a down-step r . With $T = D$ and $RR = 1$ the two steps are the same size, the walk is symmetric about zero, the two overshoots are equal, and P is exactly 50.0%. For any other ratio the steps differ and so do the overshoots. Which is the larger on a given lattice is computed, not proved: the Markov chain of Section 4.4 gives both, and Section 10 reports them.

4.3 The exponential martingale and the barrier formula

With cost the walk drifts and S_n is no longer a martingale. The repair is to find a number λ for which $e^{\lambda S_n}$ is one.

Proposition 4 (Drift-barrier form). *Let λ solve $E[e^{\lambda X}] = 1$. Then $e^{\lambda S_n}$ is a martingale, and ignoring overshoot*

$$P = \frac{e^{\lambda D} - 1}{e^{\lambda(T+D)} - 1}.$$

When the steps are small relative to the barriers,

$$\lambda \approx \frac{-2E[X]}{\text{Var}(X)} = \frac{2c}{RRr^2}.$$

This is the form a reader will find in any text, usually stated for a Brownian motion with drift $\mu = -c$ and variance σ^2 per step, where $\lambda = -2\mu/\sigma^2$ is exact. It is the least accurate of the three methods here. It inherits the no-overshoot error of Proposition 3 and adds a continuity error from the expansion, which grows as the number of steps inside the barriers shrinks. Solving the two-point equation for λ exactly would remove the second error and not the first.

4.4 The exact answer on the lattice

Both steps are multiples of a common unit u_0 once $RRr - c = a u_0$ and $r + c = b u_0$ for integers a, b . With $c > 0$ the natural unit is c itself, which divides both steps exactly when $1/\gamma$ and RR/γ are whole numbers, as they are at the configuration this paper trades. Otherwise the steps are rounded to the nearest unit, and the Markov chain is exact for the rounded walk. Equity then lives on the integers, at i units, and the account is alive for i strictly between $-[D/u_0]$ and $[T/u_0]$.

Proposition 5 (First-step equations). *Let h_i be the probability of passing from equity i and n_i the expected number of trades remaining from equity i . Then for every alive i*

$$h_i = p h_{i+a} + (1-p) h_{i-b}, \quad n_i = 1 + p n_{i+a} + (1-p) n_{i-b},$$

with $h = 1$ and $n = 0$ at or above the target and $h = 0$, $n = 0$ at or below the loss limit. There is one unknown and one equation per alive state, the system has a unique solution, and $P = h_0$, $E[\tau] = n_0$.

Overshoot is handled exactly because a state at or beyond a barrier is absorbed whether or not the barrier was landed on. This is the same process the simulation walks, so the two must agree to Monte Carlo error, and any disagreement is a bug in one of them.

The same matrix gives every distribution, not only the two means.

Proposition 6 (The Markov chain gives the whole distribution). *Let $\mathbf{v}_n$ be the row vector of probabilities over alive states after n trades, with $\mathbf{v}_0$ the unit mass at zero equity, and let $\mathbf{b}_u$ and $\mathbf{b}_d$ be the one-step exit vectors: $b_u(i) = p$ if $i + a$ is at or above the target and 0 otherwise, $b_d(i) = 1 - p$ if $i - b$ is at or below the loss limit and 0 otherwise. Then $\mathbf{v}_n = \mathbf{v}_{n-1}Q$ and*

$$P(\tau = n, \text{ pass}) = \mathbf{v}_{n-1} \cdot \mathbf{b}_u, \quad P(\tau = n, \text{ fail}) = \mathbf{v}_{n-1} \cdot \mathbf{b}_d.$$

The total occupancy $\mathbf{G} = \sum_{n \geq 0} \mathbf{v}_n = \mathbf{v}_0(I - Q)^{-1}$ is finite, and the overshoot above the target equals $(i + a)u_0 - T$ with probability $G_i p$, summed over the alive states i from which an gain per win crosses the target. The overshoot below the loss limit is the same sum on the other side.

Summing the first line over n recovers h_0 , and $\sum_n n P(\tau = n)$ recovers n_0 , which is the check that the iteration is coded right.

4.5 Expected number of trades

Proposition 7 (Wald). *With $c = 0$, $S_n^2 - \sigma^2 n$ is a martingale, so $E[\tau] = E[S_\tau^2]/\sigma^2$. Without overshoot $E[S_\tau^2] = P T^2 + (1 - P)D^2 = TD$, giving $E[\tau] = TD/\sigma^2$.*

Corollary 3 (Trade count). *With $\sigma^2 = RR r^2$ from Section 3, $E[\tau] \approx TD/(RR r^2)$. The number of trades is what a cost per trade multiplies, so the drag $c E[\tau]$ grows as $1/RR$ and as $1/r^2$.*

This is the first sign of what will decide the bracket, and Section 10 puts numbers to it.

5 The funded stage, in general

After passing, the trader keeps trading the same bracket on an account with the same loss limit $-D$ measured from the original balance. Every 14 days, if equity is positive, clears the \$100 minimum after the split, and no single day contributed more than 35% of it, the trader withdraws all of it. Withdrawal returns equity to zero and the loss limit does not move. The account ends when equity reaches $-D$ or the daily rule fires. Let W be cumulative gross withdrawals over the account's life, N its number of trades, and eq_τ its equity at death.

Proposition 8 (Conservation). *Gross profit before cost, $G_n = \text{eq}_n + W_n + cn$, is a martingale with $G_0 = 0$. The account ends in finite expected time, so optional stopping applies and*

$$E[W] = -E[\text{eq}_\tau] - c E[N].$$

Death occurs at or beyond the loss limit, $\text{eq}_\tau = -D - o$ with $o \geq 0$ the overshoot, so $-E[\text{eq}_\tau] = D + E[o]$ and

$$E[W] = D + E[o] - c E[N].$$

The drawdown allowance D is therefore the scale of lifetime lifetime payout. It is not a bound. Each withdrawal returns equity to zero against a loss limit that stays fixed, restoring a full drawdown allowance, and the overshoot term is positive. What pulls lifetime payout below D is the cost drag $c E[N]$, and nothing else.

Corollary 4 (Sizing smaller is not safer). *Lifetime payout falls with smaller risk because $E[N]$ grows roughly as r^{-2} , by the scaling of Corollary 3: a walk needs a number of steps that grows as the square of the distance over the step. Meanwhile c is fixed per trade, so the drag $cE[N]$ grows without bound as $r \rightarrow 0$.*

Proposition 9 (The liquidation rule is the firm's problem). *Whether the firm liquidates exactly at the loss limit or eliminates the account after the trade that breached it does not change W .*

The conservation identity gives the mean of W . The lattice gives its distribution, once the payout clock is written into the Markov chain.

Proposition 10 (The funded cycle, with the clock). *Call a cycle the path from zero equity to the next payout or to the account's end, and let M be the smallest equity that can be requested, read below in lattice units like the states. For the first t_w trades, the payout clock, after a reset only the loss limit absorbs, so the law of equity at trade t_w is $\mathbf{v}_{t_w} = \mathbf{v}_0 Q_f^{t_w}$ with Q_f the transition matrix on the states above the loss limit and no upper barrier. From trade t_w on the account pays at the first trade with equity at or above M and ends at the loss limit. So*

$$P(\text{pay}) = \sum_{i \geq M} v_{t_w}(i) + \sum_{i < M} v_{t_w}(i) h_i^M,$$

where h^M solves Proposition 5 with target M in place of T . The payout is the equity on the paying trade: the state itself for the mass already at or above M at trade t_w , and M plus the overshoot of Proposition 6 for the rest, started from $\mathbf{v}_{t_w}$ restricted below M . Each cycle starts at zero equity against the same fixed loss limit, so cycles are independent and identically distributed, the number of payouts K is geometric with $P(K = j) = (1 - P(\text{pay})) P(\text{pay})^j$, and lifetime withdrawals W are the sum of K independent payouts.

At the traded configuration the three-day minimum is inside the t_w -day clock and the \$100 minimum is below M , so neither adds a condition. The mixture is computed on the lattice by convolving the payout law with itself and weighting by the geometric probabilities. Section 11.7 lays the result over the simulation.

6 Expected value per purchase

A purchase pays $\alpha W B$ dollars with probability P and costs F , with α the profit split. Writing $\kappa = P \alpha E[W]$,

$$E[\text{value}] = \kappa B - F, \quad \frac{E[\text{value}]}{F} = \frac{\kappa B}{F} - 1.$$

Because κ is independent of account size by Proposition 1, expected value per fee is a decreasing function of F/B alone, and F/B falls with account size. The firm pays at its discretion, and that is the one term nothing in this paper can measure. Let $P(\text{paid})$ be the chance a payout request is paid. The expected value becomes $\kappa B P(\text{paid}) - F$, which is zero at

$$P(\text{paid}) = \frac{F}{\kappa B},$$

the breakeven payout probability: the share of requests the firm must pay for a purchase to be worth its fee.

Proposition 11 (The 90% add-on never helps expected value). *The add-on multiplies the fee by 1.35 and the take by $0.9/0.7 = 1.286$. Since κB scales by the smaller factor and F by the larger, $\kappa B/F$ falls at every account size.*

7 The finite bankroll

Expected value assumes a pocket deep enough to buy until the average arrives. A trader has a bankroll. The fee leaves it on the day of purchase, and only

$$P(\text{any cash}) = P \cdot P(W > 0 \mid \text{funded})$$

of purchases ever return anything. Ruin is absorbing: a bankroll that empties collects none of the later payouts that make the average work. The right objective is therefore the growth of the bankroll subject to not being ruined.

The process. A bankroll starts at W_0 dollars. Whenever it holds no account and can afford the fee, it buys one and the fee leaves. The account then runs the assessment and, on passing, the funded stage, under every rule above. Each payout request is paid with probability $P(\text{paid})$, and a paid payout adds $\alpha \text{eq } B$ to the bankroll. The horizon is 500 trading days. Ruin is the state of holding no account and less than one fee. The simulation in Section 11 walks this process directly.

Proposition 12 (Ruin before the first payout). *Let $q = 1 - P(\text{any cash})$ and $n_F = \lfloor W_0/F \rfloor$ the number of fees the bankroll holds. The bankroll is ruined before its first payout with probability at least q^{n_F} , and this is a lower bound on the ruin probability over any horizon long enough for n_F purchases.*

The bound is tight when the horizon is long and loose when payouts that do arrive are small relative to the fee.

Growth of one purchase. Let $\pi = P \cdot P(W > 0)$ be the chance a purchase returns cash, $f = F/W_0$ the fee as a share of the bankroll, and $y = \alpha B E[W]/(P(W > 0) W_0)$ the whole payout stream of a paying account as a share of the bankroll: $E[W]/P(W > 0)$ is the mean withdrawal of an account that pays at all, since the rest withdraw nothing. The expected log change of the bankroll over one purchase is the two-point average

$$g = (1 - \pi) \log(1 - f) + \pi \log(1 - f + y),$$

and dividing by the expected days a purchase occupies, $E[\tau] + P E[N]$, the assessment's trades plus the funded stage's when there is one, gives a growth rate. The logarithm is the right yardstick because bankroll changes multiply: a fee that takes a share f and a payout that adds a share y compound, and the expected log is what the bankroll's long-run growth rate converges to.

Several accounts at once. The rules allow it. A trader may hold several accounts in their own name, and the aggregate allocation across them is capped at \$300,000 [2, 1]. So the bankroll may hold n_a accounts of one account size at all times, buying n_a on the first day and replacing each the day after it ends, with the n_a daily cash flows summed into the one bankroll.

Proposition 13 (Pooling). *Let $\Delta_1, \dots, \Delta_{n_a}$ be the daily cash flows of n_a accounts of one account size, each with mean m and variance v , and with correlation ρ between any two. The pooled flow $\Delta = \Delta_1 + \dots + \Delta_{n_a}$ has*

$$E[\Delta] = n_a m, \quad \text{Var}(\Delta) = n_a v (1 + (n_a - 1) \rho),$$

and its spread relative to its mean is

$$\frac{\sqrt{\text{Var}(\Delta)}}{E[\Delta]} = \frac{\sqrt{v}}{m} \cdot \frac{1}{\sqrt{n_{\text{eff}}}}, \quad n_{\text{eff}} = \frac{n_a}{1 + (n_a - 1) \rho}.$$

That is the relative spread of n_{eff} independent accounts. At $\rho = 0$, $n_{\text{eff}} = n_a$ and the relative spread falls as $1/\sqrt{n_a}$. At $\rho = 1$, $n_{\text{eff}} = 1$: the n_a accounts are one account of account balance $n_a B$ at fee $n_a F$.

The ruin bound does not move. Proposition 12 counts fees, not accounts. Before its first cash the bankroll affords $n_F = \lfloor W_0/F \rfloor$ purchases whether it makes them one at a time or n_a at a time, so q^{n_F} bounds the ruin probability at every n_a . What n_a changes is the clock. n_a accounts make n_a purchases in the time one account makes one, so the bankroll reaches its first cash, or the bound, n_a times sooner, and it must hold $n_a F$ on the first day. Whether the growth that days per trade buys survives the ruin cap is a question for the simulation, and so is the value of ρ .

Where ρ comes from. The rulebook bans opposing exposure across a trader's own accounts, and its own example bans long EURUSD against long USDJPY, so opposite dollar exposure on two pairs is out too [1]. The n_a accounts therefore trade the same side, and their independence can come only from entering at different hours. Two same-side brackets on one pair on one day are correlated, and Section 11.6 measures by how much on the pair's own bars.

8 The continuous problem: what calculus settles

Write $u = RRr$ for the gain per win. In the diffusion limit of Proposition 4 every quantity so far depends on the bracket through λ , and this section shows that λ depends on u and γ alone, then asks what calculus fixes.

Proposition 14 (The assessment depends on the gain per win alone). *With $c = \gamma r$, the exponent of Proposition 4 becomes $\lambda = 2\gamma/u$, free of r on its own, and*

$$P = \frac{e^{\lambda D} - 1}{e^{\lambda(T+D)} - 1}, \quad P = \frac{1}{1 + e^{\lambda D}} \text{ when } T = D.$$

P is increasing in u and decreasing in γ , with no interior optimum.

Proposition 15 (The distribution cap sets the cash frequency). *One winning day is u of account balance and may be at most 35% of a payout request M , so $u \leq 0.35 M$, that is $M \geq u/0.35$, and the smallest withdrawable profit is $M = \max(u/0.35, m_{\min})$ with $m_{\min} = 100/(\alpha B)$ the \$100 minimum after the split, as a fraction of account balance. The probability that a funded account ever reaches it before the loss limit is the barrier formula with T replaced by M ,*

$$P(W > 0) \approx \frac{e^{\lambda D} - 1}{e^{\lambda(M+D)} - 1},$$

which rises in u while $u < 0.35 m_{\min}$ and falls above it, so its maximum is the kink $u = 0.35 m_{\min}$, where no derivative is zero. Cost-free, $\lambda \rightarrow 0$ and $e^x - 1 \approx x$ in both numerator and denominator, so

$$P(W > 0) \rightarrow \frac{\lambda D}{\lambda(M+D)} = \frac{D}{M+D}.$$

So the pass rate rises in u and the cash frequency, above the kink, falls in it, and their product, the chance a purchase returns any cash, is what Proposition 12 turns into ruin. Calculus does not fix u : the product has an interior optimum that depends on the fee share through the growth of Section 7. What calculus does fix are the stop and the risk.

Proposition 16 (The stop is a corner solution). *With commission k per lot, spread s pips and stop ℓ pips, $\gamma(\ell) = (k/10 + s)/\ell$ is decreasing in ℓ . A bracket on a pair whose daily move has standard deviation σ_p pips resolves in about $RR\ell^2/\sigma_p^2$ days, and closing within the session, which is what avoids the swap, needs that under one day. So*

$$\ell^* = \frac{\sigma_p}{\sqrt{RR}}, \quad \gamma^* = \frac{(k/10 + s)\sqrt{RR}}{\sigma_p}.$$

The cost-to-risk ratio rises as $\sqrt{RR}$, a third reason a high ratio costs. σ_p is an input, not a measurement, and a reader with a different pair substitutes. Section 12 tests the premise on the pair, finds the bracket does not close within the day, and re-solves the stop with the swap in the cost.

The swap, when the bracket is held overnight. The corner solution assumes the bracket closes within the day. When it does not, the position pays or receives the swap each night it is held. Let w be the swap in pips per lot per night, negative for a debit, and ν the nights a trade is held. On L lots the swap is worth $10 w \nu L$ dollars, and it joins the round-trip cost of Proposition 1 with the opposite sign, so the cost-to-risk ratio becomes (Appendix B)

$$\gamma(\ell) = \frac{k/10 + s - w \nu(\ell)}{\ell}.$$

The first term falls in ℓ and the swap term grows with it, because a wider bracket is held longer. At the corner solution's one-day days per trade $\nu = 0$ and the swap vanishes, which is the case Proposition 16 solved.

Proposition 17 (Direction is free). *Under the fair-game assumption the side of a trade, chosen from what is known at entry, does not change the law of the price outcome, so it changes only the sign of the swap term. Always taking the side that earns swap turns $-w \nu$ from a debit into a credit.*

Proposition 18 (The risk is a corner solution). *The daily rule eliminates on a single loss above 5% of the previous day's equity, which is at least $1 - D$ while the account is alive, so a loss of $r + c = r(1 + \gamma)$ must satisfy*

$$r(1 + \gamma) \leq 0.05(1 - D) \implies r \leq \frac{0.05(1 - D)}{1 + \gamma}.$$

Since P rises in $u = RR r$ at fixed RR , r sits at the cap.

With $k = 5$, $s = 0.5$ pip, $\sigma_p = 60$ pips and the cap at 4.48%, the paper trades $r = 4\%$, inside the cap by the margin that keeps a wide spread from breaching it. What is left for the grid is the gain per win u , that is the ratio $RR = u/r$, and the account size.

The instrument. Proposition 16 was written for a pair quoted in dollars, where one pip on one lot is \$10. Every other instrument the firm lists prices a unit of its own, a dollar of gold, an index point, a yen, and defines its own lot, so the question of which instrument makes the plan cheapest needs the corner solution restated without the \$10.

Proposition 19 (The instrument enters through one ratio). *Let an instrument be quoted in price units, let one lot move U dollars per unit of price, let the spread be s units, let a round trip cost k dollars per lot in commission, and let the daily standard deviation of the price be σ units. At the stop corner solution $\ell^* = \sigma/\sqrt{RR}$ the cost-to-risk ratio of the risk is*

$$\gamma^* = \sqrt{RR} \frac{k/U + s}{\sigma} = \sqrt{RR} \frac{C}{V}, \quad C = k + sU, \quad V = \sigma U,$$

where C is the round-trip cost of one lot in dollars and V is the dollar value of a one-sigma daily move on one lot. Neither B nor r appears.

So the instrument that makes the plan cheapest is the one with the smallest round-trip cost per lot relative to the dollar value of its daily sigma per lot, and nothing else about the instrument reaches the pass rate: Proposition 14 makes the pass rate a function of γ alone, and the corner solution fixes the days per trade at about one day per trade for every instrument. Two things vary with the instrument and are not in the ratio: the swap, which Section 12 puts into γ once the nights held are known, and the real-path days per trade, which Section 11 measured at 3.6 days on EURUSD against the corner solution's one.

What U is. U is the contract size in units of the instrument, the venue's `lotSize`, times the dollar value of one price unit. For an instrument quoted in dollars that second factor is one, so U is the contract size. For a pair quoted in another currency it is that currency's dollar rate, read on the same day. The three forms the firm's commission takes all fit k : a fixed charge per lot at opening, a charge per lot on each side, which doubles it, and a share κ of notional, for which $k = \kappa P U$ with P the price, so that $\gamma^* = \sqrt{RR}(\kappa P + s)/\sigma$ and the contract size drops out.

The swap in the ratio. With w now in dollars per lot per night, which for a dollar-quoted pair is ten times the figure in pips, the swap on L lots is $w \nu L$ dollars and the same steps give

$$\gamma = \frac{k + sU - w\nu}{U\ell}, \quad \text{and at the corner solution with } RR = 1, \quad \gamma = \frac{k + sU - w\nu}{\sigma U}.$$

Corollary 5 (Two feasibility checks). *At the corner solution the position on an account size B is*

$$L^* = \frac{rB}{U\ell^*} = \frac{rB\sqrt{RR}}{U\sigma} \text{ lots,}$$

which must be at least the venue's minimum lot, and on its lot grid to the tolerance Table 19 allows. Its notional is $L^* \cdot U \cdot P$ dollars for a dollar-quoted instrument. The margin is that notional times the venue's margin requirement m_r , the inverse of its leverage, and it must fit inside the account while it is alive, so inside $B(1 - D)$.

An instrument can win on γ^* and fail either check on a small account size: a large contract with a coarse minimum lot cannot be sized to 4% of \$3,000, and a high margin requirement can make the corner solution position unholdable. Section 9 ranks the firm's instruments on this ratio from the venue's own contract sizes, quotes and daily bars, and applies both checks account size by account size.

9 Choosing the instrument

Proposition 19 puts every instrument into the plan through one ratio, and the ratio's ordering does not depend on the bracket: $\gamma^* = \sqrt{RR}C/V$ carries the same $\sqrt{RR}$ for every instrument, so the instrument can be chosen before the ratio is. The feasibility checks of Corollary 5 need a risk and a ratio, and they use the daily-rule corner solution $r = 4\%$ of Proposition 18 with $RR = 1$, which Section 10 confirms. This section ranks the instruments the firm offers on the ratio, puts the swap into it, applies the checks, and states what was run on the instrument the earlier sections used.

9.1 Where the numbers come from

Everything is read from the firm's own book on its TradeLocker server, through two channels. The API, with GET calls only, returns 320 instruments for the account: contract size, minimum and maximum lot, quoting currency, top-of-book quotes, and two years of daily bars. The interface, read off the rendered page of the same account, lists 174 of them, and only those can be traded by hand. The two channels also disagree on leverage: the API reports 30 on every instrument, the interface enforces Commodities 30, Cryptos 2, Forex 30, Indices 30, NAS 5, which matches the firm's FAQ, and the interface's figure is used. The interface's View Details dialog also carries what no API route does: the swap per lot per night on each side, the margin requirement, and the opening fee per lot. Those were read for every listed instrument.

The spread is a top-of-book snapshot, taken 3 times on 2026-09-16, at 05:12, 13:41, 15:30 UTC: the Asian session, the London and New York overlap, and two hours into the US cash session. A US stock quote taken outside US hours is the previous close and is not ranked. The sigma is the standard deviation of the daily close-to-close change over the venue's last 250 bars, in the

instrument's own units; the majors, metals and older indices have two years of bars, and anything listed in May 2026 about 90. The bars are unadjusted, so a day that moves more than 40% of the previous close is a split or a bad bar and removes the instrument from the ranking; 25 listed instruments go that way, KLAC among them at a tenfold drop. Commission follows the rulebook: \$5 per lot at opening on forex, metals and indices, \$2 at open and at close on US stocks, 0.01% of notional on crypto [1].

9.2 The swap, and the days per trade it needs

Section 8 put the swap into the ratio: with w in dollars per lot per night and ν the nights held, at $RR = 1$

$$\gamma = \frac{k + sU - w\nu}{\sigma U},$$

with w negative for a debit. At the corner solution's one-day days per trade $\nu = 0$ and the swap vanishes. Section 11 measures 3.6 trading days per trade on the pair, which is 3.7 nights at the venue's convention of a triple swap once a week. No other instrument's days per trade has been measured, so the ranking is shown at both ends: the corner solution as the bound, and the pair's days per trade as the estimate. Direction is free under the fair-game assumption, Proposition 17, so the side that earns swap, the better of long and short, is the primary policy, and the random side, their mean, the sensitivity. The interface gives EURUSD's swap as -6.24 dollars per lot per night on the long side and +1.76 on the short, against the 0.75 and 0.25 pips Section 12 assumes.

9.3 The ranking

Table 11 gives the top of the ranking on the side that earns swap at the pair's days per trade, the corner solution value beside it, and the two checks. On the corner solution, the pure cost of spread and commission, EURUSD ranks 9 of 127 rankable instruments at $\gamma^* = 1.57\%$: gold sits at 0.25% on a 0.16-dollar spread against an 84-dollar daily sigma, and the best index, NDX100, at 0.48%. Within forex EURUSD is at or near the top, because its raw spread is the tightest. On the side that earns swap at 3.7 nights the picture changes: EURUSD's short side earns swap, which takes it to -0.12% and rank 13, and several instruments go below zero, where the swap credit exceeds the whole round-trip cost. Gold's long side is debited -79.02 dollars per lot per night and its short side earns +22.87, which is 0.27% of a one-sigma day per night on the side that earns swap, and takes it to -0.75%. A negative cost-to-risk ratio is a positive drift, but on the lattice it makes the gain per win the larger one, and the target overshoot of Proposition 3 gives most of the gain back: the exact pass rate is 50.10% for gold against 50.00% for EURUSD at these values, both a hair above one half.

instrument	class	spread (units)	σ (units)	swap long/short (\$/lot/night)	γ^* corner solution	γ carry 05:12	γ carry 13:41	γ carry 15:30	lots at \$10k	feasible from
USDCHE	Forex	0.00003	0.00339	5.40 / -14.25	2.09%	-2.11%	-2.70%	-2.70%	0.967	\$3,000
GBPCHE	Forex	0.00011	0.00303	7.32 / -19.66	4.99%	0.03%	-2.28%	-1.63%	1.082	\$3,000
UKOUSD	Commodities	0.042	2.555	3.96 / -6.48	3.60%	-2.48%	-2.09%	-2.48%	1.566	\$3,000
USDJPY	Forex	0.00100	0.71309	3.68 / -11.23	1.23%	-1.43%	-1.71%	-1.71%	0.871	\$3,000
GBPJPY	Forex	0.011	0.856	5.54 / -15.55	2.19%	-0.91%	-1.50%	-1.73%	0.725	\$3,000
AUDCHE	Forex	0.00007	0.00225	4.56 / -11.80	4.94%	0.17%	-1.16%	-0.72%	1.457	\$3,000
EURAUD	Forex	0.00003	0.00563	-9.44 / +3.14	1.78%	-0.56%	-1.09%	-0.92%	0.996	\$3,000
AUDJPY	Forex	0.00700	0.54553	3.50 / -10.88	2.71%	-0.59%	-0.95%	-0.95%	1.138	\$3,000
XAUUSD	Commodities	0.160	84.310	-79.02 / +22.87	0.25%	-0.75%	-0.75%	-0.75%	0.047	\$25,000
NDX100	Indices	1.4	394.0	-47.50 / +12.39	0.48%	-0.67%	-0.67%	-0.67%	0.102	\$3,000
EURUSD	Forex	0.00001	0.00381	-6.24 / +1.76	1.57%	-0.38%	-0.12%	-0.38%	1.049	\$3,000
BTCUSD	Cryptos	32.5	1740.8	-42.12 / +10.53	2.30%	0.02%	0.08%	0.02%	0.230	\$10,000
US30	Indices	1.8	385.7	-59.33 / -8.79	0.60%	1.49%	1.43%	1.43%	0.104	\$3,000

Table 11: The cost-to-risk ratio of the risk at the stop corner solution, by instrument, on the firm's own book. Spread and sigma are in the instrument's price units; the swap is dollars per lot per night, long / short. The corner solution column has no swap; the carry columns put the swap of the side that earns it in at 3.7 nights, one column per spread sample. Lots are the corner solution position at 4% risk on the \$10,000 account size, and the last column is the smallest account size on which the position clears both checks of Corollary 5.

Two readings of the same table have to be kept apart. The corner solution column is a ranking of trading cost, and it is stable: it moves only with the spread sample. The carry column is largely a ranking of swap credit, and it rests on three things the corner solution does not: that the days per trade on every instrument is the pair's, that the side that earns swap is taken every day, and that the credit is not paid back through the drift interest parity predicts. Section 12 found parity absent at this horizon on the pair, and the rulebook's prohibition of swap arbitrage sits next to a plan whose only positive drift is the swap. The random-side column, the mean of the two swaps at the same days per trade, is where a trader who does not pick the side lands, and it is a debit on nearly every instrument.

9.4 The checks and the decision

Gold fails the lot check below the \$25,000 account size: the corner solution position on \$10,000 is 0.047 lots, which floors to 0.04 and carries 16% less risk than the target. The indices pass at every account size from \$3,000 up, and so does every major pair. Crypto passes the lot check and fails nothing, but its spread in basis points is wide against its volatility and no coin comes near the top on either metric; the best, BTCUSD, sits at 0.08% on the side that earns swap and BTCUSD at 2.30% on the corner solution.

The rule, declared before any ranking with the swap was computed: EURUSD stays unless another instrument has a lower cost-to-risk ratio on the side that earns swap on every sample in which its quote is live, by more than the spread of its own value across those samples, and clears both checks at the \$10,000 and \$25,000 account sizes. 5 instruments beat EURUSD on the first condition and 4 clear the checks: NDX100, USDJPY, USDCHF, UKOUSD. So by the rule another instrument is cheaper. No instrument leads on both readings. The side that earns swap is led by USDCHF at -2.70%, which is a carry position in a high-rate currency, not a cheaper coin. The corner solution, among the instruments that clear every account size, is led by NDX100 at 0.48%, and the corner solution is the reading that does not lean on the swap. So NDX100 is the instrument to carry forward to the next test, and EURUSD the one the paper's numbers stand on until that test is run.

What was run on which instrument. Every result from Section 10 on, the bracket grid, the bankroll tables, the real-path control, the swap and the walk-forward, was run on EURUSD, and they stand as the pair's numbers. The winner of this section has had none of them. The next test is the real-path control of Section 11 on its own hourly bars, which the venue serves, to measure its days per trade and put its own ν into γ ; then the walk-forward of Section 12. Until those run, the ranking is a statement about cost, not a recommendation to switch.

10 Choosing the ratio and the account size

Everything before this section is general in RR . This section fixes it, and the account size rule with it, with the exact Markov chain of Proposition 5 and the bankroll process of Section 7 as the instruments.

10.1 The closed forms against the Markov chain

Table 12 checks Propositions 14 and 15 at $r = 4\%$ over the gain per win, with γ at the value the stop cap gives for $RR = 1$. Table 13 gives the stop cap and cost-to-risk ratio at three ratios.

10.2 The ratio on the grid

The ratio moves two things at once: the asymmetry of the two overshoots in Proposition 3, and the number of trades the account needs to resolve, which is what cost multiplies.

gain per win u	RR at 4%	P logistic	P Markov chain	$P(W > 0)$ closed	$P(W > 0)$ sim	$E[W]$ closed	$E[W]$ sim	cash/purchase closed
1%	0.25	42.56%	44.39%	72.2%	60.0%	8.65%	7.87%	30.7%
2%	0.5	46.26%	48.72%	58.2%	48.4%	9.77%	9.06%	26.9%
4%	1	48.13%	48.66%	42.0%	36.7%	10.39%	10.07%	20.2%
8%	2	49.06%	46.50%	26.9%	26.3%	10.72%	10.61%	13.2%
12%	3	49.38%	46.52%	19.8%	20.7%	10.84%	10.85%	9.8%

Table 12: Closed forms against the exact Markov chain and the simulation at $r = 4\%$, cost 1.67% of the risk. The logistic misses the Markov chain by the overshoot alone. The cap formula lands within a point at $u \geq 8\%$ and overstates below it, where the 14-day payout clock and the cost drag it omits both bind.

RR	stop cap $\sigma_p/\sqrt{RR}$ (pips)	γ^*	lots at \$3,000	lots at \$100,000
0.5	85	1.18%	0.14	4.71
1	60	1.67%	0.20	6.67
2	42	2.36%	0.28	9.43

Table 13: The intraday stop cap of Proposition 16 and the cost-to-risk ratio it implies, with the continuous lot size at the smallest and largest account size at $r = 4\%$.

For the overshoots, Corollary 1 says which way they move the pass rate: with $T = D$ it sits above one half when the loss limit overshoot is the larger, at one half when the two are equal, and below it when the target overshoot is the larger. The target overshoot is part of an gain per win RRr and the loss limit overshoot part of a down-step r , and on every lattice computed here the larger step leaves the larger overshoot. So cost-free a ratio below one passes above one half, a ratio of one at exactly one half, and a ratio above one below it.

Numerical check. At $r = 4\%$ the cost-free exact Markov chain gives 52.73% at $RR = 0.25$, 50.00% at $RR = 1$ and 46.53% at $RR = 3$.

For the trade count, Corollary 3: at a fixed cost per trade the drag $cE[\tau]$ grows as $1/RR$ and as $1/r^2$.

Table 14 shows which effect wins. Cost-free, a low ratio wins by a point or two. At 1.67% of the risk the low ratios are already losing at small risks, and at 5% they collapse: $RR = 0.25$ at 1% risk passes 1.7% of the time. Risk size has the larger effect at every ratio, because a larger step resolves the account in fewer trades, which is Proposition 18 seen from the grid.

RR	cost 1.67% of risk				cost 5% of risk			
	1%	2%	3%	4%	1%	2%	3%	4%
0.25	22.4%	35.5%	41.1%	44.4%	1.7%	11.5%	20.7%	27.1%
0.5	35.2%	42.9%	45.3%	48.7%	13.1%	28.1%	35.4%	39.6%
1	42.2%	47.0%	42.8%	48.7%	28.1%	38.2%	40.4%	43.7%
2	44.9%	47.6%	41.2%	46.5%	37.7%	42.9%	40.9%	42.3%
3	45.0%	46.8%	38.3%	46.5%	40.4%	43.8%	38.2%	44.5%

Table 14: Exact pass probability over reward-to-risk (rows) and risk per trade (columns) at two cost levels, from the Markov chain of Proposition 5. Cost scales with the risk.

The pass rate is half the product. Table 15 adds the funded stage at $r = 4\%$. The product $P \cdot E[W]$, which is what expected value scales with, moves only a few percent between $RR = 1$ and $RR = 3$: 4.90% against 5.05%, both well above the 4.32% of a two-to-one bracket at 2% risk. What moves a great deal is the frequency of cash. $P(W > 0)$ falls from 37% at $RR = 1$ to 21% at $RR = 3$, so a purchase returns any cash 17.9% of the time at $RR = 1$ and 9.6% at $RR = 3$. Expected value is indifferent to that. A finite bankroll is not, because by Proposition 12 its ruin probability is $q^{[W_0/F]}$ with q the no-cash probability.

Table 16 settles the choice at the bankroll level, for a \$5,000 bankroll. The $RR = 1$ configuration at 4% risk has the highest growth under the 5% ruin cap, +1.81 against +1.31 for the two-to-one

RR	P	E[W]	P · E[W]	P(W > 0)	P(any cash)	E[N] assessment
0.25	44.39%	7.87%	3.49%	60.0%	26.6%	25.6
0.5	48.72%	9.06%	4.41%	48.4%	23.6%	13.5
1	48.66%	10.07%	4.90%	36.7%	17.9%	8.6
2	46.50%	10.61%	4.93%	26.3%	12.2%	5.2
3	46.52%	10.85%	5.05%	20.7%	9.6%	3.5

Table 15: The assessment and the funded stage by reward-to-risk at $r = 4\%$, cost 1.67% of the risk. The product is nearly flat above $RR = 1$; the cash frequency is not.

bracket at 2%, with the same capped account size, the first cash in 61 days instead of 88, and a deeper bankroll drawdown, 66% instead of 54%. The $RR = 3$ configuration has a comparable product and roughly double the ruin at every account size, which is the cash frequency showing up where expected value cannot see it. The sub-one configurations run the other way: $RR = 0.5$ has lower ruin at every account size and a shallower bankroll drawdown, 48% against 66%, and grows +1.47 under the cap against +1.81, because its lifetime payout is lower and it needs half again as many trades. At the pessimistic cost it keeps half the growth of $RR = 1$ and $RR = 0.25$ turns negative. A trader who values the shallower drawdown over the growth has $RR = 0.5$ as the honest alternative; nothing below it survives cost.

configuration	P E[W]	\$3,000	\$10,000	\$25,000	\$50,000	\$100,000	capped optimum
RR 2, 2%	4.32%	0% / +0.15	0% / +0.45	0% / +0.97	4% / +1.31	21% / +1.25	\$50,000, +1.31, dd 54%, 88 d
RR 0.25, 4%	3.49%	0% / +0.05	0% / +0.21	0% / +0.56	1% / +0.85	10% / +1.05	\$50,000, +0.85, dd 36%, 92 d
RR 0.5, 4%	4.41%	0% / +0.15	0% / +0.48	0% / +1.04	2% / +1.47	14% / +1.57	\$50,000, +1.47, dd 48%, 66 d
RR 1, 4%	4.90%	0% / +0.26	0% / +0.73	0% / +1.41	4% / +1.81	21% / +1.66	\$50,000, +1.81, dd 66%, 61 d
RR 2, 4%	4.93%	0% / +0.38	0% / +0.97	2% / +1.68	13% / +1.74	37% / +1.16	\$25,000, +1.68, dd 51%, 64 d
RR 3, 4%	5.05%	0% / +0.48	0% / +1.13	4% / +1.77	20% / +1.57	44% / +0.91	\$25,000, +1.77, dd 63%, 61 d

Table 16: Six bracket configurations on a \$5,000 bankroll: ruin probability and expected log growth by account size, and the growth-optimal account size under a 5% ruin cap with its growth, median bankroll drawdown and median days to first cash.

Corollary 6 (The bracket). *Take the largest risk per trade the daily rule allows and a reward-to-risk near one. A ratio below one loses on trade count at any positive cost; a ratio above one buys a few percent of expected value with a halving of cash frequency, which the bankroll pays for in ruin.*

10.3 The gain per win and the account size, per bankroll

The growth model of Section 7, built from the closed forms of Propositions 14 and 15 and the trade counts of the Markov chain, ranks $(u, \text{account size})$ per bankroll with the ruin bound of Proposition 12 as the constraint. The first-order condition in u has no closed form because π , y and the day count all move with it, so it is solved on the grid. The model holds the fee share fixed and pays the stream as a lump, so its level overstates the bankroll process about twofold. Its ranking is what it is for, and Table 17 places it beside the simulated bankroll process. The two agree on the account size at every bankroll from \$2,500 up and on the gain per win at \$5,000 and \$10,000, where it is 4% and 4% in both. At \$2,500 the 4% configuration sits on the ruin cap, with a simulated ruin near 5% that a seed can push either way, and the simulation picks 2%. At \$1,000 the model buys the \$10,000 account size at 2% where the simulation, which sees the bankroll path and not a bound, keeps the \$3,000 account size and takes a larger step. The model is the derivation; the simulation is the check, and where they part the simulation wins.

Corollary 7 (The whole plan, per account balance). *Risk 4% per trade. Stop one daily sigma of the pair, target the same distance. The gain per win, and with it the ratio, is a function of the fee as a share of the bankroll: about 8% when the fee is under 3% of the bankroll, 4% near 6%, 2%*

bankroll	model free: account size, u	ruin	model capped: account size, u	growth	simulated capped: account size, u	growth	fee/bankroll
\$1,000	\$25,000, 4%	26%	\$10,000, 2%	+2.08	\$3,000, 8%	+0.91	9.9%
\$2,500	\$100,000, 4%	41%	\$25,000, 4%	+3.62	\$25,000, 2%	+1.43	6.3%
\$5,000	\$100,000, 4%	16%	\$50,000, 4%	+3.70	\$50,000, 4%	+1.79	6.0%
\$10,000	\$100,000, 8%	9%	\$100,000, 4%	+3.78	\$100,000, 4%	+1.84	5.6%

Table 17: Optimum over account size and gain per win, for each bankroll: the closed-form growth model, unconstrained and under the 5% ruin bound, against the simulated bankroll process under the same cap. Growth is over 500 days.

above 10%. The account size is the largest whose fee is at most about 6% of the bankroll. Holding several accounts at once changes the account size and the count, Corollary 9.

The configuration the rest of the paper reports is the one this corollary gives for a fee share near six percent, which is where the capped optimum sits at every bankroll tested: $RR = 1$, $r = 4\%$, stop 60 pips, $\gamma = 1.67\%$, so $c = 0.07\%$ of account balance per trade.

11 The traded configuration in numbers

11.1 The assessment

At $RR = 1$ and $r = 4\%$ a single loss is $r + c = 4.07\%$ against a daily limit of at least 4.55%, so the daily rule never fires. With $c = 0.07\%$ the lattice unit is c . In that unit the gain per win is $(RRr - c)/c = RR/\gamma - 1 = 59$, the down-step is $(r + c)/c = 1/\gamma + 1 = 61$, and the barriers sit at $\lceil T/c \rceil = \lceil D/c \rceil = 135$ units, so the alive states number $2 \cdot 135 - 1 = 269$ and the system is solved in a millisecond. Table 18 and Figure 1 show the three methods of Section 4 against the simulation of the full rulebook.

Numerical check (Proposition 3). At $RR = 2$ and $r = 1\%$, where the barriers sit at exactly nine down-steps and only the target overshoots, the exact Markov chain gives 49.09% against 50.00%. At the traded configuration the cost-free exact value is 50.00%, the symmetric case, so every point below it in Table 18 is cost.

risk r	closed form	exact, $c = 0$	exact, c	simulation $\pm$ s.e.	$E[\tau]$ exact	$E[\tau]$ sim
1.0%	42.56%	50.00%	42.23%	42.16% $\pm$ 0.14	88.85	88.81
2.0%	46.26%	50.00%	46.99%	47.11% $\pm$ 0.14	24.70	24.71
3.0%	47.50%	50.00%	42.82%	42.82% $\pm$ 0.14	12.00	11.99
4.0%	48.13%	50.00%	48.66%	48.67% $\pm$ 0.14	8.60	8.60

Table 18: Pass probability by method at $RR = 1$ with cost 1.67% of the risk. The simulation runs 120,000 accounts under every rule in Table 8. The exact Markov chain and the simulation agree within sampling error at every risk. The closed form is the diffusion approximation of Proposition 4 and drifts away from both as the number of steps inside the barriers falls.

Numerical check (Proposition 7). $TD/\sigma^2 = 5.06$ trades. The exact Markov chain gives 8.60 and the simulation 8.60. The gap is overshoot: $E[S_\tau^2]$ is evaluated at the landing points, which lie beyond the barriers, and squaring amplifies the excess even when the two overshoots cancel in the first moment. The Markov chain is the number to use.

Cost, and a control on real prices. Between the derived cost and the MNQ floor the pass rate moves from 48.67% to 43.40%, a difference of 5.3 points. That is the largest single sensitivity in the paper and it rests on an assumption, because the firm documents its \$5 per lot commission but not its live spread. The walk also idealises the path: every day is an independent draw and a barrier is either hit or not. As a control, the same bracket is traded at random entry times and random directions over 467 real MNQ regular sessions of one-minute bars, with intrabar barriers

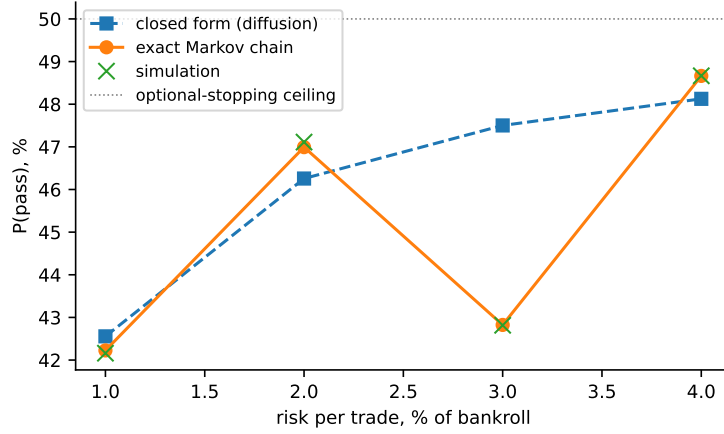


Figure 1: The three analytical methods against the simulation at $RR = 1$. Cost-free the exact value is the optional-stopping value itself, by symmetry. The dip at 3% risk is a lattice trap: three wins net of cost sum to $3(r - c) = 8.85\%$, short of the 9% target by the cost of three trades, so a fourth win is needed. The closed form cannot see it, and it is the other thing to check before choosing r .

and the stop taking precedence on ties, at 100 micro contracts against a \$100,000 account balance so that one stop equals r of the account balance. The real paths pass 40.30% of the time against 43.40% for the walk at the matched cost, a gap of 3.1 points, wider than at smaller risks because a 4% account resolves in a handful of trades and is lumpier. The cost stack still moves the pass rate more than the path idealisation does.

The same control on the pair itself. The MNQ control is a different market at a different cost. The bracket of the traded configuration, 60 pips against 60 at 4% risk with the derived cost, is also traded on 17,231 hourly EURUSD bars over 813 trading days, random entry and direction, barriers on the hourly high and low with the stop taken on a tie, one entry a day, a trade running across days until it resolves. The real path passes 48.58% of the time against 48.66% for the Markov chain, with 8.63 trades per account against 8.60, and cost-free it passes 50.10%, against one half. The Monte Carlo standard error is 0.35%. The pair is a fair game at this bracket and the walk prices it correctly. What the walk gets wrong is days per trade. The measured daily standard deviation is 44.7 pips, not the 60 pips the stop corner solution of Proposition 16 took as its input, and a trade resolves in 3.6 trading days against the 1.8 that Wald’s count gives at the measured sigma, because the intraday path mean-reverts. Every per-trade number in this paper stands. Every per-day number, the challenge in days, the fourteen-day clock in trades, and the bankroll’s growth per year, runs at about a third of the modelled speed on this pair.

11.2 The account size and the lot grid

Proposition 1 needs the position to be sizeable to the chosen risk. At the 60-pip stop the continuous lot is $L = rB/(10\ell)$, which is 0.20 at \$3,000 and 6.67 at \$100,000. Table 19 floors and rounds L to the 0.01 grid at every account size and reports the risk the position actually carries and the Markov chain’s pass rate at that risk. Flooring never raises the risk above the chosen r , so it can never breach the daily rule that r was set against; rounding to nearest stays inside the cap of Proposition 18 too at every account size. Either way the deviation is at most 0.04 points of risk and 0.33 points of pass rate, so the independent of account size pass rate holds and the choice of account size is the ratio of fee to account balance and nothing else.

account size B	exact lots	floored	r_{eff}	P	rounded	r_{eff}	P
\$3,000	0.200	0.20	4.00%	48.66%	0.20	4.00%	48.66%
\$10,000	0.667	0.66	3.96%	49.00%	0.67	4.02%	48.66%
\$25,000	1.667	1.66	3.98%	48.66%	1.67	4.01%	48.66%
\$50,000	3.333	3.33	4.00%	48.66%	3.33	4.00%	48.66%
\$100,000	6.667	6.66	4.00%	48.66%	6.67	4.00%	48.66%

Table 19: The 0.01-lot minimum at the traded stop of 60 pips and $r = 4\%$. The effective risk is what the floored or rounded position loses at the stop, and P is the exact Markov chain at that risk.

11.3 The funded stage

Numerical check (Proposition 8). The simulation gives $E[W] = 10.11\%$, $-E[\text{eq}_\tau] = 11.62\%$ (so $E[o] = 2.62\%$), $E[N] = 21.3$ trades and a cost drag of 1.42%. The identity holds with a gap of -0.085 points of account balance. Table 20 repeats the check at every risk.

risk r	$E[W]$	$-E[\text{eq}_\tau]$	$E[N]$	$-E[\text{eq}_\tau] - cE[N]$	gap (pts)	$P(W > 0)$	median life
1.0%	7.56%	9.48%	115	7.56%	+0.008	65.7%	88
2.0%	8.71%	10.19%	45	8.68%	+0.029	51.2%	34
3.0%	8.33%	9.58%	24	8.39%	-0.055	39.1%	17
4.0%	10.11%	11.62%	21	10.20%	-0.085	36.5%	16

Table 20: Funded-stage lifetime payout against the conservation identity, 60,000 accounts per row, $RR = 1$, cost 1.67% of the risk. The gap column is simulation minus identity in points of account balance. Lifetime payout and the chance of any payout move in opposite directions with size.

At $r = 1\%$ the account lives 115 trades on average and lifetime payout falls to 7.56%, which is Corollary 4 in numbers. This is the trade-count corollary of the `eval_convexity` topic reappearing in the funded stage: variance has no effect, and the only cost that grows is the number of round trips.

Numerical check (Proposition 9). Clamping equity at $-D$ moves $-E[\text{eq}_\tau]$ from 11.62% to 9.00% and $E[W]$ from 10.11% to 10.11%, the second difference being sampling noise. The rule moves the firm's booked loss and nothing of the trader's.

11.4 Expected value

At the traded configuration $\kappa = 0.03444$ for the 70% split. Table 21 gives the figures of Section 6 account size by account size.

split	account balance	fee	F/B	$E[\text{value}]$	per fee	breakeven	$P(\text{paid})$
70%	\$3,000	\$38	1.27%	+\$65	$1.72\times$		36.8%
70%	\$10,000	\$99	0.99%	+\$245	$2.48\times$		28.7%
70%	\$25,000	\$158	0.63%	+\$703	$4.45\times$		18.3%
70%	\$50,000	\$298	0.60%	+\$1,424	$4.78\times$		17.3%
70%	\$100,000	\$560	0.56%	+\$2,884	$5.15\times$		16.3%
90%	\$3,000	\$51	1.70%	+\$82	$1.60\times$		38.4%
90%	\$10,000	\$134	1.34%	+\$309	$2.30\times$		30.3%
90%	\$25,000	\$213	0.85%	+\$894	$4.20\times$		19.2%
90%	\$50,000	\$402	0.80%	+\$1,812	$4.51\times$		18.2%
90%	\$100,000	\$756	0.76%	+\$3,672	$4.86\times$		17.1%

Table 21: Expected value per purchase at $P = 48.67\%$, $E[W] = 10.11\%$. On expected value alone the largest account size wins and the add-on loses at every account size, as Proposition 11 says.

11.5 The bankroll

Only 17.8% of purchases return cash at this configuration, after a median wait that Table 22 puts near three months. With $q = 0.822$ the bound of Proposition 12 sits beside the simulated ruin probability for every bankroll and account size, with $P(\text{paid}) = 1$ here and varied in the next subsection.

bankroll	account size	F/W_0	P(ruin)	q^{n_F}	median drawdown	days to cash	P(cash)	median final	$E[\log g]$
\$500	\$3,000†	7.6%	10.8%	7.8%	84%	58	93%	\$1,988	+0.761
	\$10,000	19.8%	40.6%	37.6%	139%	42	63%	\$4,045	-0.252
	\$25,000	31.6%	55.4%	55.6%	95%	34	46%	\$26	-0.020
	\$50,000	59.6%	83.3%	82.2%	60%	22	17%	\$202	-0.040
	\$100,000	112.0%	100.0%	100.0%	0%	—	0%	\$500	+0.000
\$1,000	\$3,000★	3.8%	1.1%	0.6%	42%	63	99%	\$2,516	+0.791
	\$10,000	9.9%	16.4%	14.1%	99%	55	87%	\$6,499	+0.883
	\$25,000†	15.8%	31.3%	30.9%	126%	46	70%	\$14,582	+1.060
	\$50,000	29.8%	55.1%	55.6%	89%	34	46%	\$106	+0.383
	\$100,000	56.0%	83.2%	82.2%	56%	22	17%	\$440	+0.038
\$2,500	\$3,000	1.5%	0.0%	0.0%	17%	63	100%	\$4,016	+0.450
	\$10,000★	4.0%	1.0%	0.7%	44%	63	99%	\$8,308	+1.072
	\$25,000†	6.3%	5.5%	5.3%	70%	60	95%	\$19,275	+1.729
	\$50,000	11.9%	21.3%	20.9%	107%	50	79%	\$33,589	+1.457
	\$100,000	22.4%	45.5%	45.7%	134%	38	55%	\$37,033	+0.822
\$5,000	\$3,000	0.8%	0.0%	0.0%	8%	63	100%	\$6,516	+0.261
	\$10,000	2.0%	0.0%	0.0%	22%	63	100%	\$10,808	+0.730
	\$25,000	3.2%	0.1%	0.2%	35%	63	100%	\$21,888	+1.406
	\$50,000★†	6.0%	4.4%	4.4%	66%	60	96%	\$39,119	+1.785
	\$100,000	11.2%	21.1%	20.9%	101%	50	79%	\$68,187	+1.647
\$10,000	\$3,000	0.4%	0.0%	0.0%	4%	63	100%	\$11,516	+0.143
	\$10,000	1.0%	0.0%	0.0%	11%	63	100%	\$15,808	+0.446
	\$25,000	1.6%	0.0%	0.0%	17%	63	100%	\$26,888	+0.955
	\$50,000	3.0%	0.1%	0.2%	33%	63	100%	\$44,250	+1.422
	\$100,000★†	5.6%	3.5%	3.6%	62%	61	97%	\$79,253	+1.839

Table 22: The bankroll process, 6,000 paths per configuration, $P(\text{paid}) = 1$. Drawdown is the bankroll’s own peak-to-trough as a share of W_0 . † marks the account size with the highest expected log growth, ★ the highest with ruin at most 5%. The q^{n_F} column is the analytical lower bound of Proposition 12.

Why unconstrained growth is not the objective either. At a \$1,000 bankroll the highest expected log growth is the \$25,000 account size, at a fee of 15.8% of the bankroll and a ruin probability of 31%, buying 0.269 of extra log growth over the safe choice. The expectation of a logarithm hides an absorbing state behind the paths that survive. Table 23 compares the unconstrained optimum with the optimum under a 5% ruin cap.

bankroll	free account size	F/W_0	ruin	capped account size	F/W_0	ruin	growth cost
\$500	\$3,000	7.6%	10.8%	none			
\$1,000	\$25,000	15.8%	31.3%	\$3,000	3.8%	1.1%	-0.269
\$2,500	\$25,000	6.3%	5.5%	\$10,000	4.0%	1.0%	-0.656
\$5,000	\$50,000	6.0%	4.4%	\$50,000	6.0%	4.4%	+0.000
\$10,000	\$100,000	5.6%	3.5%	\$100,000	5.6%	3.5%	+0.000

Table 23: Growth-optimal account size with and without a 5% ruin cap. The capped optimum sits at a fee of 3.8% to 6.0% of the bankroll at every size tested, with a median bankroll drawdown of 42% to 66% and 60 to 63 days to the first inflow.

Corollary 8 (The rule). *Buy the largest account size whose fee is at most about six percent of the bankroll.*

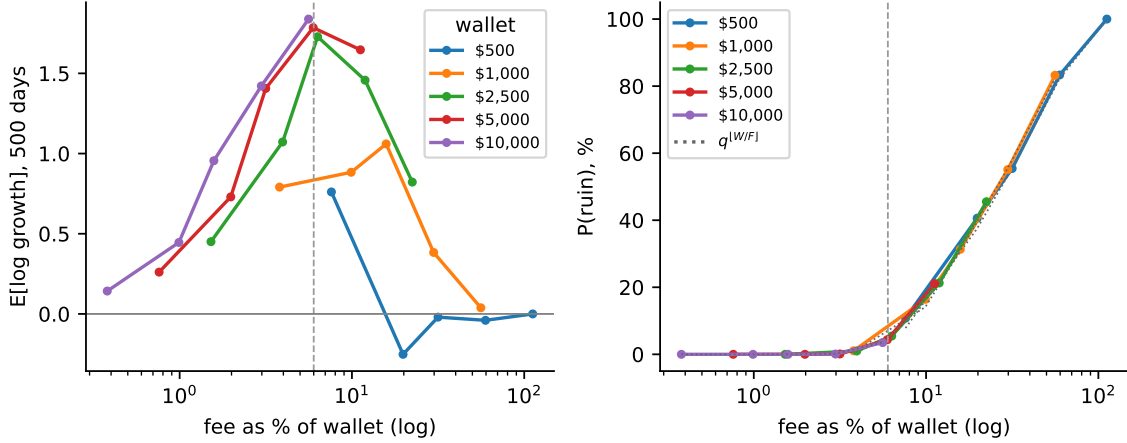


Figure 2: Left: expected log growth against fee as a share of the bankroll. Every bankroll peaks near a six-percent fee and collapses beyond it. Right: the simulated ruin probability with the $q^{[W_0/F]}$ bound dotted. Expected value predicts growth rising monotonically with account size; it does not.

11.6 Spreading the bankroll

The correlation. On the 813-day EURUSD sample, the same-side bracket entered from the first bar of 07:00 UTC and again from 16:00 UTC, both at the 30-pip stop of Corollary 10, resolve with outcomes correlated at $\rho_s = 0.26$ over 718 days. At the 60-pip stop of the traded configuration it is 0.57, because a wider bracket lives longer and the two overlap more. Hours closer together correlate more: 07:00 against 12:00 UTC gives 0.45 at 30 pips. By Proposition 13 two accounts at 0.26 are worth 1.59 independent ones.

The families. Each account's daily coin is $\Phi(\sqrt{\rho} Z_0 + \sqrt{1-\rho} Z_i)$ with Z_0 shared, so the normals behind any two accounts correlate at ρ . For the sign of a fair bracket the outcome correlation maps to the normal one by

$$\rho = \sin\left(\frac{\pi \rho_s}{2}\right),$$

so the measured 0.26 becomes $\rho = 0.39$. Four families run: independent ($\rho = 0$), staggered at the 30-pip measurement, staggered at the 60-pip measurement as the sensitivity, and correlated ($\rho = 1$). n_a runs from 1 to 12, never above $\$300,000/B$, and never beyond what the bankroll can open on the first day. At $n_a = 1$ the independent family is the bankroll process of Table 22 on the same seed, which the notebook checks to 10^{-4} .

Table 24 is the table in n_a for the \$5,000 bankroll on the \$50,000 account size. Ruin rises with n_a above the bound of 4.4%, to 6.1% at $n_a = 2$ for independent accounts, because two purchases come due at once and a bankroll that closes a day below zero is ruined whatever the bound counts. Growth rises faster, +2.33 at $n_a = 2$ against +1.79 for one account. The correlated family goes the other way, 21.3% ruin and +1.46 growth at $n_a = 2$: two \$50,000 accounts at \$596 stand in for one \$100,000 account at \$560, and the \$100,000 row of Table 22 beats them on both counts, 21.1% and +1.65. That is the $\rho = 1$ case of Proposition 13 in numbers.

Table 25 settles the choice per bankroll. The rule, declared before the run: spreading earns its place if at three or more of the five starting bankrolls the staggered family's capped optimum holds two or more accounts and beats the one-account optimum by more than two standard errors of the difference. It does at 4 of 5. At \$5,000 the staggered optimum holds 4 accounts of the \$25,000 account size, an outlay of 12.6% of the bankroll, with ruin 2.9% and growth +2.49 against +1.79 for one \$50,000 account; its first cash lands in 30 days and its median bankroll drawdown is 66% against 66%. Across the five starting bankrolls the staggered optimum holds 2 to 12 accounts with a first-day outlay of 8% to 19% of the bankroll, and its gain over one account is +0.42 to

n_a	$n_a F/W_0$	$q^{[W_0/F]}$	independent		staggered		staggered, 60-pip ρ		correlated	
			ruin	E[log g]	ruin	E[log g]	ruin	E[log g]	ruin	E[log g]
1	6.0%	4.4%	4.4%	+1.79	4.2%	+1.81	4.4%	+1.79	4.4%	+1.79
2	11.9%	4.4%	6.1%	+2.33	8.6%	+2.20	12.8%	+1.95	21.3%	+1.46
3	17.9%	4.4%	8.9%	+2.54	15.0%	+2.17	22.3%	+1.73	37.5%	+1.09
4	23.8%	4.4%	14.2%	+2.46	21.9%	+1.99	31.9%	+1.37	45.8%	+0.44
5	29.8%	4.4%	19.7%	+2.30	29.9%	+1.65	40.7%	+0.98	55.1%	+0.38
6	35.8%	4.4%	25.8%	+2.04	38.3%	+1.23	48.1%	+0.63	68.2%	+0.34

Table 24: The table in n_a on the \$50,000 account size from a \$5,000 bankroll, 6,000 paths, $P(\text{paid}) = 1$. The bound $q^{[W_0/F]}$ is the same at every n_a . Ruin climbs above it as n_a purchases come due together; growth climbs with it for every family but the correlated one.

+0.97 of log growth. The independent family, the upper bound, reaches +3.17 at \$5,000 with 9 accounts of the \$25,000 account size.

bankroll	one account			$n_a \times$ account size	independent			$n_a \times$ account size	staggered, $\rho_s = 0.26$			
	account size	ruin	E[log g]		$n_a F/W_0$	ruin	E[log g]		$n_a F/W_0$	ruin	E[log g]	
\$500	none			none				none				
\$1,000	\$3,000	1.1%	+0.79	$5 \times \$3,000$	19.0%	5.0%	+1.85	$2 \times \$3,000$	7.6%	2.7%	+1.21	
\$2,500	\$10,000	1.0%	+1.07	$5 \times \$10,000$	19.8%	4.5%	+2.25	$10 \times \$3,000$	15.2%	3.8%	+1.71	
\$5,000	\$50,000	4.4%	+1.79	$9 \times \$25,000$	28.4%	4.2%	+3.17	$4 \times \$25,000$	12.6%	2.9%	+2.49	
\$10,000	\$100,000	3.5%	+1.84	$12 \times \$25,000$	19.0%	0.1%	+3.09	$12 \times \$25,000$	19.0%	3.5%	+2.81	

Table 25: The capped optimum per bankroll, $P(\text{ruin}) \leq 5\%$, for one account (Table 22) against the best number of accounts held at once, independent and at the measured correlation. $n_a F/W_0$ is the first-day outlay as a share of the bankroll.

Corollary 9 (Spreading). *Hold several accounts of one account size at once, all on the same side, entered at different hours. The account size sits one or two steps below the one-account rule, so that the first-day outlay is 8% to 19% of the bankroll, and the count is what the ruin cap allows at the measured correlation: 4 accounts of \$25,000 at a \$5,000 bankroll, and the allocation cap of \$300,000 at \$10,000. Beyond two accounts the correlation is unmeasured, so the gain there is an upper estimate.*

11.7 The distributions behind the means

Every table so far reports a mean or a median, and a trader decides on the whole distribution. Figure 3 answers six questions a trader asks, each as a probability read straight off the axis, with the lattice law of Propositions 6 and 10 drawn over the simulation wherever one exists.

How long until you know. The chance the challenge has resolved by trade n , split into passed and failed. The median is 7 trades and the ninetieth percentile 16. The curve climbs in steps at the odd counts because a pass is three net wins and a fail three net losses, and the Markov chain agrees with the simulation to within 0.36% at every count. The Markov chain also gives the overshoot past each barrier that Proposition 3 charges the pass rate for: 2.44% of account balance past the target and 2.96% past the loss limit, against 2.44% and 2.97% simulated.

How many payouts a funded account gives. Geometric by Proposition 10: a cycle pays with probability 36.74% by the Markov chain against 36.55% simulated, so 63.4% of funded accounts never pay (63.3% by the Markov chain), and each further payout is as likely as the first. Without the clock the two-barrier probability would be 45.38%, so the fourteen-day wait costs about nine points per cycle.

How long a funded account lasts. The chance it is still alive after n trades. Median 16 trades, ninetieth percentile 46.

How much a funded account pays. The chance that lifetime payout is at least x of account balance, a staircase whose steps are the payouts. The median payout is 15.07% of account balance

against a minimum request of 11.43%, because the account is read on the fourteenth day of the cycle and not at the barrier. The ninety-fifth percentile payout is 31.07%, an account that sat above the barrier through a whole waiting period. The Markov chain's mean of 10.19% sits beside 10.11% simulated and 10.11% from the conservation identity.

When the bankroll runs out, and when it first sees cash. For a \$5,000 bankroll, the chance of ruin by day d and the chance that the first payout has landed by day d , on the capped-optimal \$50,000 account size and on the \$100,000 account size. Ruin on the larger account size is 21.1% by day 500 and reaches most of that by day 160: a bankroll that survives its first two purchases has a funded account paying, and the ones that do not are gone.

What the bankroll is worth by day. Median with a 10th to 90th percentile band, to day 1,000, instead of a single slice. Table 26 reads it at four days. The \$100,000 median sits below the starting bankroll for the first 70 days, the fee paid and nothing yet returned, and leads the \$50,000 account size from then on. The difference between the two account sizes is the ruin curve of the previous panel, which is what the bankroll sees.

day	capped account size				\$100,000 account size			
	ruin	p10	median	p90	ruin	p10	median	p90
100	0.0%	\$2,616	\$8,643	\$19,991	10.0%	\$520	\$12,373	\$35,063
250	3.5%	\$5,707	\$20,972	\$38,449	20.7%	\$520	\$33,840	\$71,929
500	4.4%	\$16,173	\$39,119	\$64,385	21.1%	\$520	\$68,187	\$123,179
1000	4.4%	\$41,398	\$76,850	\$112,390	21.1%	\$520	\$139,867	\$218,743

Table 26: The bankroll of \$5,000 read off Figure 3 at four days, for the capped-optimal account size and the largest, 6,000 paths each. Ruin is the share of paths that could not afford the next fee. Quantiles are in dollars.

11.8 Two breakevens

The expected-value breakeven of Section 6 is the payout probability at which one purchase, averaged over infinitely many, is worth its fee. The bankroll breakeven is the payout probability at which a finite bankroll's expected log growth is zero over the horizon. Table 27 finds the second by bisection on $P(\text{paid})$.

account size	fee	EV breakeven	bankroll \$2,500	bankroll \$5,000	bankroll \$10,000
\$3,000	\$38	37%	43%	41%	40%
\$10,000	\$99	29%	48%	36%	33%
\$25,000	\$158	18%	40%	31%	23%
\$50,000	\$298	17%	53%	38%	29%
\$100,000	\$560	16%	68%	45%	36%

Table 27: Breakeven $P(\text{paid})$: expected value against a finite bankroll's log growth. A dash marks an account size the bankroll cannot sensibly buy.

The bankroll needs the firm 1.1 to 4.2 times more honest than expected value implies, and the gap widens with account size because a larger fee is a larger share of the bankroll at risk before any payout. At a \$5,000 bankroll the \$100,000 account size grows only above $P(\text{paid}) = 45\%$, where its expected-value breakeven is 16.3%.

12 The stop, revisited on the pair

Proposition 16 set the stop so that a bracket closes within the day, and the swap never entered. Section 11 measured 3.6 trading days per trade on the pair. This section takes the swap term

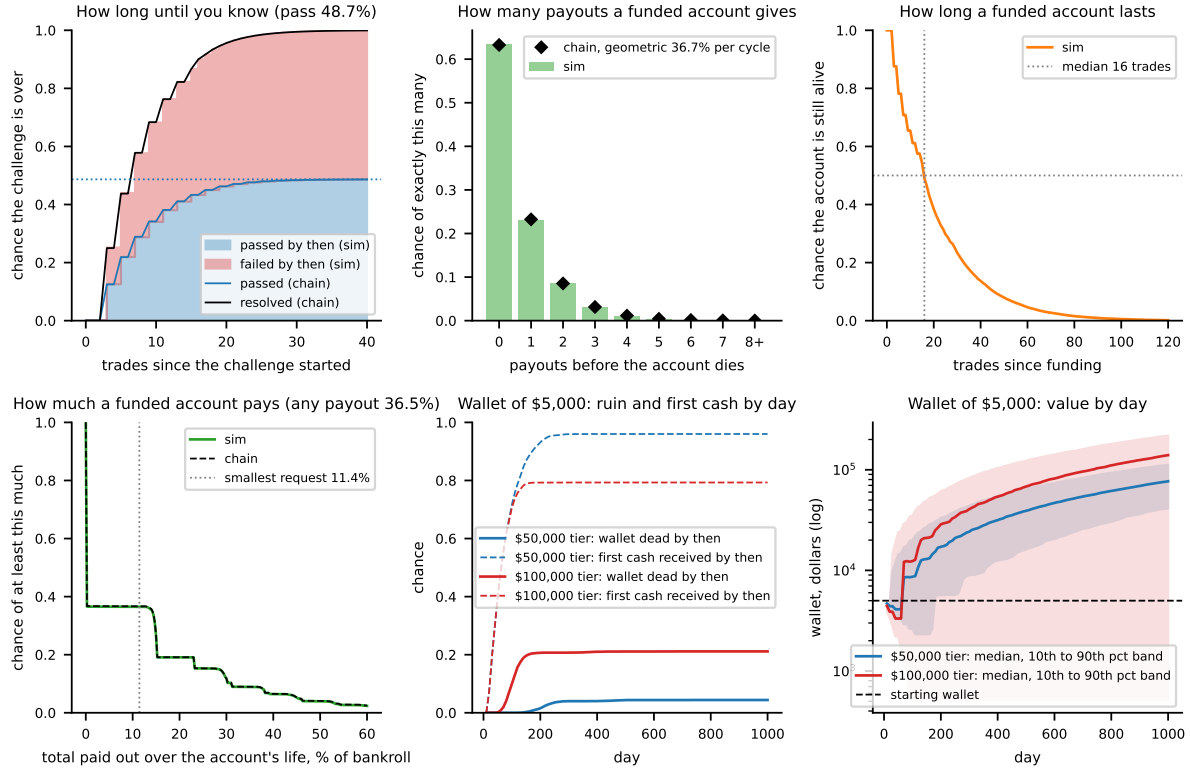


Figure 3: Six distributions at the traded configuration, simulated (120,000 challenges, 60,000 funded accounts, 6,000 bankroll paths) with the lattice law drawn over where one exists. Top left: chance the challenge is over by trade n , passed and failed. Top middle: chance of exactly k payouts from one funded account, against the geometric law of Proposition 10. Top right: chance the funded account is still alive after n trades. Bottom left: chance that lifetime payout is at least x of account balance, against the Markov chain. Bottom middle: chance a \$5,000 bankroll is dead by day d , and chance its first cash has arrived by then, on the \$50,000 and \$100,000 account sizes. Bottom right: that bankroll's median and 10th to 90th percentile band by day. The bankroll rule of Section 7 would be falsified by a \$100,000-account size ruin curve that stayed at zero.

of Section 8 to the pair, where Proposition 17 makes the direction of each trade a free choice, replaces the stop in pips by a stop in daily sigmas, and chooses the multiple on the first half of the data and scores it on the second.

12.1 The swap on the pair

Section 8 put the swap into the cost-to-risk ratio, $\gamma(\ell) = (k/10 + s - w\nu(\ell))/\ell$, and what the pair adds is numbers. The firm charges a triple swap on Wednesday to cover the weekend, so a trade held d trading days pays $1.4(d - 1)$ nights. The firm's documents do not publish its swap rates. The figures used in this section are typical retail EURUSD rates, 0.75 pips a night against the long side and 0.25 in favour of the short, and every number in this section moves with them. The platform's own figures, read for Section 9, are -6.24 and +1.76 dollars per lot per night, a tenth of that in pips, close to the assumed ones.

At the 60-pip stop on the real path a trade is held about 3.6 nights. With the swap at a random side the pass rate is 45.34% against 48.58% without it. On the carry side it is 49.90%. The caveat is uncovered interest parity, under which the spot drifts against the high-rate currency by the rate gap and the credit washes out. The cost-free pass rate of 50.10% on this sample, on random sides, says the drift at this horizon is not visible, and the carry literature says parity holds only in part.

12.2 The stop in sigmas

Proposition 7 in pips gives $E[\text{days}] = \ell^2/\sigma^2$ for a symmetric bracket, so the nights held depend on the stop only through ℓ/σ . The real path takes longer than the walk, 3.6 days against 1.8 at the measured sigma, but the scaling argument stands. A stop set as

$$\ell_t = \beta \sigma_{t-1}$$

holds the nights fixed when the regime changes, where a stop fixed in pips does not: the daily sigma is 44.7 pips over the sample and ranges from 29.3 to 59.5 between its 10th and 90th percentiles, so 60 pips is one and a third sigmas in one regime and two in another, and the nights scale with the square. Substituting,

$$\gamma(\beta) = \frac{k/10 + s}{\beta \sigma_{t-1}} - \frac{w \nu(\beta)}{\beta \sigma_{t-1}},$$

so at fixed β the swap term is regime-free and the commission term still moves as one over sigma. That residual is what the walk-forward has to survive.

The sigma is the framework's **VolatilityKF** on daily closes, a scalar Kalman filter on squared daily moves r_t^2 with process-to-measurement noise ratio ρ_v . Each day it predicts the variance $P^- = P + \rho_v$, takes the gain $K = P^-/(P^- + 1)$, updates $v \leftarrow v + K(r_t^2 - v)$, and keeps $P = (1 - K)P^-$. In steady state P repeats, and $(1 - K)P^- = P^-/(P^- + 1) = K$, so $P = K$ and $P^- = K + \rho_v$. Substituting into the gain,

$$K = \frac{K + \rho_v}{K + \rho_v + 1} \implies K^2 + \rho_v K - \rho_v = 0,$$

$$K^* = \frac{-\rho_v + \sqrt{\rho_v^2 + 4\rho_v}}{2},$$

so the filter is an exponentially weighted average of squared moves with weight K^* on the newest, and with $\rho_v = 0.0025$, $K^* = 0.049$ and the memory is about $1/K^* = 21$ days.

The filter has one parameter, ρ_v , and no long-run level: after a quiet month it reads the quiet level and stays there until a large move arrives. The stop for a trade on day t uses the filter's value at $t - 1$, and no trade is entered in the filter's 30-day seeding window.

12.3 The objective and the walk-forward

Pass rate is per trade and the bankroll lives on the calendar. With τ trading days per trade, skipped days included, there are $250/\tau$ trades a year, and the bankroll process of Section 7 run for that many model days at the measured effective cost per trade gives the expected log growth per calendar year,

$$g = \mathbb{E} \left[\log \frac{W_{250/\tau}}{W_0} \right],$$

for a \$5,000 bankroll on the \$50,000 account size that the bankroll rule picks, every payout paid. It is a comparison between stops, not a forecast. The effective cost is the commission and spread per trade less the swap credit, both measured in the real-path engine, so the bankroll process sees the same drag the real path paid.

The hourly data splits at its midpoint, 17 April 2025. For each direction policy the multiple β is chosen on the first half by g and scored on the second, against the fixed 60-pip stop. Table 28 gives every configuration. The Monte Carlo standard error on a pass rate at 6,000 accounts is 0.65%.

stop	half	mean stop, pips	days per trade	trades per year	P random side	cost-to-risk ratio random	g random	g carry
60 pips fixed	first	60	4.69	53	45.70%	3.82%	+0.098	+0.229
60 pips fixed	second	60	3.16	79	46.73%	2.93%	+0.285	+0.418
0.75 σ	first	30	1.86	134	41.58%	5.34%	+0.353	+0.557
0.75 σ	second	34	1.90	131	45.58%	3.87%	+0.473	+0.601
1.00 σ	first	40	2.26	110	44.43%	4.43%	+0.322	+0.520
1.00 σ	second	45	2.43	103	46.60%	3.31%	+0.372	+0.514
1.35 σ	first	54	3.09	81	46.15%	3.90%	+0.251	+0.421
1.35 σ	second	60	3.47	72	46.70%	3.08%	+0.235	+0.369
2.00 σ	first	80	5.44	46	44.67%	3.79%	+0.053	+0.177
2.00 σ	second	89	5.90	42	46.98%	3.08%	+0.053	+0.146

Table 28: The stop in daily sigmas against the fixed stop, on each half of the EURUSD sample, both direction policies. g is expected log growth per calendar year of a \$5,000 bankroll on the \$50,000 account size. Cost-to-risk ratio is the effective cost per trade, swap included, as a share of the risk.

On the random side the first half picks $\beta = 0.75$ with $g = +0.35$ a year, and on the second half that choice scores +0.47 against +0.28 for the fixed stop and is the second half's own best. On the carry side the first half picks $\beta = 0.75$ at +0.56, which scores +0.60 on the second half against +0.42 for the fixed stop, again the second half's own best. The ordering in β is monotone on both halves and both policies.

The tight stop does not win on pass rate. On the second half it passes 45.6% against 46.7% for the fixed stop, because its effective cost-to-risk ratio is 3.9% of the risk. It wins on days per trade: a trade at 34 pips resolves in 1.9 trading days against 3.2, so 131 trades a year against 79, and with payouts paid each purchase has positive expected value, so more purchases compound faster.

Corollary 10 (The stop, on the pair). *Set the stop at 0.75 of the previous day's sigma, floored at 30 pips, size the lots to the stage's risk over that stop, and enter once a day on either side: the walk-forward picks the same multiple on the random side, 0.75, as on the one that earns swap.*

Three caveats hold this result. Hourly bars with the stop taken on a tie bite hardest at tight stops, so the pass rate at 0.75 sigmas is a floor and a smaller multiple cannot be resolved on this data. The tightest configuration tested averaged 30 pips, and in a quiet regime 0.75 sigmas falls under that: at the end of the sample the filter reads about 28 pips and the rule would ask for 21, where commission alone is near five percent of risk. The 30-pip floor in the corollary keeps the stop inside the tested range until finer bars settle the tight end. The growth objective rewards days per trade only because every payout is assumed paid. And the swap rates are assumed, not the firm's: if both sides of the pair are debited by more than half a pip a night, the carry side falls back under the no-swap line and the random-side column is the one to read.

The entry hour. The corollary fixes the stop and the side, not the hour. The strategy enters on the first hourly bar outside every news window between 07:00 and 10:00 UTC, the London open, where the raw spread is tightest and a bracket at the floored stop usually resolves the same day. The pass rate does not depend on the hour on this data: at the 60-pip stop the walk passes 49.6% entering at 00:00 UTC against 50.1% at a random hour, both commission only (Section 19), a gap well inside the precision of Section 1.

13 The news rule

The rulebook forbids news trading, which it defines as “opening or closing a trade within 10 minutes before or after high-impact news is released” [1], and a breach eliminates the account. Everything before this section placed the bracket at the venue and let it fill when touched. A leg that fills inside such a window is a close inside the window. The calendar lists 16 high-impact releases a week across all currencies, a trade on the pair is held about a day at the stop of Section 12, and exits cluster in the volatility a release brings, so the venue would commit that breach for us often. Section 11 did not price this because the walk it measured has no calendar. This section adds the rule to the trade, states what the martingale settles about any such rule, finds the one thing it does not settle, and measures three ways of obeying it on the cohort through the engine that carries the strategy. Two of the three fail, and the measurement is what says so.

13.1 The unit of decision

The bars are hourly and the rule is in minutes, so the decision is taken at bar closes. An instant is *outside every news window* when no high-impact release sits within ten minutes of it. A bar *overlaps a news window* when some instant of it is inside one: an order resting through the bar can fill anywhere inside it. A market order sent at a bar’s close fills at about that instant, so it is allowed only when the instant is outside every news window. These two facts fix every rule below: nothing may rest through a bar overlapping a news window, and nothing may be sent at an instant inside a news window. Entries follow at once: no entry on a bar overlapping a news window, and the next bar of the entry window may still be outside every news window, so the day is not given up.

13.2 What the martingale settles

Proposition 20 (Obeying the rule is free in expectation). *Under zero drift, the expected profit and loss of a trade before costs is zero under any rule that pulls, replaces or closes the trade’s orders on a schedule fixed by the calendar and the path so far, and the bracket’s ratio RR is unchanged whenever the legs return at their original prices.*

So no way of obeying the rule costs expectation, and the choice between them is made on three things the proposition is silent about: the distribution around zero, the costs paid, and a discontinuity in the rulebook itself.

13.3 Three rules, and the one thing the martingale does not settle

Holding unbracketed. Before a bar overlapping a news window, cancel both legs and hold the position unbracketed; at the first bar outside every news window after, put the same bracket back, or close at market if the price sits past a level. Cancelling and replacing costs nothing, so a trade that survives a window is the trade of Section 3, and only the trades resolved at market after a window differ: they carry the release’s overshoot o past the level, a fatter tail on both sides. The pass probability of Section 4.4 depends on outcomes only through the overshoots at the two account boundaries, and both grow alike at $RR = 1$, so it moves at second order. The daily rule

is where this fails. Table 8 caps a day's loss at 5% of the previous day's equity, the trade risks $r = 4\%$, and the room between the two in units of the stop distance ℓ is

$$\text{buffer} = \frac{0.05 - r}{r} \ell = 0.25 \ell$$

so a stop of 30 pips may be overrun by 7.5 pips before the daily rule eliminates the account. A resting stop is overrun by slippage. An unbracketed position is overrun by whatever the release does in the hour, and a release moves the pair further than 7.5 pips in a minute. This is not a wider loss on a trade. It is the fee lost, and since the firm closes a breached account at once, a second close inside the window. The mean of Proposition 20 does not see it, because the rulebook's response to the tail is a discontinuity the profit and loss does not carry.

The early close near the stop. The natural repair: at the bar before one overlapping a news window, if the price already sits within one buffer of the stop, close at market there instead of holding unbracketed, so that an unbracketed position starts at least two buffers from the breach. Neutral in mean by the proposition, and the cohort below says how little it helps: the breach is not a matter of starting close to the stop but of what an hour with a release does to a 30-pip stop.

Exiting for news. Before a bar overlapping a news window, close the position at market, at an instant outside every news window, with the trade alive: its lots, its levels and the price the flatten got are kept. At the first bar outside every news window after, re-enter at market on the same side with the same lots, and put the bracket back *shifted by the gap* between the flatten price and the rejoin price. The shift is what makes this the same trade. Write g for the pips the closed legs have realised so far and ℓ for the stop distance. The rejoined leg then has $\ell - g$ pips to its target and $\ell + g$ to its stop, so the legs sum to $+\ell$ or to $-\ell$ whatever the pair did while the trade was flat, and the risk per trade of Table 8 holds to the pip. Keeping the old prices instead would make the rejoined leg risk ℓ plus the favourable part of the gap, and the first version of this rule did exactly that: the cohort showed trades losing more than the daily cap with no unbracketed bar anywhere, and the shift is the repair. Each leg closes at an instant outside every news window inside its levels, so $|g| < \ell$ and the rejoin is never past a level, with one exception: a flatten sent at a Friday close fills at the Sunday open, which can gap through a level, and then the closed legs have already realised the stop or the target and the trade is settled there; the cohort had 1 such trade. There is no tail, so there is no breach, and by the proposition no expectation is lost. What is paid is one round trip per episode, the commission and the spread of Section 8, $k/10 + s$ pips on the pair. When the instant between two bars is itself inside a window no order may be sent there, so the strategy looks one bar further and exits for news a bar early. A trade held a day meets about one touched hour, so the cost-to-risk ratio of Section 8 roughly doubles. Against the alternative, which loses accounts to the daily rule, that is the price of the plan at this firm.

13.4 On the cohort

The strategy that trades this play, `PrimeAcademyStrategy`, was replayed by the engine over the 813 trading days of Section 11 four times on the deployed short side: with the news rule off, which is the reference run the replay is checked against; holding unbracketed without the early close near the stop; holding unbracketed with the early close near the stop at one buffer; and exiting for news. The calendar is ForexFactory's high-impact set, 2,393 releases over the cohort, all currencies, and the bars are hourly, so a fill is a touch of the bar's range and the worst extreme while unbracketed is the bar's high or low. Table 29 reads the four runs off the engine's own trade log, and bootstraps the firm's rules over each run's trades the way Section 4 bootstraps the walk: pass at the target, out at the loss limit, out when a trade loses more than the daily cap of the equity before it. The replay charges the commission and neither the spread nor the swap. The spread understates the exit-for-news run's cost by s per episode, 0.67 pips a trade at the spread of

Section 9. The swap runs the other way on the deployed side: Section 12 measures the short side, which earns swap, at 49.90% against 48.58% with no swap charged at all, and the engine charges none, so these figures are conservative for a short and optimistic for a long. Sections 11 and 12 do charge the swap, so this section’s costs are not directly comparable with theirs.

run	closed	target	stop	early close	unbracketed	overran	breached	exits for news	exits in bars overlapping a news window	pass	daily rule	days
rule off (reference)	467	236	231	0	0	0	0	0	128	51.2%	0.7%	9
unbracketed, no early close	456	228	228	0	535	67	33	0	74	44.6%	26.2%	7
unbracketed, early close at one buffer	462	229	221	12	519	61	32	0	72	44.2%	25.8%	7
exiting for news	416	213	202	0	1	0	0	555	0	53.8%	0.2%	11

Table 29: The news rule on the cohort, from the engine’s replay of the strategy. Exits in bars overlapping a news window counts, on the reference run, the closes the venue-held bracket made inside a window; on the other runs it counts market closes decided at the instant outside every news window that ends a bar overlapping a news window. Overran and breached count unbracketed episodes whose worst extreme went past the stop, and past the stop by more than the buffer. Exits for news counts the round trips exiting for news paid. Daily rule is the share of bootstrapped accounts it eliminates.

On the reference run 128 of 467 exits, 27% of them, fell in a bar overlapping a news window: the breaches the venue would have committed. Holding unbracketed, 535 episodes over 456 trades were held unbracketed, more than one a trade. In 67 of them the worst extreme during the unbracketed bar passed the stop, and in 33 it passed the stop by more than the buffer, which is the daily rule firing: the bootstrap loses 26.2% of accounts to it against 0.7% on the reference, and the pass rate falls from 51.2% to 44.6%. The currencies whose releases touched the breached hours, with several to an hour, were USD 33, CAD 8, GBP 4, All 1: the dollar’s own releases do the damage, and a calendar restricted to the pair’s two currencies would not have spared the account. The early close near the stop closes 12 trades ahead of a window and leaves 32 of the 33 breaches. Exiting for news pays 555 round trips over 416 trades, 1.33 a trade, leaves 1 unbracketed episode and no breach, and the bootstrap reads a pass rate of 53.8% with 0.2% lost to the daily rule, against 51.2% and 0.7% on the reference. Exiting for news is the rule the strategy carries. Its pass rate reads 2.6 points above the reference, which is not a property of the rule: the two runs hold different trades, the per-trade mean differs by \$+35 with a standard error of \$135, and the bootstrap resamples whatever luck each set carried. The columns that are not luck are the breaches, 0 against 33, the exits in bars overlapping a news window, 0 against 128, and the daily rule, 0.2% against 26.2% holding unbracketed.

On the pair’s own calendar. The firm’s rule names high-impact news without publishing its list. Replayed on a calendar of EUR and USD releases alone, 49% of the store’s high-impact events, the strategy exits for news 0.78 times a trade (standard error 0.05 over 423 trades) against 1.33 on every currency, and 53% of trades exit for news at least once. Each exit for news pays the commission and the spread again, so at A exits for news a trade the cost-to-risk ratio of the risk is

$$\gamma(A) = cE[1/\ell_t](1 + A) + s_w,$$

with c the round trip in pips, $E[1/\ell_t]$ over the deployed stops and s_w the random side’s swap share. Table 30 puts each rate through the purchase condition of Section 1. On the pair’s calendar a purchase returns 1.21 times its fee when the firm pays and the \$1,000 bankroll’s growth there is -0.068 : the purchase condition fails.

calendar	exits for news a trade	cost-to-risk ratio	funded risk	pass	any payout	cash / fee	growth if it pays	breakeven probability	purchase condition
no exits for news	0.00	3.45%	1.575%	44.5%	52.8%	1.59	+0.193	51%	passes
EUR and USD	0.78	5.76%	1.7%	40.8%	47.2%	1.21	-0.068	none	fails
EUR and USD, plus 2 se	0.87	6.04%	1.725%	40.4%	46.6%	1.18	-0.104	none	fails
every currency	1.33	7.41%	1.725%	38.2%	43.7%	0.99	-0.329	none	fails

Table 30: The purchase condition at each exit for news rate, deployed configuration, random side with swap, a 0.5-pip spread. The third row is the pair’s rate plus two of its standard errors.

Every exit for news pays the spread again, so the verdict turns on it. Table 31 computes the same purchase condition along the spread: it passes up to 0.3 pip on the pair's calendar and up to 0.1 pip on every currency's.

spread, pips	cost / risk	cash / fee	EUR and USD calendar	cost / risk	cash / fee	every currency
0.0	3.12%	1.66	passes, 46%	3.94%	1.50	passes, 60%
0.1	3.65%	1.56	passes, 54%	4.63%	1.39	passes, 75%
0.2	4.18%	1.47	passes, 63%	5.33%	1.28	fails
0.3	4.71%	1.38	passes, 77%	6.02%	1.18	fails
0.5	5.76%	1.21	fails	7.41%	0.99	fails
1.0	8.40%	0.88	fails	10.87%	0.65	fails

Table 31: The purchase condition along the spread, at the exit for news rate of each calendar. A passed purchase condition is given with its breakeven probability that the firm pays.

14 The parameter sweep: rates and durations over the ratio and the risk

Every section so far fixed the bracket at one ratio and one risk and asked what it pays. This section turns the question around: for every reward-to-risk RR and every risk r in a grid, what are the rates that decide the plan, the chance of passing and the chance of being paid, and how long does each take? It does so for the two stages separately, because nothing forces them to trade at the same risk: the funded account is a new account and its risk is a setting. The answer is a parameter sweep, read off to choose the strategy's parameters.

Three facts from Section 20 are now taken as settled, because the choice of configuration depends on them. The loss limit is enforced on every tick, so a losing trade is cut at the loss limit and never runs past it. The funded account opens at the nominated balance. And the bankroll is \$1,000, which by Section 7 buys the \$3,000 account size; its \$100 minimum payout is then 4.76% of the account balance, not the 0.14% of the \$100,000 account size. The stop is the deployed one of Corollary 10, which averages 35 pips on the sample, so a round trip costs one pip of commission and spread over 35, a cost-to-risk ratio of $\gamma = 2.87\%$ of the risk at every r .

The parameter sweep is built in two layers, in this order: the exact solution of the Markov chain, derived below, and the deployed strategy through the framework's historical broker on real EURUSD prices, which Section 14.11 checks against its configuration by configuration and which alone gives the durations in days.

14.1 What is swept

The statistics fall into rates and durations, and into the two stages.

stage	rates	durations
assessment	P(pass), P(fail), win rate per trade	trades to resolve: mean, median, 90th percentile; trades to pass, given a pass
funded	P(any payout), payouts per account, payout per cycle a , gross withdrawn $E[W]$	trades to the first payout: median, 90th percentile; account life: mean, median, 90th percentile
per purchase	P(cash), expected cash over the fee	trades from purchase to first cash: median

Table 32: The statistics of the parameter sweep. Durations are counted in trades here, where they are exact; Section 14.8 turns them into days.

14.2 A fair bracket with legs of any length

Capping a barrier changes the distance to one of the two exits of a trade, so the first step is the win probability of a bracket whose legs are not equal.

Proposition 21 (Fair legs). *Let the price move without drift, and let a bracket have its target a above entry and its stop b below it, in price. The target is reached first with probability*

$$p = \frac{b}{a + b}.$$

With $a = RR\ell$ and $b = \ell$ it gives back $p = 1/(1 + RR)$ of Section 3. The proposition says more: a leg shortened to meet an account barrier moves the win probability and leaves the trade fair. A target cut from ℓ to $\ell/2$ is reached twice as often as it is missed, $p = \ell/(\ell/2 + \ell) = 2/3$, and wins half as much.

The legs at each equity. Measure equity s in fractions of the account balance and let the account sit between the loss limit $-D$ and, in the assessment, the target T . A trade from s risks r and aims at RRr and costs c , so an uncapped win lands at $s + RRr - c$ and a loss at $s - r - c$. Capping replaces the legs by the distance still available:

$$a(s) = \min(RRr, T - s + c), \quad b(s) = \min(r, s + D - c).$$

The first is the target cap of Corollary 2: a win lands exactly on T . The second is what a loss limit enforced on the tick does, and what the strategy does by placing its own stop at the loss limit: a loss lands exactly on $-D$. Each trade then wins with probability $p(s) = b(s)/(a(s) + b(s))$ by Proposition 21.

14.3 The assessment: rates and durations from one Markov chain

Put s on a lattice of step u and let Q be the matrix of one-trade moves between alive states: row s has $p(s)$ in the column of $s + a(s) - c$ and $1 - p(s)$ in the column of $s - b(s) - c$, whenever those states are alive. Let $r^+(s)$ be the probability of leaving through the target in one trade, $p(s)$ if the win lands at or above T and zero otherwise, and $r^-(s)$ the same through the loss limit.

The rate. The pass probability $h(s)$ from each state satisfies one step of the Markov chain, $h = r^+ + Qh$, which is Proposition 5 with the capped legs. So

$$(I - Q)h = r^+,$$

and $P(\text{pass}) = h(0)$.

The durations. Let v_t be the row vector of probabilities of being alive in each state after t trades, $v_t = e_0 Q^t$ from the start at zero. The account passes on trade t exactly with probability $f_t^+ = v_{t-1} r^+$ and fails on it with $f_t^- = v_{t-1} r^-$, and the pmf of the trades to resolve is $f_t = f_t^+ + f_t^-$. The median is the first t at which the running sum of f_t reaches one half, and the 90th percentile the first at which it reaches 0.9. The mean is

$$E[N] = e_0 (I - Q)^{-1} \mathbf{1},$$

and the duration given a pass has the pmf $f_t^+/P(\text{pass})$. Appendix C derives the three.

The lattice. The unit is one fortieth of a round trip, $u = c/40$, so the cost is exactly 40 units and the risk, at $r = c/\gamma$, exactly $40/\gamma$ units. A fixed unit would round the cost, and at $r = 1\%$ the rounding makes a trade ten percent cheaper than it is.

14.4 The funded stage: when a payout may be requested

Two rules decide the smallest equity m at which a payout may be requested. The request must be at least \$100 after the split α , so at least $100/\alpha$ dollars before it, which on an account balance B is

$$m_1 = \frac{100}{\alpha B}.$$

And no single day may contribute more than 35% of the amount. With one trade a day, a winning day makes RRr , and the amount is the equity at the request, so the equity must be at least

$$m_2 = \frac{RRr}{0.35}.$$

Both must hold, so $m = \max(m_1, m_2)$. On the \$3,000 account size $m_1 = 100/(0.7 \times 3000) = 4.76\%$. The two are equal at

$$r^* = \frac{0.35 m_1}{RR},$$

which is 1.67% at $RR = 1$. Above r^* the 35% rule sets the hurdle and it grows with the risk: at $r = 4\%$ it is $4/0.35 = 11.4\%$ of the account balance, which the account must reach from zero before it falls 9%. Below r^* the minimum payout sets it and it no longer falls with the risk. That is why lowering the funded risk helps until r^* and little after.

14.5 One funded cycle, as a Markov chain with a clock

Proposition 10 solves a funded cycle, from zero equity to the next payout or to the account's end, with the fourteen-trade clock. With the capped stop the same construction holds with $b(s)$ in place of r , and propagating the occupancy gives the durations as well as the rates. For the first $t_w - 1$ trades only the loss limit absorbs: $v_t = v_{t-1}Q_f$, where Q_f is the move matrix with the loss limit as the only exit, and the mass carried through the loss limit at trade t is $\delta_t = v_{t-1}r^-$. From trade t_w on, the mass at or above m is paid and leaves:

$$\pi_t = \sum_{s \geq m} v_t(s), \quad v_t(s) \leftarrow 0 \text{ for } s \geq m.$$

The probability that a cycle pays is $a = \sum_t \pi_t$, the probability that it ends is $1 - a = \sum_t \delta_t$, the distribution of the payout is that of the equity on the paying trade, and π_t/a is the pmf of the cycle's length given that it pays.

14.6 The funded account as a renewal process

Proposition 22 (Renewal). *The number of payouts K of a funded account is geometric, $P(K = k) = (1 - a)a^k$, so*

$$P(\text{any payout}) = a, \quad E[K] = \frac{a}{1 - a}.$$

The gross withdrawn and the life are

$$E[W] = E[K] E[S], \quad E[L] = E[K] E[T^{\text{pay}}] + E[T^{\text{die}}],$$

where S is one payout and $T^{\text{pay}}, T^{\text{die}}$ are the lengths of a paying and of a dying cycle. The pmf of the life has the generating function

$$G_L(z) = \frac{\hat{\delta}(z)}{1 - \hat{\pi}(z)}, \quad \hat{\pi}(z) = \sum_t \pi_t z^t, \quad \hat{\delta}(z) = \sum_t \delta_t z^t.$$

The pmf of the life is read off G_L at the roots of unity with the fast Fourier transform, on a grid long enough that the tail beyond it is negligible. Payouts per month alive are $E[K]/E[L]$ times the trades in a month.

14.7 Per purchase

A purchase returns cash if the account passes and then pays at least once, and the two stages are independent, so

$$P(\text{cash}) = P(\text{pass}) \times a.$$

Its expected cash is the trader's share of the account balance times the pass rate times the funded lifetime payout, $\alpha B P(\text{pass}) E[W]$, read against the fee F . The trades from purchase to first cash, given cash, are the trades to pass given a pass plus the trades to the first payout given one, and the pmf of a sum of independent counts is the convolution of theirs:

$$P(N^{\text{cash}} = n) = \sum_j \frac{f_j^+}{P(\text{pass})} \frac{\pi_{n-j}}{a}.$$

14.8 From trades to days

A duration in trades becomes one in days through the length of a trade. A bracket with legs a and b on a price of daily variance σ^2 lasts, by Wald's identity in price (Appendix C),

$$E[\tau] = \frac{ab}{\sigma^2} = \frac{RR \ell^2}{\sigma^2} \text{ days}$$

for an uncapped bracket. The trade lasts RR times longer at a ratio of RR , with the stop fixed. Section 11 found the real pair slower than this by about a factor of two, because the hourly path mean-reverts, so the days in the parameter sweep are the days per trade the broker measures at each ratio, in Section 14.11, and this formula is the baseline they are read against.

Numerical check. Table 33 runs the Markov chains of this section against the simulations of Sections 4 and 5, extended to cap the same legs, on 16 configurations across ratios from 0.5 to 3 and risks from 1% to 4%, 60,000 accounts each. The largest gap is 1.9 standard errors, and the mean durations agree to the first decimal.

stage	RR	risk	limit, target	Markov chain	simulation	diff. (SE)
assessment, P(pass)	1	4.0%	review, uncapped	46.75%	46.60%	-0.8
assessment, P(pass)	1	4.0%	tick, capped	46.24%	46.12%	-0.6
assessment, P(pass)	1	2.0%	tick, capped	43.37%	43.43%	+0.3
assessment, P(pass)	1	1.0%	tick, capped	37.25%	37.41%	+0.8
assessment, P(pass)	2	2.0%	tick, capped	46.56%	46.28%	-1.4
assessment, P(pass)	0.5	3.0%	tick, capped	40.98%	41.10%	+0.6
assessment, P(pass)	3	1.5%	tick, capped	46.99%	46.99%	+0.0
assessment, P(pass)	1	1.0%	tick, uncapped	35.91%	36.12%	+1.1
funded, P(any payout)	1	4.0%	review	34.79%	34.71%	-0.4
funded, P(any payout)	1	4.0%	tick	29.37%	29.27%	-0.5
funded, P(any payout)	1	2.0%	tick	46.30%	46.32%	+0.1
funded, P(any payout)	1	1.5%	tick	52.35%	52.40%	+0.2
funded, P(any payout)	1	1.0%	tick	52.21%	52.07%	-0.7
funded, P(any payout)	0.5	2.0%	tick	50.15%	49.95%	-1.0
funded, P(any payout)	2	1.5%	tick	40.60%	40.45%	-0.8
funded, P(any payout)	3	1.0%	tick	41.99%	41.61%	-1.9

Table 33: The exact Markov chains of this section against the simulation of the full rulebook, 60,000 accounts per configuration. The difference is simulation minus Markov chain in standard errors of the simulation.

14.9 The parameter sweep

Figures 4 and 5 are the two stages over the grid, and Figure 6 combines them per purchase at a ratio of one, the assessment risk against the funded risk. Each configuration prints its value; the red frame marks the configuration the strategy trades today; a hatched configuration breaks the daily rule; and in the assessment the dashed line bounds, above and to the right of it, the configurations where one win is more than 35% of the target, which break the 35% rule if the firm applies it in the assessment, as its documents do not say.

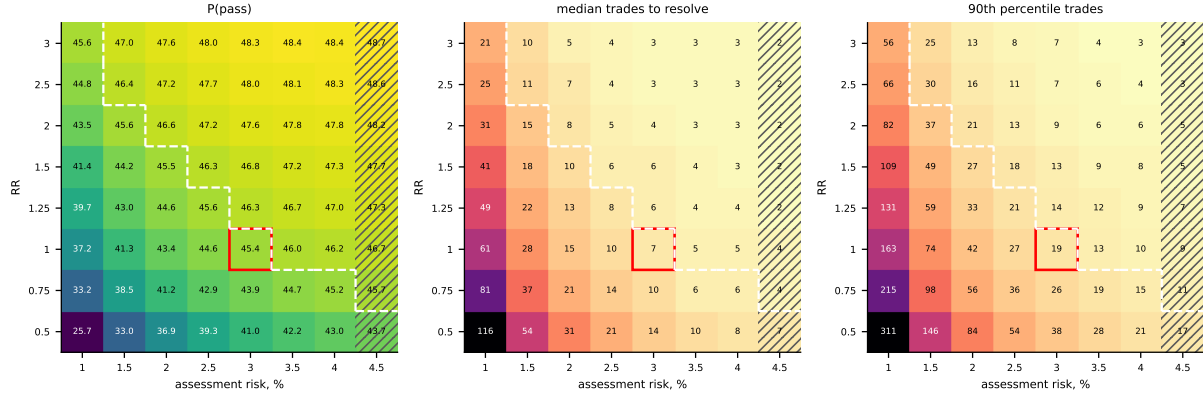


Figure 4: The assessment over ratio and risk, the loss limit on the tick and the target capped. Left: $P(\text{pass})$. Middle: median trades to resolve. Right: 90th percentile. Read the left panel along a row and up a column: the pass rate rises with the risk and with the ratio, because both cut the number of trades the cost is paid on; the middle and right panels show what that costs in the record, fewer trades to a pass. With no cost the whole panel would read one half.

statistic	best configuration	best	today	at the best configuration	at today
assessment: $P(\text{pass})$	$RR\ 3, 3.5\%^\dagger$	48.4%	45.4%	median trades 3	median trades 7
assessment: median trades	$RR\ 1.5, 4\%^\dagger$	3	7	$P(\text{pass})\ 47.3\%$	$P(\text{pass})\ 45.4\%$
funded: $P(\text{any payout})$	$RR\ 3, 0.5\%$	55.7%	52.4%	$E[W]\ 6.8\%$	$E[W]\ 6.7\%$
funded: payouts per account	$RR\ 3, 0.5\%$	1.26	1.10	first payout 37	first payout 18
funded: $E[W]$	$RR\ 3, 3\%$	7.8%	6.7%	$P(\text{any})\ 19.5\%$	$P(\text{any})\ 52.4\%$
funded: median trades to first payout	$RR\ 0.5, 2.5\%$	14	18	$P(\text{any})\ 49.6\%$	$P(\text{any})\ 52.4\%$
per purchase: $P(\text{cash})$	$4\% / 1.5\%^\dagger$	24.2%	23.8%	first cash 25	first cash 28
per purchase: cash / fee	$4\% / 4\%^\dagger$	1.85	1.67	$P(\text{cash})\ 13.6\%$	$P(\text{cash})\ 23.8\%$
per purchase: median trades to first cash	$3.5\% / 3.5\%^\dagger$	21	28	$P(\text{cash})\ 14.9\%$	$P(\text{cash})\ 23.8\%$

Table 34: The best configuration of the grid for each statistic, against the configuration the strategy trades today. “Best” is the maximum for a rate and the minimum for a duration; the table reports what the other statistics are at that configuration, so a choice can be read off with its cost. Configurations marked $\dagger$ break the 35% rule if the firm applies it in the assessment.

Reading the parameter sweep. Four things stand out, in order of how much they move.

The funded risk matters most, and the result has a ridge. Along any row of Figure 5 the chance of any payout rises as the risk falls, peaks, and falls again. The peak sits where RRr is near r^* : above it the 35% rule sets a payout hurdle that grows with the risk and that the account rarely reaches before the loss limit; below it the \$100 minimum sets the hurdle, and a smaller risk only takes longer to climb it while paying the cost on more trades. At $RR = 1$ the peak is 52.4% at 1.5% risk, against 29.4% at 4%. The grid configuration nearest the deployed funded risk, $RR = 1$ at 1.5%, sits on it at 52.4%.

The ratio moves the peak little. Across the whole grid the highest chance of any payout is 55.7%, at $RR\ 3$ at 0.5%, a few points above the peak at $RR = 1$, and it takes 37 trades to the

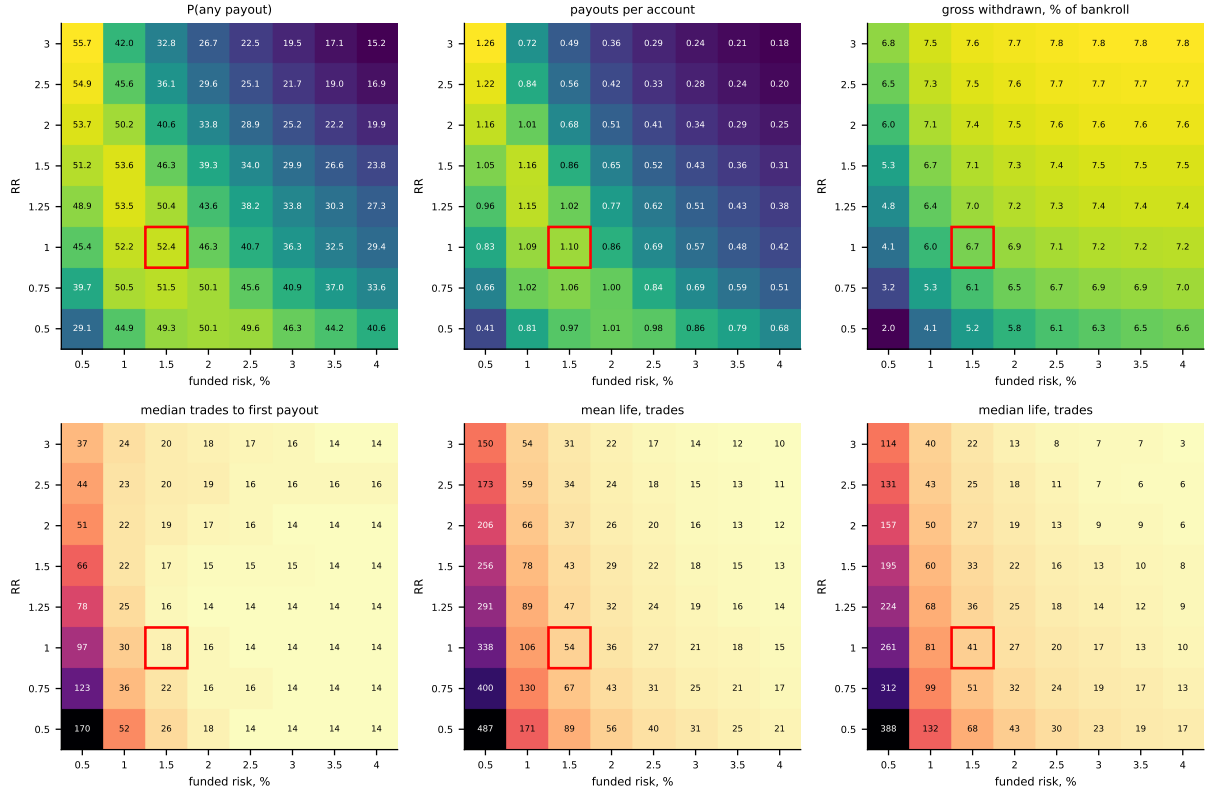


Figure 5: The funded stage over ratio and risk on the \$3,000 account size, the loss limit on the tick. Top: $P(\text{any payout})$, payouts per account, gross withdrawn. Bottom: median trades to the first payout, mean life, median life. The ridge in the top left panel sits where RR is near $0.35 m_1$, the risk r^* at which the 35% rule stops binding; to its left the minimum payout sets the hurdle.

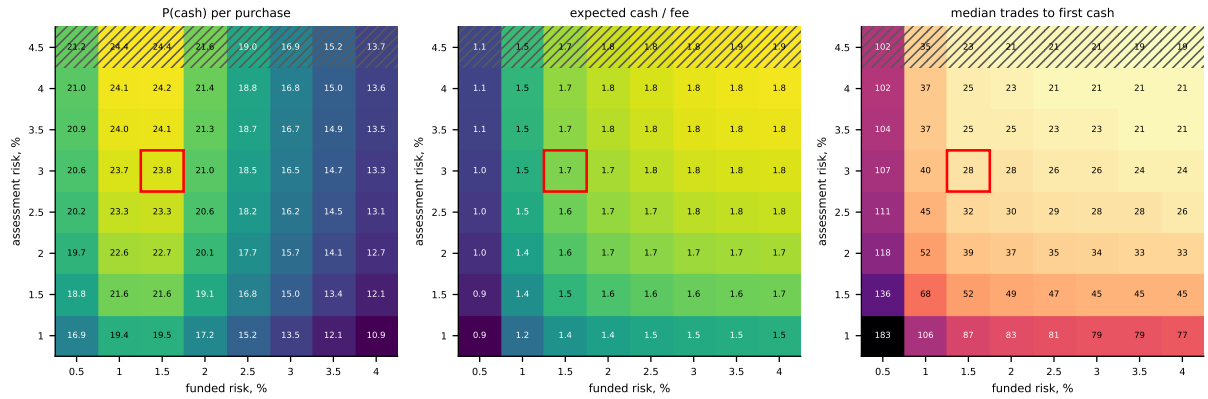


Figure 6: Per purchase at $RR = 1$, the assessment risk against the funded risk: $P(\text{cash})$, expected cash over the fee if every payout is paid, and median trades from purchase to first cash.

first payout against 18 today. Its trades are also longer: by Section 14.8 a trade at ratio RR lasts RR times as many days with the stop fixed.

In the assessment both the risk and the ratio help, for the same reason. A larger risk and, with the target capped, a wider target both cut the number of trades that pay the cost. At 4% risk the pass rate is 43.0% at $RR = 0.5$, 46.2% at $RR = 1$ and 48.4% at $RR = 3$; at $RR = 1$ it is 37.2% at 1% risk. The best configuration, $RR = 3$ at 3.5% at 48.4%, resolves in a median of 3 trades: most of its passes are one or two wins, which is the record the operator wants to avoid showing, and at that ratio a single win is more than 35% of the target, so it breaks the rule if the firm applies it in the assessment.

Per purchase the gain from freeing the ratio is small. With a free ratio in each stage the best chance that a purchase ever pays is 27.0%, at $RR = 3$ at 3.5% then $RR = 3$ at 0.5%, against 23.8% for today's plan; the median trades to first cash are 38 against 28. The plan traded today is within a few points of the best the rules allow.

A correction to the notebook's section 23. That section chose the funded risk at the cost-to-risk ratio of the 60-pip stop, 1.67% of the risk, where the deployed stop pays 2.87%. At the right cost the funded account at 1.5% risk pays at least once with probability 52.4%, against the 55.0% it reported. The funded risks it compared now read 1% 52.2%, 1.5% 52.4%, 2% 46.3%, 4% 29.4% for the chance of any payout, so its choice of 1.5% stands: it pays as often as 1% and reaches its first payout sooner.

14.10 How the optimum is found

The parameter sweep is read in three layers, each doing what only it can. Calculus sets the shape of the optimum, exact computation sets its value, and the history checks the model and measures its inputs. No layer grids everything.

Calculus: the stages separate, and both optima are corner solutions or kinks. The funded account opens at the nominated balance, so the chance that a purchase ever pays is $P(\text{pass}) \times a$ with no variable shared between the factors, and each stage is chosen alone. In the assessment, with the gain per win $u = RRr$ and the cost-to-risk ratio γ , Proposition 14 gives

$$\frac{\partial P}{\partial u} = P(1 - P) \frac{2\gamma D}{u^2} > 0,$$

so the pass rate rises with the gain per win until a rule stops it. The rule that stops it first is the 35% single-day rule, if the firm applies it in the assessment: one winning day at most $0.35 \times 9\%$, that is $u \leq 3.15\%$. The day's win is read gross. The commission is charged at the open, and a trade lasts two days, so the day the target fills shows the whole win. Along that cap the ratio barely matters, so it is fixed at one, where a random-side trade is an exact coin and each trade is shortest. The deployed risk is 3%, a margin of 0.15% under the cap. In the funded stage Proposition 15 puts the maximum of the chance of any payout at the kink $u = 0.35 m_{\min} = 1.67\%$, where no derivative is zero, so a root finder has nothing to find.

Exact computation: below the kink the curve is a sawtooth. After n trades at ratio one with j more wins than losses, the equity is $j r - n \gamma r$. A payout is allowed once that reaches the minimum request $m_{\min}$, so one fewer net win suffices once

$$r \geq r_j = \frac{m_{\min}}{j - n \gamma},$$

and at the payout clock, fourteen calendar days or 7 trades at the deployed days per trade, the chance of any payout jumps at every r_j with $n = 7$. With the random side's cost-to-risk ratio of 3.45% the jumps sit at 1.28% and 1.00% and 0.83% and 0.70% and 0.62%. A grid in half-point

steps straddles them, and a root finder stops on one tooth. The funded risk is therefore found by a line search in steps of 0.025% of the account balance, and the choice is made within the near-optimal range of risks whose chance of any payout sits within a point of the best, since no measurement on this history orders configurations closer than that. Within the near-optimal range the median trades to the first payout is the same at every risk, so the pick is the near-optimal range's largest risk, which withdraws the most. Figure 7 shows the curve at each cost scenario. The argmax moves with the cost; the near-optimal range and the pick move much less.

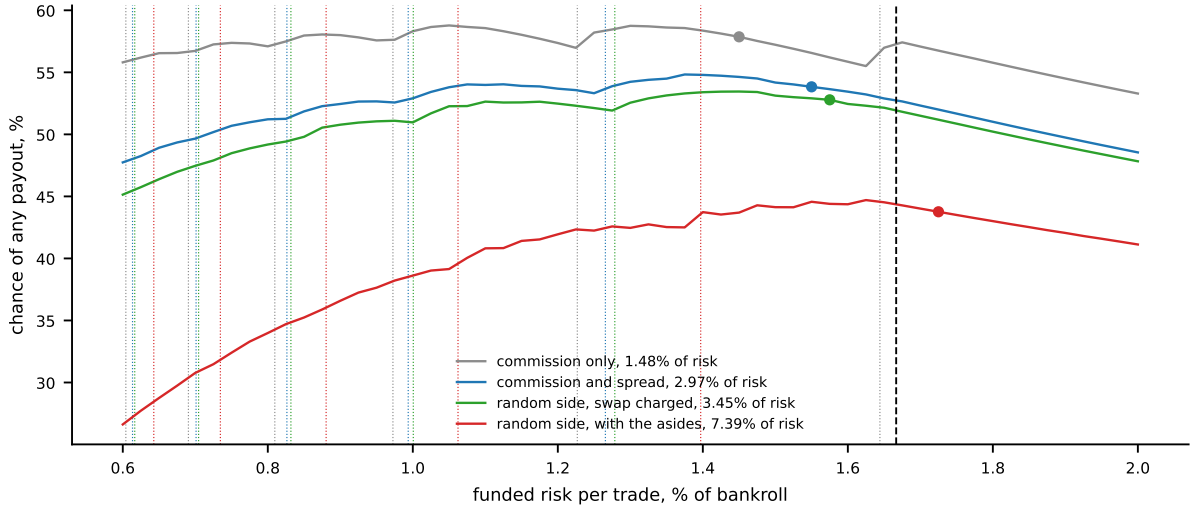


Figure 7: The funded chance of any payout along the risk at a ratio of one, one line per cost scenario, the tooth positions r_j dotted, the kink dashed, each scenario's pick marked. Every jump should sit on a dotted line; one off them would mean the Markov chain and the formula disagree about the lattice.

The history: inputs and faults, not the optimum. Given the win probability, the cost-to-risk ratio and the reading of each rule, every rate in the parameter sweep is exact, so the optimum carries no sampling error of its own. Its uncertainty is the uncertainty of those inputs, pushed through the Markov chains. One point of per-trade win rate moves the drift as much as two points of cost-to-risk ratio. So a claim that one configuration beats another is settled by the Markov chains when their difference keeps its sign over the whole plausible range of inputs, and by a measurement of the one input that flips it when it does not; more history does not settle it. At a ratio of one the funded risks from 1% to 1.5% trade places at a spread near a third of a pip, which is why the live spread is one of the three pending measurements. What the broker adds is the model check of Section 14.11 and the calendar: the days each duration takes.

14.11 The parameter sweep through the broker

The Markov chains assume a price with no memory and a bracket that fills exactly where it is aimed. The broker drops both assumptions: it replays the deployed strategy, `PrimeAcademyStrategy`, over the vendor's hourly EURUSD bars from 2023-11-24 to 2026-09-10, filling orders the way Section 19 describes. For the parameter sweep the strategy carries the account rules itself. At each entry it reads its equity off the broker's balance and shortens the target leg so a win lands on the assessment's target and the stop leg so a loss lands on the loss limit, net of the round trip; at each completed trade it scores the account under the rulebook, and in a replay it opens the next account when one ends. One pass over the history then yields many accounts. The coin side is replayed under 20 seeds, which share the prices and not the directions, over all 192 configurations of the two stages and the per-purchase grid. The broker charges the commission and no spread, so it is compared with the Markov chains at the commission alone, 1.44% of the risk.

The declared test, and its result. The rule declared before the run was that a configuration agrees when the broker’s rate, averaged over the seeds, is within two between-seed standard errors of the exact Markov chain, and that the parameter sweep agrees when fewer than ten percent of configurations fail. 39% of the configurations failed. By the declared rule the broker and the Markov chains disagree, and the rest of this subsection is the diagnosis, run after that result and read as such.

Each trade is close to fair. Plain brackets, with no account rules, reach the target within 1.4 points of what Proposition 21 says at every ratio (Table 35). At two ratios, 0.5 and 1.5, the shortfall is a little over a point and sits about three and a half between-seed standard errors below fair; that error ignores what the seeds share through the price path, so the significance is an upper bound. A bar that reaches both legs, where the broker books the stop, is rare: 13 exits across all the ratios. The market prices one trade close to the way the Markov chains do, and where it falls short it falls short by about a point.

RR	trades	reach the target	$1/(1 + RR)$	gap (SE)	both legs in one bar
0.5	11,949	0.6561	0.6667	-3.5	13
0.75	10,543	0.5698	0.5714	-0.5	0
1	9,340	0.5016	0.5000	+0.4	0
1.25	8,403	0.4456	0.4444	+0.3	0
1.5	7,678	0.3862	0.4000	-3.3	0
2	6,560	0.3255	0.3333	-1.6	0
2.5	5,569	0.2819	0.2857	-0.9	0
3	4,827	0.2411	0.2500	-1.4	0

Table 35: Plain brackets through the broker, coin side, 20 seeds: the share of trades reaching the target against $1/(1 + RR)$, the gap in between-seed standard errors, and the exits on a bar that reached both legs.

The error was wrong twice. First, the seeds share one price path. At $RR = 1$ that does not matter, because a random direction on symmetric legs makes every trade an exact coin whatever the price did; at any other ratio whether the far or the near leg is reached depends on the day, and every seed sees the same day. Second, an account can span months: at low risk an assessment or a funded account runs for a year of the history, and 2.8 years hold only a few such accounts, however many seeds replay them. And the protocol itself biases the rate: the account still open when the history ends is dropped, and in the long-lived funded configurations the open ones are the paying ones. The fair comparison is therefore the broker against the Markov chains’ own model run under the broker’s protocol, the same trades per replay, the open account dropped, pooled over seeds, with the error clustered in blocks of calendar time twice as long as the accounts. That protocol biases the funded rate by as much as 23 points, and a configuration with fewer than ten such blocks is not resolvable by this history.

Where the history can resolve it, the broker agrees. 73 of the 128 assessment and funded configurations are resolvable. In them 14% sit beyond two standard errors, with a mean gap of -0.8 standard errors: close to what chance gives, with a slight lean below that matches the per-trade shortfall of about a point at ratios other than one on this history (Table 35). The 0.01-lot grid of the \$3,000 account size, which trades a little under the nominal risk, does not move it. Today’s assessment configuration is resolvable and agrees, 47.6% through the broker against 47.7% for the Markov chain. The funded configuration nearest today’s, 1.5% at $RR = 1$, is not: its accounts live about 113 days, the history holds 4 blocks of them, and the broker’s 50.0% against the Markov chain’s 55.4% is a gap it cannot resolve. The unresolvable configurations are the low risks and the ratios far from one, whose accounts last from 52 to 569 days.

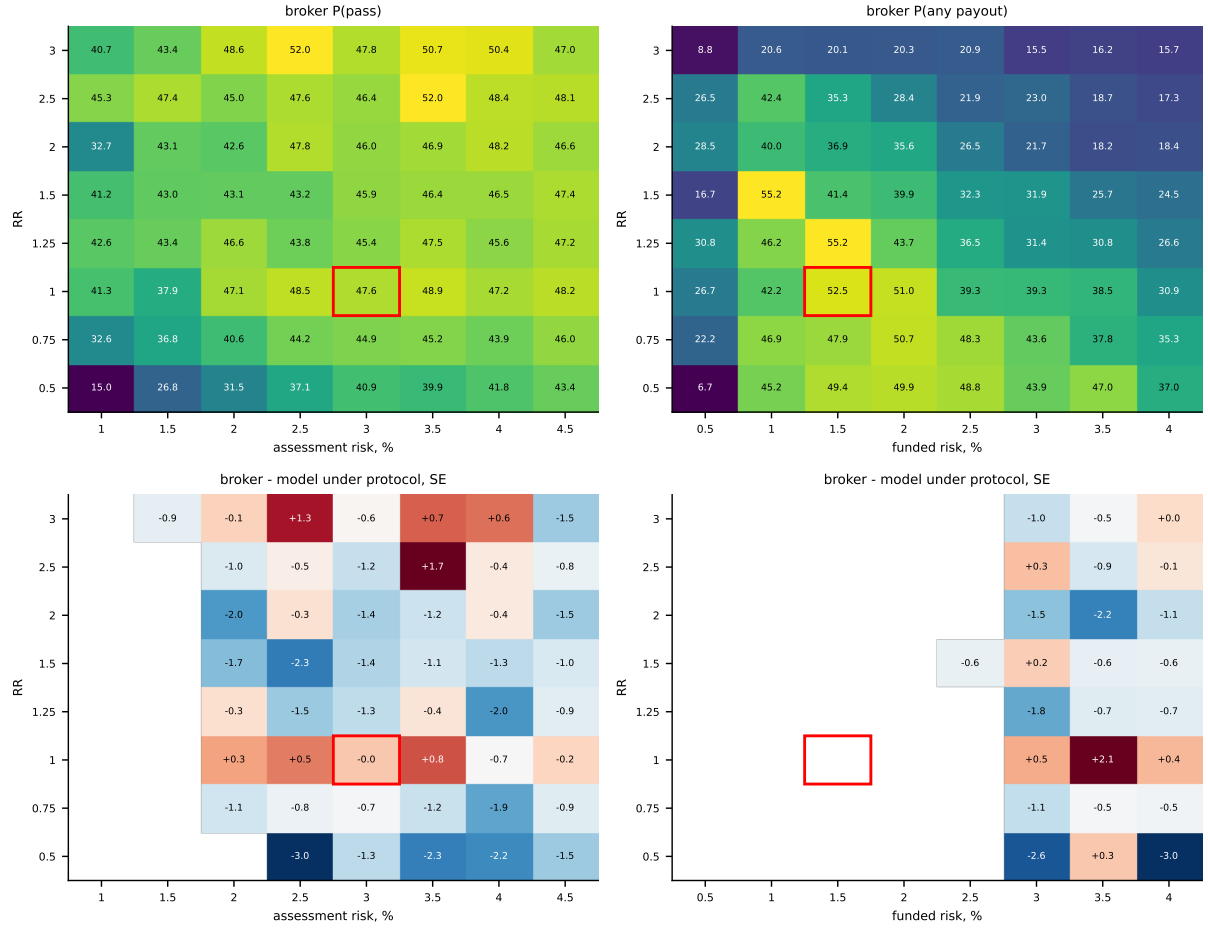


Figure 8: The parameter sweep through the broker. Top: the rates, today's configurations framed. Bottom: broker minus the Markov chains' model under the broker's protocol, in standard errors clustered by blocks of calendar time; a blank configuration is not resolvable by 2.8 years of history. A band of one colour along a row or a column would say the market and the model disagree about how that parameter acts.

What only the broker gives: the days. The Markov chains count trades. The broker measures the calendar. A trade at the deployed stop lasts 2.0 days at $RR = 1$, against 1.1 by the Wald baseline of Section 14.8; the real pair is slower at short horizons, as Section 11 found, and the gap closes as the ratio widens, to 3.5 against 3.3 at $RR = 3$ (Table 36). At today's configurations the assessment passes in 21 days, given a pass; the funded account pays its first payout after a median of 46 days and lives 123 days on average. Figure 9 maps the three durations.

RR	broker, days per trade	Wald baseline	broker / Wald
0.5	1.62	0.55	2.92
0.75	1.81	0.83	2.18
1	2.03	1.11	1.83
1.25	2.23	1.38	1.61
1.5	2.41	1.66	1.45
2	2.76	2.21	1.25
2.5	3.14	2.77	1.13
3	3.51	3.32	1.06

Table 36: Calendar days per trade at the deployed stop, measured by the broker over the assessment configurations of each ratio, against the Wald baseline $RR \ell^2 / \sigma^2$ in trading days, scaled by seven fifths to calendar days.

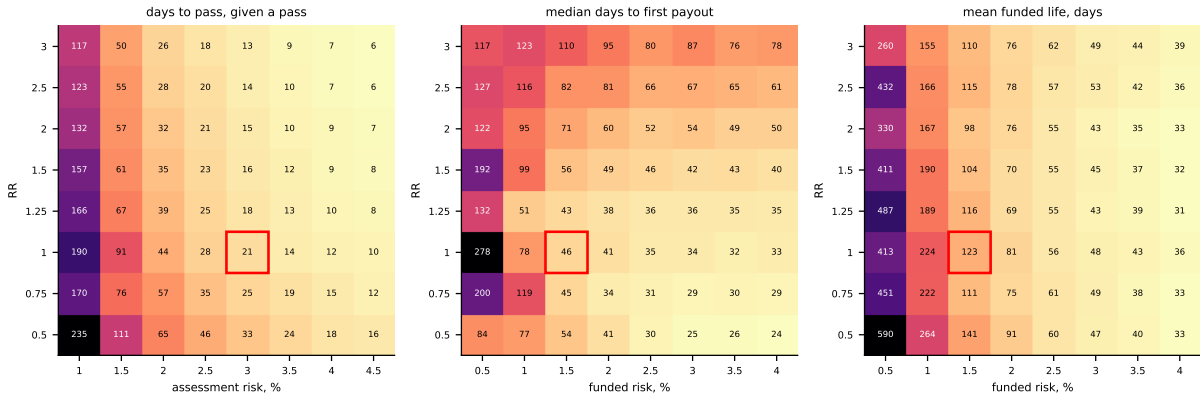


Figure 9: Durations in calendar days through the broker. Left: days to pass, given a pass. Middle: median days to the first payout. Right: mean funded life. Read a row of the middle panel against Figure 5: a funded risk that pays more often also pays later.

15 Three objectives and the Pareto front

The operator asks for three things at once: cash soon, cash in total, and a shallow bankroll drawdown. No exchange rate between a day and a dollar is given, and any weight between them would be a number nobody can defend, so no weighted sum is formed. This section turns the criteria into three objectives and a set of limits, reduces the decision vector with the calculus of the earlier sections, computes every configuration that is left, and reports the Pareto front: the configurations that no other configuration beats on all three objectives at once. The operator then picks from the Pareto front with one number in dollars.

15.1 From criteria to objectives and limits

A criterion is an objective when more of it is always wanted and it trades against the others; it is a limit when a configuration either meets it or is not a candidate. Table 37 sorts the operator's criteria.

critereon	becomes	read as
money soon	objective T	median days to the bankroll's first paid payout
money in total	objective G	the bankroll's long-run net cash, dollars a year
a shallow drawdown on a \$1,000 bankroll	objective D , limit on ruin	the body of the bankroll's drawdown is a preference; its atom, a bankroll that cannot buy again, is not
buy only what the bankroll can carry	limit	the breakeven probability that the firm pays, plus two standard errors, below 80% (Section 1)
a high payout rate per account	limit	the funded chance of any payout at least 50%
a record with both directions every written rule	limit limits	a fresh coin each trade Section 2
a lower risk once funded, a tighter stop, trading intraday	decision variables	admissible, not required

Table 37: The operator's criteria, sorted.

Three merges keep the objectives to three. Drawdown and ruin are one criterion read twice: the body of the drawdown distribution is traded against speed and cash, and the ruin atom is a limit, at 5% over three years as in Section 7. The ruin limit is applied to the pooled bankroll directly, so it also sets the account size and the number of accounts. The purchase condition of Section 1 and the payout-rate criterion become limits. The direction limit is on the mechanism, not on a realised share: over the ten or so trades of one assessment a fair coin's long share has a standard deviation of

$$\sqrt{0.25/10} \approx 16 \text{ points,}$$

so a band on one account's share fails by chance; the share over the whole record is reported instead.

The cash rate is arithmetic. G is the expected net cash per year if the firm pays, not the log growth of Section 7. The bankroll's risk has two axes of its own here, D and ruin, and the belief that the firm pays enters through the purchase condition. T and D are likewise read in the world where the firm pays.

15.2 The problem

Decision vector. The stop ℓ in pips, the ratio RR , the assessment risk r_A , the funded risk r_F , the most trades a day k , the account size B , and the number of accounts held at once N , each replaced the day after it ends and entered at hours whose outcomes correlate as Section 11.6 measured, $\rho = 0.26$.

Proposition 23 (The cash rate). *Let a purchase pass with probability P , take $E[n_A]$ trades to resolve the assessment, and, if it passes, withdraw a gross $E[W]$ of the account balance B over a funded life of $E[L_F]$ trades. With a fee F , a split α , each request paid with probability h , d calendar days a trade and N accounts, the bankroll's long-run net cash is*

$$G = \frac{365 N (h \alpha B P E[W] - F)}{d (E[n_A] + P E[L_F])}$$

dollars a year.

Every term but d comes exactly from the Markov chains of Section 14. G ignores the bankroll's own ruin, which stops the renewal, so over a horizon it overstates the bankroll's cash by at most the ruin probability times the rate.

The other two objectives. T is the median, over bankroll paths, of the calendar day of the first paid payout into the bankroll, counting failed purchases and their replacements; a path with no cash in 3 years counts as never, so the median is over every path. D is the 90th percentile over paths of the largest fall from a running peak in the first year,

$$D = Q_{0.9} \left[\max_{t \leq 365} (M_t - W_t) \right],$$

where W_t is the bankroll on day t and M_t its running maximum, floored at the opening \$1,000. Both come from the bankroll process of Section 7 with the funded stage at its own risk and every payout paid, 10,000 paths, the \$3,000 account size. The drawdown before the first cash is a whole number of fees, so a plain percentile sits on one of those values; D is the Harrell–Davis estimate of the quantile, a weighted mean of all the order statistics, whose standard error is not zero.

Limits. A configuration is feasible when ruin within 3 years is at most 5%, the bankroll grows if the firm pays, the breakeven probability of Section 1 plus two standard errors is below 80%, the funded chance of any payout is at least 50%, and T is finite.

Dominance. A configuration is dominated when another is no worse on T , G and D and better on one. T and D are simulated, so they must differ by more than two standard errors of their difference, bootstrapped over paths for T and from the Harrell–Davis estimate for D , to count as better or worse. G is exact given its inputs, so any difference counts. The Pareto front is every feasible configuration nothing dominates, per cost scenario.

15.3 What calculus settles

The ratio, the assessment risk, the funded risk. Section 14.10 puts the ratio at one and the assessment risk at the 35% cap read gross, 3%, a margin under 3.15%. The funded risk is chosen at each stop by the line search of that section, inside the near-optimal range with the fewest trades to the first payout. It is an inner choice, not an axis, and it keeps the chance of any payout within a point of its best, which is what the payout-rate limit asks.

One trade a day. Let up to k fair brackets be taken in a day, the day ending at the first loss. The trades taken have mean

$$E[n_k] = \sum_{j=1}^k 2^{-(j-1)} = 2(1 - 2^{-k}),$$

and the day's largest gain is $k r$, so the 35% cap gives $r \leq 0.35 T/k$. Ended at the first win instead, the day's largest loss is $k r (1+\gamma)$, and the daily rule at the loss limit gives $r \leq 0.05 (1-D)/((1+\gamma) k)$. Either way the risk falls as $1/k$. The account's days per trade in days follows the variance a day,

$$V_k = r^2 E[n_k],$$

which falls with k : at the cap, V_2/V_1 is about 0.4 when the day ends at a loss. Its odds follow, in the diffusion limit of Proposition 14, the ratio of the drift to the variance of one trade,

$$\frac{2\gamma r}{r^2} = \frac{2\gamma}{r},$$

which rises as r falls. So several trades a day are slower and, in the diffusion limit, pass less often. Table 38 checks it on plain barriers at the deployed cost. Every $k > 1$ is slower. The pass rates differ by lattice effects of a point or two: the one-a-day row carries the trap of an uncapped 3% step, whose three wins fall short of the target by the cost, which the cap removes (45.2% capped, against 42.5% here). The Pareto front is computed at $k = 1$.

k	the day ends at	risk	pass	days to pass	days, against one	variance a day, against one
1	one trade	3.000%	42.5%	13.1	1.00	1.00
2	first loss	1.575%	41.0%	24.3	1.86	0.41
3	first loss	1.050%	37.3%	42.7	3.27	0.21
2	first win	2.211%	42.6%	15.1	1.16	0.82
3	first win	1.474%	40.8%	26.8	2.05	0.42

Table 38: The assessment with up to k trades a day, on plain barriers at the deployed cost-to-risk ratio, 200,000 accounts each. The risk is the largest the binding rule allows. Days are trading days, given a pass; the variance a day is $r^2 E[n_k]$, both against one trade a day at 3%.

The stop: cost against days per trade. Each cost component scales with the stop in its own way. The commission and the spread are paid once a trade, a fixed number of pips, and the lots are the risk over that day's stop ℓ_t , so their share of the risk is c/ℓ_t and its mean is $c E[1/\ell_t]$, more than $c/E[\ell_t]$ whenever the stop varies. Swap nights and exits for news accrue with the holding time, which Section 14.8 puts at $ab/\sigma^2 = \ell^2/\sigma^2$, and each costs a fixed number of pips, so their shares are proportional to ℓ :

$$\gamma(\ell) = c E[1/\ell_t] + s_w \frac{\ell}{\ell_0} + A c E[1/\ell_t] \left(\frac{\ell}{\ell_0} \right)^2,$$

with ℓ the mean stop, c the round trip in pips, $s_w = 0.48\%$ the random side's swap share and $A = 1.33$ the exits for news a trade, both at the deployed mean stop $\ell_0 = 34.8$ pips. A mean of 32 pips or more is reached by the loss limit setting $\max(0.75 \sigma_{t-1}, f)$ over the entries of Section 14.11; a smaller mean is a fixed stop, with $E[1/\ell_t] = 1/\ell$. At ℓ_0 the formula gives the four cost scenarios of Section 1. The days per trade is the broker's. Wald's identity makes a bracket's expected length a function of ab alone, so the days per trade the broker measured at ratio RR and the deployed stop (Table 36) is the days per trade of a ratio-one bracket with

$$\ell = \sqrt{RR} \ell_0.$$

Below the smallest ratio measured, a 24.6-pip stop, the line through the two lowest points is extended and floored at one entry a trading day, seven fifths of a calendar day, which binds near 16 pips. A trade takes 1.40 calendar days at 15 pips, 2.03 at the deployed stop and 2.53 at 45: the broker's days per trade is far flatter in the stop than Wald's ℓ^2 , because a trade that resolves within its day still waits for the next day's entry. So a tighter stop buys little speed and pays its cost on every trade. The payout clock is fourteen calendar days, and a request comes at the end of the first trade that ends on or after day fourteen: fourteen divided by the days a trade, rounded up, in trades, seven at the deployed stop.

Accounts held at once. N accounts make N purchases in the time one makes one, so they cut T as the first of N arrivals, add their G , and put N fees at risk before any cash arrives, which raises D and ruin. The ruin bound of Proposition 12 counts fees, not accounts, so it does not move; the simulation settles where the cap binds.

What is left. The Pareto front is over the stop and the number of accounts, 8 stops from 15 to 45 pips and N from one to three, in each of the four cost scenarios of Section 1: 96 configurations.

15.4 The Pareto front

Table 39 lists the Pareto front of each scenario with the deployed configuration beside it, and Figure 10 draws every configuration.

cost scenario	stop	N	funded risk	days a trade	any payout	T , days	G , \$ a year	D , p90	ruin	breakeven probability
commission only	15	1	1.575%	1.40	52.2%	88	\$194	\$418	0.8%	41%
	20	1	1.525%	1.49	54.4%	94	\$216	\$380	0.3%	33%
	25	1	1.475%	1.63	55.9%	101	\$213	\$342	0.2%	32%
	30	1	1.45%	1.80	57.5%	106	\$204	\$306	0.1%	31%
	34.8°	1	1.45%	2.03	57.9%	117	\$189	\$304	0.1%	32%
	40	1	1.425%	2.28	58.6%	130	\$170	\$267	0.0%	34%
	20	2	1.525%	1.49	54.4%	61	\$433	\$589	2.5%	34%
	25	2	1.475%	1.63	55.9%	65	\$425	\$532	1.6%	32%
	30	2	1.45%	1.80	57.5%	69	\$408	\$494	1.1%	31%
	34.8	2	1.45%	2.03	57.9%	77	\$378	\$467	1.0%	31%
	45	2	1.4%	2.53	59.6%	94	\$310	\$418	0.6%	34%
	25	3	1.475%	1.63	55.9%	52	\$638	\$717	4.6%	36%
	28	3	1.45%	1.73	56.6%	55	\$614	\$688	3.8%	35%
	34.8	3	1.45%	2.03	57.9%	61	\$567	\$617	2.9%	34%
	45	3	1.4%	2.53	59.6%	74	\$465	\$570	2.0%	37%
commission and spread	30	1	1.575%	1.80	52.9%	113	\$155	\$379	0.3%	46%
	34.8	1	1.55%	2.03	53.8%	124	\$149	\$342	0.2%	45%
	40	1	1.525%	2.28	55.0%	135	\$144	\$304	0.1%	43%
	30	2	1.575%	1.80	52.9%	72	\$310	\$582	3.6%	49%
	34.8	2	1.55%	2.03	53.8%	79	\$298	\$532	2.5%	45%
	40	2	1.525%	2.28	55.0%	88	\$288	\$495	1.6%	44%
	45	2	1.5%	2.53	56.3%	94	\$274	\$456	1.1%	42%
	45	3	1.5%	2.53	56.3%	76	\$411	\$634	3.8%	47%
random side, swap charged	30	1	1.6%	1.80	51.9%	115	\$141	\$380	0.4%	52%
	34.8	1	1.575%	2.03	52.8%	126	\$135	\$342	0.3%	51%
	30	2	1.6%	1.80	51.9%	72	\$282	\$608	4.8%	59%
	34.8	2	1.575%	2.03	52.8%	81	\$269	\$563	3.3%	54%
	40	2	1.575%	2.28	53.4%	89	\$263	\$532	2.4%	52%
	45	2	1.55%	2.53	54.7%	96	\$249	\$494	1.7%	49%
random side, with the exits for news	34.8°	1	1.725%	2.03	43.8%	150	-\$2	\$456	3.3%	nan%

Table 39: The Pareto front configurations per cost scenario, with the deployed stop at one account, marked ° where it is not on the Pareto front. Assessment at 3%, funded at the stop’s pick, \$1,000 on the \$3,000 account size, every payout paid. T is the median days to the bankroll’s first cash, G the net cash rate of Proposition 23, D the Harrell–Davis 90th percentile drawdown of the first year, ruin over 3 years, and the breakeven probability that the firm pays of Section 1. The scenario with the exits for news has no feasible configuration.

Reading the Pareto front. Four things, in order of how much they move.

The number of accounts sets the speed, and the stop does not. At one account the median first cash lands between 101 and 150 days at every stop with commission and spread; the stop moves it little because the days per trade is flat. A second account cuts it by about 36%. A third cuts it by less.

The limits decide how many accounts. Every added account puts one more fee at risk before the first cash, so the ruin cap and the purchase condition bind first on the third account and at the tight stops, where the cost-to-risk ratio is highest. With commission and spread the deployed stop at two accounts reads 79 days, \$532 of drawdown, ruin 2.5% and a breakeven probability of 45%, and is on the Pareto front; at three accounts it fails the ruin cap. With the swap charged two accounts are feasible from 30 pips up, and three nowhere.

Tight stops fail the limits. At 15 pips the cost-to-risk ratio doubles and the days per trade does not follow, so the cash rate with commission and spread is \$27 a year with ruin at 6.3%. With commission and spread the Pareto front starts at 30 pips.

The exits for news close every configuration. With the exits for news at the measured rate no configuration passes the purchase condition at any stop or number of accounts; the best cash rate in that scenario is \$43 a year even when the firm pays. The Pareto front exists only once the exit for news rate is measured lower.

The plan’s two configurations on this Pareto front. With the random side’s swap the deployed configuration, the 34.8-pip stop at one account, reads 126 days to first cash, \$135 a

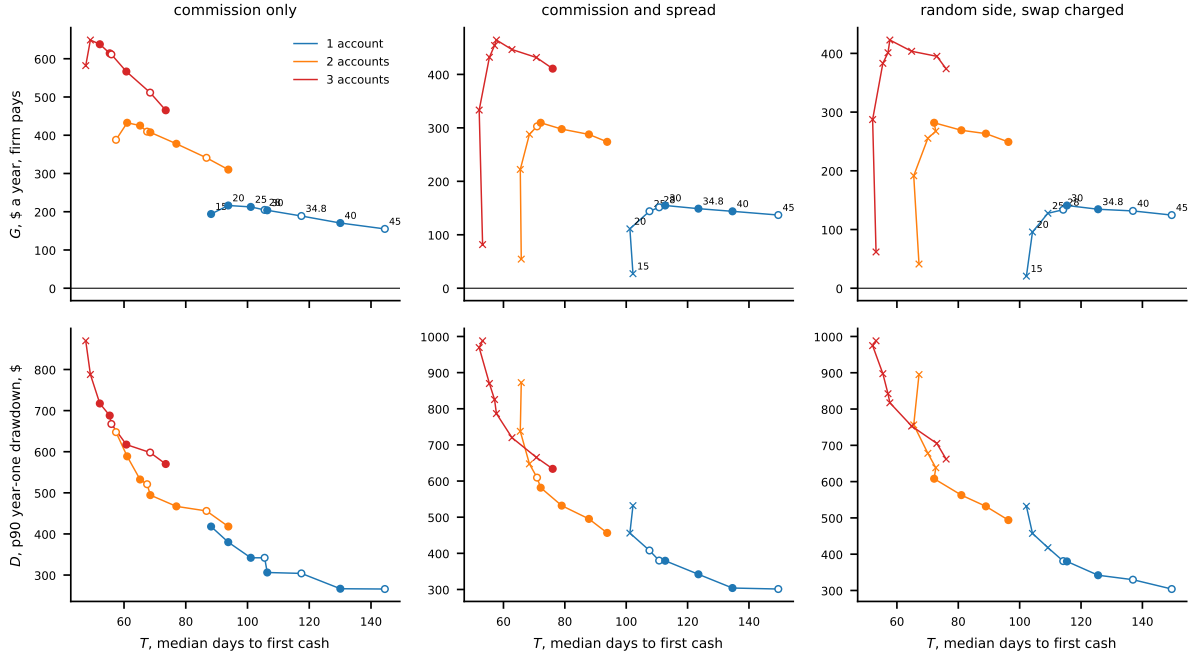


Figure 10: Every configuration of each scenario with a feasible configuration. Top: the cash rate against the days to first cash; bottom: the year-one drawdown against the same. One line per number of accounts through the stops, the one-account points labelled by their stop. Filled: on the Pareto front; hollow: feasible and dominated; a cross fails a limit. Read the lines leftwards: a line that rose in the top panel and fell in the bottom one as it moved left would mean speed, cash and drawdown do not conflict. Every line rises in the bottom panel, so speed costs drawdown.

year, \$342 of drawdown and a breakeven probability of 51%; the buy-test table of Section 1 reads 51% on its own paths. The chance of any payout is 52.8%, at a funded risk of 1.575%. With commission and spread the same configuration reads 124 days, \$149 a year, \$342 of drawdown, ruin 0.2% and a breakeven probability of 45%. The two-account configuration, 45 pips, reads 96 days to first cash, \$249 a year, \$494 of year-one drawdown, ruin 1.7%, breakeven probability 49% with the swap. Its stop is $\max(0.75 \sigma_{t-1}, 44.3)$, with 90% of entries at the loss limit, where the floored lots of the nominal 3% and 1.55% are 0.20 and 0.10 and deliver 2.95% and 1.48%.

15.5 Choosing a point

The Pareto front is a menu, and the operator picks from it with one number: the largest year-one drawdown they will carry, D^* , in dollars. It admits the Pareto front configurations with $D \leq D^*$, and among them two candidates remain, the fastest and the richest, which Table 40 gives at four caps. Where they are the same configuration the choice is made; where they differ the operator trades days against dollars directly, on two configurations, with the numbers beside each.

With no cap, and commission and spread, the fastest configuration on the Pareto front is 30 pips, 2 accounts: 72 days, \$310, \$582 and the richest 45 pips, 3 accounts: 76 days, \$411, \$634. With the swap charged, the fastest configuration on the Pareto front is also the richest: 30 pips, 2 accounts: 72 days, \$282, \$608.

From a mean stop to the rule. Each stop in this section is a mean over the entries of Section 14.11. The deployed rule $\max(0.75 \sigma_{t-1}, 30)$ reaches a 40-pip mean with the multiple raised to 0.92 at the 30-pip floor, or with the loss limit raised to 38 pips at 0.75; it reaches a 45-pip mean with 1.06 or a minimum stop of 44 pips. The two settings are different configurations. The multiple spreads the stops wider around the same mean, so $E[1/\ell_t]$ and the cost-to-risk ratio

cost scenario	D^*	fastest configuration on the Pareto front	richest Pareto front configuration
commission only	\$300	40 pips, 1 account: 130 days, \$170, \$267	the same
	\$400	20 pips, 1 account: 94 days, \$216, \$380	the same
	\$500	30 pips, 2 accounts: 69 days, \$408, \$494	the same
	\$600	20 pips, 2 accounts: 61 days, \$433, \$589	45 pips, 3 accounts: 74 days, \$465, \$570
commission and spread	\$400	30 pips, 1 account: 113 days, \$155, \$379	the same
	\$500	40 pips, 2 accounts: 88 days, \$288, \$495	the same
	\$600	30 pips, 2 accounts: 72 days, \$310, \$582	the same
	\$400	30 pips, 1 account: 115 days, \$141, \$380	the same
random side, swap charged	\$500	45 pips, 2 accounts: 96 days, \$249, \$494	the same
	\$600	34.8 pips, 2 accounts: 81 days, \$269, \$563	the same

Table 40: The fastest and the richest Pareto front configuration under a year-one drawdown cap D^* . Each configuration reads: stop, accounts, days to first cash, cash rate a year, drawdown. A cap with no admissible Pareto front configuration is omitted.

are larger; the loss limit holds the stops close to their mean, and at 40 pips its commission and spread cost 1.009 times $c/40$. The Pareto front reads every stop of 32 pips or more through the loss limit setting.

A fixed 20-pip stop on 5-minute bars. Below 24.6 pips the Pareto front’s days per trade is extended from the hourly measurements, and an hourly bar whose range spans both legs books the stop. The finest bars the data holds are 5-minute bars over 2026-06-18 to 2026-09-10, laid out as the hourly ones are. Plain brackets at a fixed 20-pip stop, ten coin seeds sharing the price path, give 50 trades a seed: a target share of $52.4\% \pm 2.2$ with 0 exit bars reaching both legs, a mean hold of 10.6 hours, 80% of trades closed before the rollover, 0.30 swap nights a trade and a days per trade of 1.60 calendar days a trade against the Pareto front’s 1.49 (Table 41); the hourly bars over the same weeks read 50.2% and 1.67. With the measured days per trade and swap nights, and the exits for news scaled by the hold (0.19 a trade), Table 42 recomputes the configuration at a 0.1-pip spread, the band measured on the account, and at the paper’s 0.5: at 0.1 pip the fixed 20-pip stop reaches first cash in 104 days against 126 at the deployed rule, with \$147 against \$130 a year, \$413 against \$343 of drawdown and the same breakeven probability, 53%.

stop	bars	trades a seed	target share	both legs	hold, days	closed same day	swap nights	days per trade
20 pips, fixed	300 s	50	$52.4\% \pm 2.2$	0	0.44	80%	0.30	1.60
20 pips, fixed	3600 s	48	$50.2\% \pm 2.3$	0	0.50	73%	0.35	1.67
deployed rule	300 s	16	$52.5\% \pm 4.0$	0	1.82	38%	1.38	3.08
deployed rule	3600 s	16	$51.2\% \pm 4.0$	0	1.47	44%	1.12	2.70

Table 41: Plain brackets through the broker over 2026-06-18 to 2026-09-10, ten coin seeds. Hold and days per trade in calendar days; the days per trade is a replay’s span over its trades.

configuration	spread	days per trade	exits for news	cost-to-risk ratio	days to first cash	cash a year	drawdown, p90	breakeven probability
20 pips, fixed	0.1	1.60	0.19	3.91%	104	\$147	\$413	53%
deployed rule	0.1	2.03	0.78	3.65%	126	\$130	\$343	53%
20 pips, fixed	0.5	1.60	0.19	6.29%	116	\$46	\$490	none
deployed rule	0.5	2.03	0.78	5.76%	138	\$59	\$418	none

Table 42: The fixed 20-pip configuration and the deployed configuration with the measured days per trade and swap nights, one account, random side, at two spreads.

What this Pareto front does not see. One summer of 5-minute bars at one tight stop; the exit for news rate at that stop is scaled from the deployed rule’s, not measured. The swap and exit for news shares elsewhere are scaled by Wald’s holding time, which the broker finds slower at short horizons, so both are rough at the other tight stops. The accounts’ correlation was measured

at one pair of hours; a third account needs a third hour, closer to the others, and correlates more. And every dollar here is read in the world where the firm pays every request.

16 Every configuration

The Pareto front of Section 15 reports the configurations no other configuration beats on all three objectives. Which of those the operator wants depends on how a day trades against a dollar, which only the operator can say, so this section reports every configuration with its numbers and marks the Pareto front within them.

The grid. Six settings are crossed: the stop at the eight mean stops of Section 15; the spread at 0.1 pip, the band measured on the evaluation account on 2026-10-02, and at the paper's 0.5; the calendar of releases the strategy exits for, the pair's two currencies (0.78 a trade at the deployed stop) or every currency's (1.33); the assessment risk at 2%, 2.5% and 3%; the funded risk at the line search's pick of Section 14.10 or at 1%, 1.5%, 2% and 2.5%; and one to three accounts. That is 480 configurations and 1,440 rows. Each runs through the Markov chains of Section 14 and the bankroll of Section 15: the random side with its swap, ratio one, both legs capped, the \$3,000 account size, a \$1,000 bankroll, every payout paid, three years, 10,000 paths on one seed. The cost-to-risk ratio is the round trip $cE[1/\ell_t]$, the swap's pips a night times the nights held over the stop, and each exit for news at $cE[1/\ell_t]$. The nights and the exits for news scale with the time held, Wald's $(\ell/34.8)^2$, except at 20 pips, where the days per trade, the nights and the time held are the 5-minute measurements of Section 15 taken against the deployed rule on the same weeks. The days per trade at 15 and 25 pips are extrapolated.

The limits. 68 rows meet all three limits of Section 15, 68 at 0.1 pip and 0 at 0.5 pip. Every configuration that is within them pays the measured spread.

Reading the grid. Four things, in order of how much they move.

On every currency's calendar, one configuration family is left. At 0.1 pip 9 rows are within the limits, and the 2 Pareto front configurations are both the fixed 20-pip stop at one account. At the line search's funded risk, 1.65%, it reaches first cash in 104 days, with \$143 a year, \$418 of drawdown, ruin 0.8% and a breakeven probability of 57%. The deployed mean stop there takes 130 days and fails the payout limit, any payout at 49.8%. A 20-pip trade is open about a quarter as long as one at the deployed stop, so it exits for news about a quarter as often, and on this calendar the tight stop is also the cheap one. No row with two or three accounts is within the limits on this calendar: at 3% assessment and the picked funded risk two accounts carry ruin of 5.9% to 14.1%.

On the pair's calendar two accounts are feasible. The fastest feasible row is 28 pips at two accounts: 71 days, \$299 a year, \$612 of drawdown, ruin 4.4%. At one account the 20-pip stop reads 104 days and \$159 a year.

The funded risk trades payout frequency for size, not speed. At 20 pips on the pair's calendar, 2% funded reaches first cash in 103 days with \$210 a year, \$455 of drawdown and ruin 1.3%, and 2.5% in 106 days with \$267, \$494 and 2.2%. Both fail the payout limit: the 35% rule raises the request with the risk, so fewer funded accounts pay, 46.7% and 41.4%, and those that do pay more.

The assessment risk sits at 3%. At 20 pips the first cash takes 164 days at 2% and 125 at 2.5%, against 104 at 3%, which is Proposition 14: the pass rate rises with the gain per win.

The rows within the limits. Table 44 lists them. The page `grid.html` beside this paper holds all 1,440, with a heat map of any metric over the stop and the funded risk at any spread, calendar, assessment risk and account count.

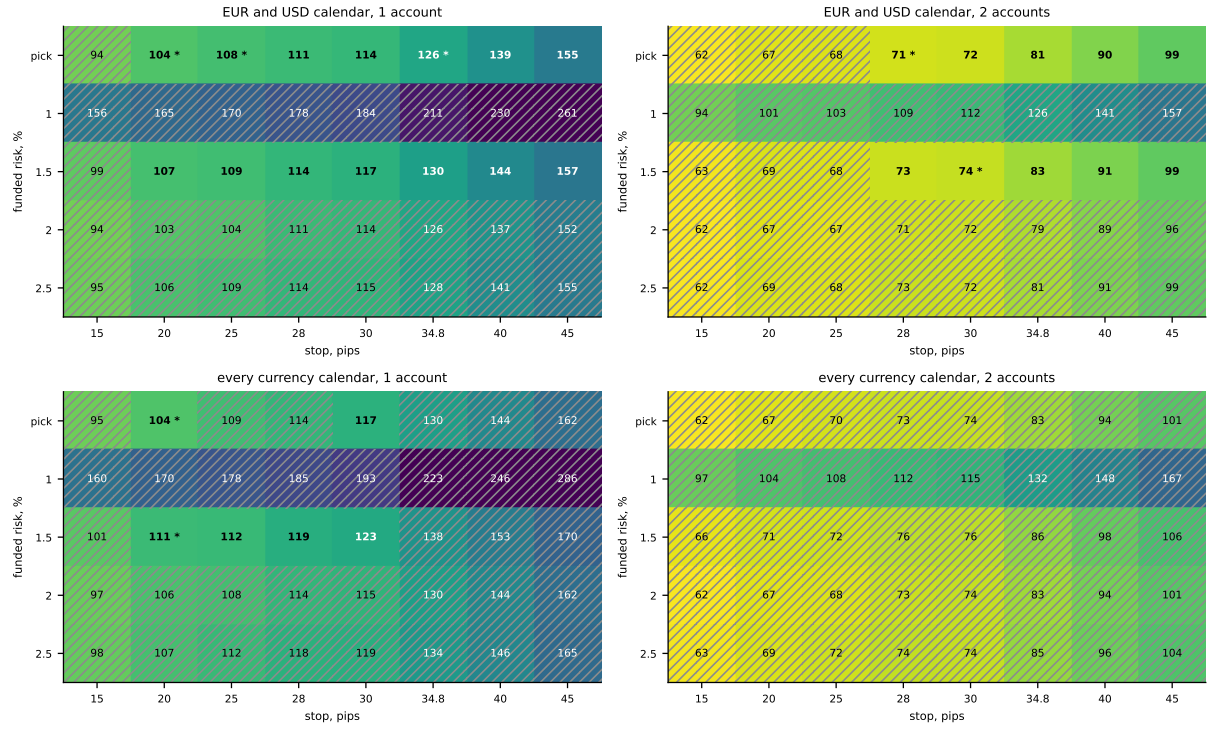


Figure 11: Median days to the bankroll's first cash at 0.1 pip and 3% assessment risk, stop against funded risk. Bold: within the limits; hatched: fails one; *: on the Pareto front of its spread and calendar. The row “pick” is the line search's funded risk at each stop. A wider stop faster than a tighter one in the same row by more than two standard errors of the difference, about two days, would mean a wide stop pays for its slower trades; none is, and six neighbouring pairs at two accounts invert by a day or less.

calendar	stop	assess	funded	N	T , days	G , \$/yr	D	ruin	p^*	any pay
EUR, USD	20.0*	3.0%	1.62%*	1	104	\$159	\$409	0.6%	49.6%	51.1%
EUR, USD	20.0	3.0%	1.50%	1	107	\$137	\$380	0.5%	53.8%	51.7%
EUR, USD	25.0*	3.0%	1.57%*	1	108	\$150	\$380	0.6%	50.3%	51.6%
EUR, USD	25.0	3.0%	1.50%	1	109	\$138	\$380	0.5%	53.3%	52.0%
EUR, USD	28.0	3.0%	1.60%*	1	111	\$150	\$380	0.5%	50.6%	51.6%
EUR, USD	30.0	3.0%	1.60%*	1	114	\$149	\$380	0.3%	49.2%	52.3%
EUR, USD	28.0	3.0%	1.50%	1	114	\$134	\$380	0.4%	53.6%	52.1%
EUR, USD	30.0	3.0%	1.50%	1	117	\$133	\$376	0.2%	52.1%	52.9%
EUR, USD	20.0	2.5%	1.62%*	1	125	\$132	\$380	0.5%	57.2%	51.1%
EUR, USD	34.8*	3.0%	1.60%*	1	126	\$130	\$343	0.3%	52.9%	52.2%
EUR, USD	25.0	2.5%	1.57%*	1	129	\$126	\$367	0.4%	57.7%	51.6%
EUR, USD	34.8	3.0%	1.50%	1	130	\$116	\$342	0.2%	57.1%	52.8%
EUR, USD	20.0	2.5%	1.50%	1	130	\$116	\$362	0.3%	60.9%	51.7%
EUR, USD	25.0	2.5%	1.50%	1	130	\$116	\$345	0.3%	60.0%	52.0%
EUR, USD	28.0	2.5%	1.60%*	1	135	\$126	\$343	0.3%	57.3%	51.6%
EUR, USD	28.0	2.5%	1.50%	1	138	\$113	\$342	0.2%	60.5%	52.1%
EUR, USD	30.0	2.5%	1.60%*	1	139	\$125	\$342	0.2%	56.4%	52.3%
EUR, USD	40.0	3.0%	1.60%*	1	139	\$116	\$342	0.1%	56.2%	52.3%
EUR, USD	30.0	2.5%	1.50%	1	141	\$113	\$342	0.1%	59.1%	52.9%
EUR, USD	40.0	3.0%	1.50%	1	144	\$104	\$335	0.1%	59.8%	52.8%
EUR, USD	34.8	2.5%	1.60%*	1	152	\$109	\$323	0.2%	60.4%	52.2%
EUR, USD	45.0	3.0%	1.57%*	1	155	\$102	\$305	0.1%	61.6%	52.9%
EUR, USD	34.8	2.5%	1.50%	1	156	\$98	\$304	0.1%	63.8%	52.8%
EUR, USD	45.0	3.0%	1.50%	1	157	\$93	\$304	0.1%	64.2%	53.3%
EUR, USD	20.0	2.0%	1.62%*	1	164	\$98	\$337	0.1%	68.9%	51.1%
EUR, USD	20.0	2.0%	1.50%	1	168	\$86	\$304	0.0%	73.5%	51.7%
EUR, USD	40.0	2.5%	1.60%*	1	169	\$98	\$304	0.1%	63.7%	52.3%
EUR, USD	25.0	2.0%	1.57%*	1	170	\$94	\$304	0.1%	69.3%	51.6%
EUR, USD	25.0	2.0%	1.50%	1	171	\$87	\$304	0.1%	71.5%	52.0%

calendar	stop	assess	funded	N	T , days	G , \$/yr	D	ruin	p^*	any pay
EUR, USD	40.0	2.5%	1.50%	1	173	\$88	\$304	0.1%	66.8%	52.8%
EUR, USD	28.0	2.0%	1.60%*	1	178	\$95	\$304	0.0%	68.7%	51.6%
EUR, USD	28.0	2.0%	1.50%	1	182	\$86	\$304	0.0%	71.7%	52.1%
EUR, USD	30.0	2.0%	1.60%*	1	186	\$94	\$304	0.0%	67.4%	52.3%
EUR, USD	30.0	2.0%	1.50%	1	189	\$86	\$304	0.0%	70.2%	52.9%
EUR, USD	45.0	2.5%	1.57%*	1	190	\$85	\$303	0.0%	68.9%	52.9%
EUR, USD	45.0	2.5%	1.50%	1	193	\$79	\$277	0.0%	71.7%	53.3%
EUR, USD	34.8•	2.0%	1.60%*	1	205	\$82	\$266	0.0%	71.4%	52.2%
EUR, USD	34.8	2.0%	1.50%	1	209	\$74	\$266	0.0%	75.1%	52.8%
EUR, USD	40.0	2.0%	1.60%*	1	228	\$73	\$266	0.0%	74.9%	52.3%
EUR, USD	28.0•	3.0%	1.60%*	2	71	\$299	\$612	4.4%	54.8%	51.6%
EUR, USD	30.0	3.0%	1.60%*	2	72	\$297	\$606	4.2%	53.5%	52.3%
EUR, USD	28.0	3.0%	1.50%	2	73	\$268	\$607	4.4%	59.2%	52.1%
EUR, USD	30.0•	3.0%	1.50%	2	74	\$266	\$578	4.0%	57.7%	52.9%
EUR, USD	34.8	3.0%	1.60%*	2	81	\$260	\$570	3.8%	57.6%	52.2%
EUR, USD	34.8	3.0%	1.50%	2	83	\$232	\$550	3.6%	62.8%	52.8%
EUR, USD	25.0	2.5%	1.57%*	2	83	\$252	\$582	4.8%	66.6%	51.6%
EUR, USD	25.0	2.5%	1.50%	2	83	\$232	\$572	4.7%	71.0%	52.0%
EUR, USD	30.0	2.5%	1.60%*	2	85	\$250	\$567	4.0%	62.9%	52.3%
EUR, USD	28.0	2.5%	1.60%*	2	85	\$252	\$570	4.0%	62.0%	51.6%
EUR, USD	28.0	2.5%	1.50%	2	87	\$227	\$570	4.0%	68.1%	52.1%
EUR, USD	30.0	2.5%	1.50%	2	88	\$225	\$543	3.9%	67.0%	52.9%
EUR, USD	40.0	3.0%	1.60%*	2	90	\$233	\$546	3.2%	63.4%	52.3%
EUR, USD	40.0	3.0%	1.50%	2	91	\$208	\$532	3.0%	68.3%	52.8%
EUR, USD	34.8	2.5%	1.60%*	2	97	\$218	\$532	3.3%	66.0%	52.2%
EUR, USD	45.0	3.0%	1.57%*	2	99	\$203	\$530	2.5%	65.3%	52.9%
EUR, USD	45.0	3.0%	1.50%	2	99	\$187	\$508	2.4%	70.0%	53.3%
EUR, USD	34.8	2.5%	1.50%	2	99	\$196	\$530	3.0%	70.7%	52.8%
EUR, USD	40.0•	2.5%	1.60%*	2	110	\$195	\$497	2.7%	70.6%	52.3%
EUR, USD	45.0	2.5%	1.57%*	2	119	\$171	\$491	2.2%	75.4%	52.9%
every	20.0•	3.0%	1.65%*	1	104	\$143	\$418	0.8%	57.3%	50.1%
every	20.0•	3.0%	1.50%	1	111	\$119	\$390	0.7%	64.0%	50.8%
every	25.0	3.0%	1.50%	1	112	\$107	\$393	0.9%	71.8%	50.4%
every	30.0	3.0%	1.65%*	1	117	\$120	\$405	0.7%	65.2%	50.3%
every	28.0	3.0%	1.50%	1	119	\$101	\$381	0.7%	74.4%	50.4%
every	30.0	3.0%	1.50%	1	123	\$99	\$380	0.5%	72.5%	51.2%
every	20.0	2.5%	1.65%*	1	128	\$117	\$380	0.6%	66.4%	50.1%
every	20.0	2.5%	1.50%	1	133	\$98	\$380	0.4%	73.3%	50.8%
every	30.0	2.5%	1.65%*	1	142	\$97	\$377	0.4%	74.8%	50.3%

Table 44: Every row within the limits, all at 0.1 pip, by calendar, accounts and days to first cash. *: the line search's funded risk; •: on the Pareto front of its calendar. N accounts; T median days to first cash; G cash a year if the firm pays every request; D the 90th percentile year-one drawdown; ruin within three years; p^* the breakeven probability that the firm pays; any pay the funded chance of any payout.

17 The chosen configuration, for daily use

The operator trades the configuration Section 16 puts first on every currency's calendar: a fixed 20-pip stop at one account, 3% in the assessment and 1.65% once funded, the measured 0.1-pip spread. Its cost-to-risk ratio is 4.15% of the risk and a trade takes 1.60 calendar days. This section gives what that operator reads from day to day.

From any balance. The chance of passing from an equity e is the assessment Markov chain of Section 14 with the target moved to $T - e$ and the loss limit to $D + e$, both legs capped (Figure 12). From the start it is 43.3%, in 9.6 trades on average. Three points up it is 60% and six points up 79%; three points down 28% and six points down 13%. The expected trades left are largest near the start and fall towards both barriers.

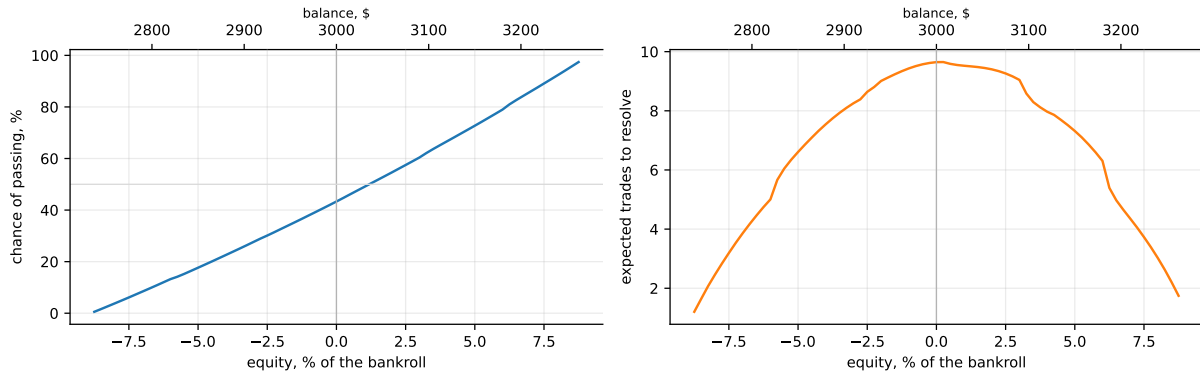


Figure 12: The assessment from each equity at the configuration. Left: the chance of passing; right: the expected trades to resolve. The top axis is the balance on the \$3,000 account size. A curve that fell as the equity rose would mean the caps work against the trader.

The funded payout clock. A funded cycle pays at the first trade from the 9-th on with equity at or above the request, 4.76% of the account balance (\$143), or ends at the loss limit. The chance the current cycle pays, from equity e with t trades of the clock already taken, is the funded Markov chain of Section 14 with the request at $M - e$, the loss limit at $D + e$ and the clock at its remaining trades (Figure 13). From a fresh account it is 50.1%.

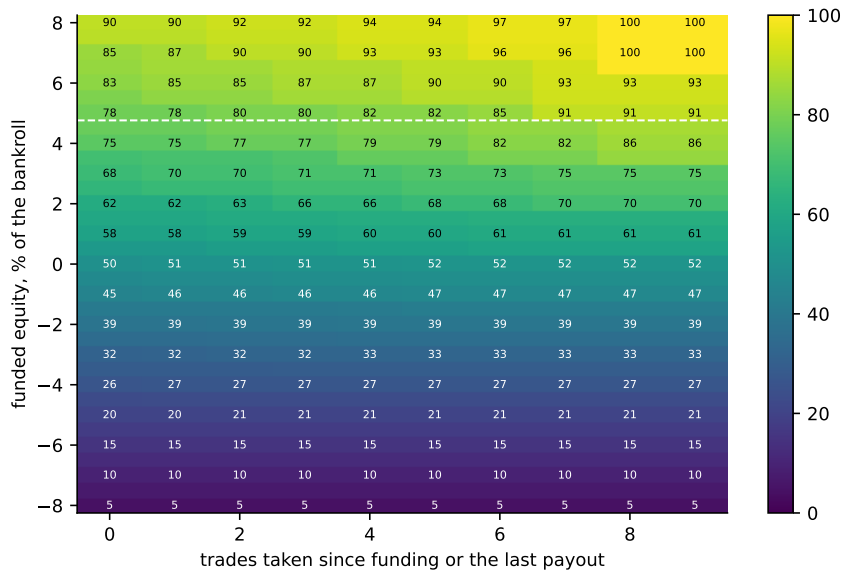


Figure 13: The chance that the current funded cycle pays, by equity and by the trades taken since funding or the last payout. The dashed line is the request. Above it, with the clock run out, the chance is one.

The bankroll. Figure 14 follows the \$1,000 bankroll over 10,000 paths with every payout paid. The first cash comes by day 60 on 27% of paths, by day 104 on 49%, by day 180 on 74% and within a year on 95%. The mean payouts received pass the mean fees paid after 188 days. After a year the bankroll's median is \$1,050, its 10th percentile \$664 and its 90th \$1,507. Three-year ruin is 0.8%.

One input at a time. Figure 15 moves one input at a time. Along the spread the median first cash reads 104 days at no spread, 104 at 0.1 pip, 112 at 0.3 and 120 at 0.5, and the breakeven probability 46%, 57% and 78% at 0, 0.1 and 0.2 pip; from 0.3 pip the bankroll shrinks even if the firm

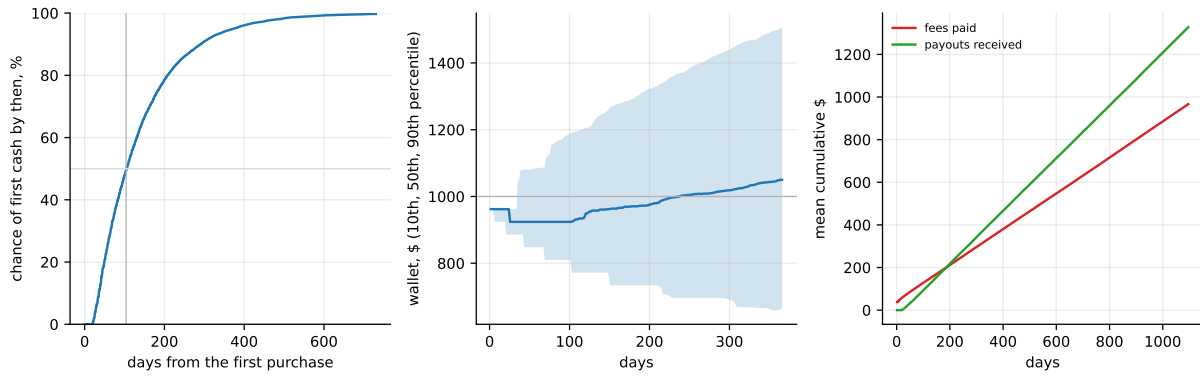


Figure 14: Left: the chance the first cash has arrived by each day, the median marked. Middle: the bankroll's 10th, 50th and 90th percentiles over the first year. Right: mean cumulative fees and payouts over three years.

pays. Along the belief the bankroll's three-year log growth is the line $g(p) = p g_{\text{pays}} + (1-p) g_{\text{refuses}}$, here from -0.223 to $+0.166$, which crosses zero at 57.3% . Along the funded risk the chance of any payout peaks at 51.0% at 1.40% ; the pick, 1.65% , sits within a point of it on the near-optimal range, where the first payout comes soonest.

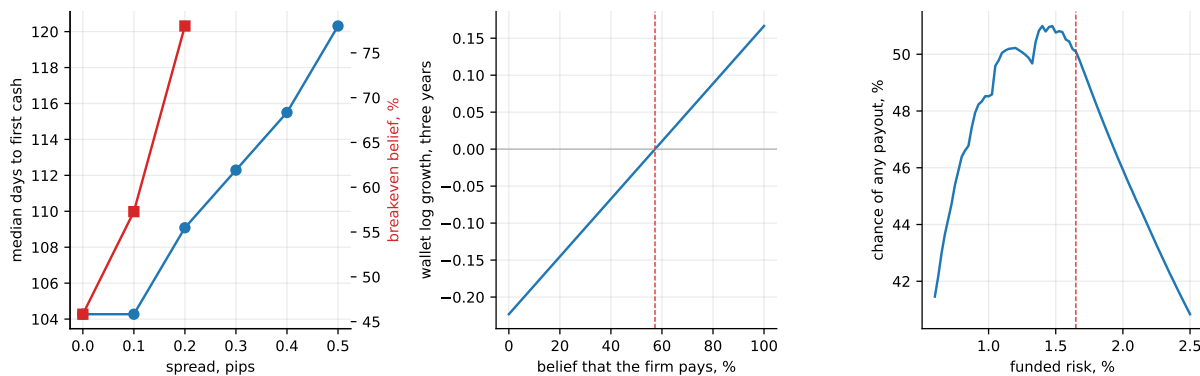


Figure 15: Left: median days to first cash and the breakeven probability along the spread. Middle: the bankroll's log growth over the belief that the firm pays, the breakeven dashed. Right: the funded chance of any payout along the funded risk, the pick dashed.

18 Three futures firms, the same play

The same zero-edge play can be bought elsewhere. An aggregator page (imantrading.org, “easiest cheapest prop firms”, dated 27 August) lists three futures firms’ 50K Flex accounts. This section runs the plan under each as the page states the rules. None was read from the firm’s own documents. Lucid restricts Indonesian traders, Tradeify was a wall the operator met, and FundedNext Futures permits bots and news trading, with access from Indonesia unconfirmed.

The model. One fair 1:1 bracket a trading day on MNQ, a 40-point stop, commission and one tick of spread from the instrument’s file: a round trip costs 1.88% of the risk, and twice that, 3.75% , as the second scenario. The risk per trade runs from $\$250$ to $\$1,000$. The assessment passes when the profit reaches the target with the largest day within the consistency share; the funded account pays after five qualifying days, taking half the profit up to the cap. Each firm’s daily cash flows go through the bankroll of Section 15: $\$1,000$, three years, 10,000 paths, the same

	fee	target	drawdown	consistency	payout	cap
Lucid	\$105	\$3,000	\$2,000	50%	5 days of \$150, 90% split	\$2,000
FundedNext Futures	\$70	\$2,500	\$1,500	40%	5 days of \$200, 95% split	\$1,500
Tradeify	\$99, then \$115	\$3,000	\$2,000	40%	5 days of \$150, 90% split	\$2,500

Table 45: The page’s rules for each 50K Flex account. The drawdown trails the highest end-of-day balance, in the assessment and in the funded stage until the first payout, then sits at the starting balance (FundedNext) or \$100 above it. A payout takes up to half the profit. No daily loss limit.

limits. With a static loss limit and no consistency rule the simulator gives 41.43% at 3% risk where the assessment Markov chain gives 41.48% (z -0.44).

The result. None of the 30 rows is within the limits. The assessment passes 12% to 21% of the time, against Prime Academy’s 43.3%, and the bankroll is ruined within three years on 55% to 94% of paths. The bankroll’s log growth is negative at every row even if the firm pays every request, so no belief passes the purchase condition. Table 46 gives every row at the base cost and Table 47 each firm’s fastest row beside the configuration of Section 17.

firm	risk	pass	any payout	cash / fee	days to first cash	cash a year	drawdown, p90	ruin	breakeven probability	within limits
Lucid	\$250	16.4%	73.2%	0.41	430	−\$301	\$735	61.7%	none	no
Lucid	\$375	18.7%	67.0%	0.63	213	−\$369	\$945	79.1%	none	no
Lucid	\$500	19.4%	57.0%	0.85	150	−\$232	\$1,153	79.9%	none	no
Lucid	\$750	19.2%	37.5%	1.09	never	\$262	\$1,785	82.0%	none	no
Lucid	\$1,000	19.0%	22.6%	1.08	never	\$385	\$2,527	88.4%	none	no
FundedNext Futures	\$250	15.3%	70.0%	0.63	300	−\$200	\$700	54.8%	none	no
FundedNext Futures	\$375	17.3%	57.0%	0.99	168	−\$8	\$980	63.6%	none	no
FundedNext Futures	\$500	16.7%	43.5%	1.14	146	\$228	\$1,194	69.8%	none	no
FundedNext Futures	\$750	19.0%	22.6%	1.32	never	\$984	\$2,016	77.5%	none	no
FundedNext Futures	\$1,000	20.8%	12.1%	1.14	never	\$541	\$2,285	88.3%	none	no
Tradeify	\$250	16.4%	73.2%	0.37	430	−\$344	\$789	70.0%	none	no
Tradeify	\$375	18.7%	67.0%	0.57	213	−\$458	\$936	83.6%	none	no
Tradeify	\$500	19.4%	57.0%	0.78	150	−\$378	\$1,190	84.0%	none	no
Tradeify	\$750	19.2%	37.5%	1.00	never	−\$2	\$1,849	85.8%	none	no
Tradeify	\$1,000	19.0%	22.6%	1.00	never	−\$4	\$2,642	90.8%	none	no

Table 46: Every risk at each firm, base cost. Days to first cash read “never” where fewer than half the bankroll paths ever see cash. Cash a year is the mean net flow with an unlimited bankroll.

firm	risk	pass	any payout	cash / fee	days to first cash	cash a year	drawdown, p90	ruin	breakeven probability	within limits	access
Lucid 50K Flex	\$500	19.4%	57.0%	0.85	150	−\$232	\$1,153	79.9%	none	no	restricts Indonesia
FundedNext Futures 50K Flex	\$500	16.7%	43.5%	1.14	146	\$228	\$1,194	69.8%	none	no	bots and news allowed; Indonesia unconfirmed
Tradeify 50K Flex	\$500	19.4%	57.0%	0.78	150	−\$378	\$1,190	84.0%	none	no	operator hit a wall
Prime Academy \$3,000	\$90	43.3%	50.1%	1.46	104	\$143	\$418	0.8%	57%	yes	available

Table 47: Each futures firm at its fastest risk, base cost, beside the Prime Academy configuration.

Why the trailing loss limit loses. A static loss limit leaves a fair coin fair: Proposition 3 gives $D/(T + D)$, 40% for a \$3,000 target over a \$2,000 loss limit. A trailing loss limit moves up behind every end-of-day gain, so the distance to the loss limit never grows while the distance to the target shrinks only through net gains; a run of wins followed by losses fails an account a static loss limit would have kept. The assessment’s pass rate falls to about half of $D/(T + D)$. The fee is then two to three times Prime Academy’s against a bankroll that buys fewer attempts, and the funded payout, half the profit at a time, leaves the account exposed to a loss limit that the first payout fixes close under the balance.

19 How the numbers were checked

A number in this paper can be wrong in four different ways, and each needs a different check. The algebra can be wrong, which a simulation of the same model catches. The model can be wrong about prices, which real prices catch. The strategy that trades the plan can differ from the model, which a trade-by-trade comparison catches. And the accounting of a whole account can be wrong in the engine that runs the strategy, which scoring that engine’s own balance under the firm’s rules catches. Table 48 lists the four.

layer	what is compared	against	result	what it would catch
1. algebra	exact Markov chain, closed forms	simulation of the full rulebook	48.66% against 48.67%	a wrong derivation
2. prices	the same bracket on real EURUSD	the exact Markov chain	48.58% against 48.66%	a model that misprices the path
3. strategy	every trade of the deployed strategy	the research rule on the same bars	467 of 467 exits match	code that trades differently from the model
4. accounts	the broker’s balance, cut into accounts	the research models	Table 49	broken fee, lot or account accounting

Table 48: The four checks. Layers 1 and 2 are the numerical-check boxes and the real-path controls of Sections 4 to 12; layers 3 and 4 run the strategy itself.

The engine. Layers 3 and 4 replay `PrimeAcademyStrategy`, the code that trades the account, through the framework’s `HistoricalBarBroker` over the vendor’s hourly EURUSD bars from 2023-11-24 to 2026-09-10. The broker fills a market order at the next bar’s open, fills a resting stop or target at its own price when a bar reaches it, and books the stop when one bar reaches both. It charges the commission of the instrument’s validated `meta.json`, \$2.50 a side per lot, which is the venue’s \$5 per round trip. It charges no spread, because vendor bars carry no bid and ask, and no swap, which it prints as unmodelled on every run. It records the balance at every close, and the balance is what the firm’s rules are applied to.

Layer 3, trade by trade. Every exit the strategy logs is re-run through the research rule from the same entry bar with the same levels, and every one of the 467 closed trades exits on the same bar for the same reason. The daily sigma the strategy logs matches the research filter, and every lot count is the risk over the stop floored to 0.01. The fixed-side run’s net balance is pinned to the cent, so a change to the commission, the fills or the lot rule fails the check; setting the commission to zero in `meta.json` was tried, and it fails.

Layer 4, account by account. The broker’s balance after each close is cut into back-to-back accounts: a challenge passes at $+T$ and fails at $-D$, a funded account follows the payout rules of Section 5 and ends at $-D$ or on the daily rule, and the next account opens at the next trade. Lots are sized from the fixed account balance, so cutting one path is exact. Each account counts once, so the error is binomial over accounts. The reference is the research model on the same inputs, commission only, and the rule, declared before the run, is agreement within two standard errors on the coin side. Table 49 gives the result. All three checks agree.

Which pass rate describes the deployed strategy. The paper quotes several pass rates, and they differ in what they charge, not in what they measure. Table 50 lines them up. Read down the table and each step adds or removes one cost: the spread is worth about 3.2 points at the deployed stop; the swap earned on that side adds some back, 49.90% against 48.58% at

check	configuration	broker, coin	broker, short	research model	coin gap
challenge	deployed stop	50.8% $\pm$ 6.5 (59)	50.0% $\pm$ 6.6 (58)	49.3%	+0.23 SE
challenge	fixed 60 pips	55.6% $\pm$ 9.6 (27)	48.4% $\pm$ 9.0 (31)	49.6%	+0.62 SE
funded, mean W	deployed stop	11.6% $\pm$ 4.8 (20)	10.1% $\pm$ 3.2 (21)	10.4%	+0.25 SE
funded, $P(W > 0)$	deployed stop	40.0%	42.9%	37.1%	

Table 49: The strategy through the broker, scored under the firm’s rules. Broker columns give the rate, its standard error in points and, in brackets, the number of independent accounts. The research model is the real-path walk for the challenge and the lattice of Section 5 for the funded stage, both charging the commission alone, as the broker does. The deployed stop is $\max(0.75 \sigma_{t-1}, 30)$ pips entered 07:00–10:00 UTC; the fixed stop is the 60-pip bracket of Section 11, entered at 00:00 UTC, which trades only 262 times because a wider bracket lives longer.

the 60-pip stop; and exiting for news around news pays 1.33 extra round trips a trade, with the bootstrap reading 53.8% against 51.2% with the rule off. Every row lies between 45.6% and 55.6%, a range the precision of Section 1 accounts for.

stop	entry	side	charged	engine	pass rate
60 pips	any day	either	commission, spread	exact Markov chain	48.66%
60 pips	random hour	random	commission, spread	real-path walk	48.58%
60 pips	00:00 UTC	coin	commission	broker	55.6% $\pm$ 9.6
deployed	07:00–10:00 UTC	random	commission	real-path walk	49.3%
deployed	07:00–10:00 UTC	random	commission, spread	real-path walk	46.2%
deployed	any hour, second half	random	commission, spread, swap	real-path walk	45.6%
deployed	07:00–10:00 UTC	short	commission	broker	50.0% $\pm$ 6.6
deployed, exiting for news	07:00–10:00 UTC	short	commission, round trips exiting for news	broker, bootstrap	53.8%

Table 50: Every pass rate in the paper for the two stops, by what it charges. “Deployed” is the stop of Corollary 10. Broker rows carry the standard error of Table 49; the walks re-sample one history, and their own error understates the data’s.

What the checks do not reach. The broker makes the accounting of the real strategy checkable; it does not make the history longer. At 58 to 59 accounts a gap under about thirteen points of pass rate is invisible, so layer 4 rules out broken plumbing and nothing finer. The spread, the swap, the path inside a bar and the equity between closes are outside every layer, and Section 20 lists what each is worth.

20 What is assumed and what is open

Each item below would change the answer if wrong. Table 51 ranks them by what they move; the items after it give the detail, grouped by who can settle them.

Only the firm can settle these.

- **Whether the loss limit can be overshoot.** The lattice of Section 4.4, the parametric simulation and the real-path control all absorb on crossing, so a losing trade carries equity past $-D$ and $o_d > 0$. The rulebook makes the drawdown equity-based and requires that balance or equity “must not fall below this limit” [1], which if enforced on the tick closes the position at $-D$ exactly and makes $o_d = 0$. The three implementations agree with one another because they share that assumption, not because any of them tests it. At the traded configuration the reading is worth 7.0 points of pass rate, 48.66% as published against 41.63% with a loss limit enforced on every tick, and the same ordering appears on the real path. The same reading applies to the funded stage, where Proposition 8 gives $E[W] = D + E[o] - c E[N]$ and the measured overshoot of the loss limit 2.62% is a quarter of the lifetime payout: a loss limit enforced on every tick would put $E[o] = 0$ and lifetime

question	what it moves	who can settle it
the cost of exiting for news	fails the purchase condition on every currency's calendar (0.99 times the fee) and on the pair's own (1.21)	the live spread, the firm's list
does the 35% rule apply in the assessment?	assessment risk 3% or 4%: about a point of pass rate and nine days	the firm
is the loss limit enforced on every tick?	pass rate -7.0 points; funded lifetime payout 10.11% to 7.49%	the firm
does the firm pay?	everything; buying needs the belief that it does above 51%	the firm
the live spread	about 3.2 points of pass rate per 0.5 pip at the deployed stop	the live quotes
the swap rates	short side, which earns swap, 49.90% against a random side 45.34%	the account statement
the whole cost stack	5.3 points between the derived cost and a futures-like one	the live account
aiming at the target instead of past it	+6.4 points	a strategy change
the firm's news calendar	a breach the calendar does not see	the firm
the path inside a bar, weekend gaps	the loss limit, in the same direction as the first row	finer bars
the fee's timing	0.09 of a point	settled: immaterial
the days per trade at tight stops beyond one summer of 5-minute bars	whether the fixed 20-pip configuration holds in a faster regime	more 5-minute history; the demo soak's own bars
the correlation of accounts at other hours	whether a third account passes the ruin cap	the pair at more hour pairs

Table 51: The open questions, largest first.

lifetime payout near 7.49% of account balance against the 10.11% reported, which carries into the expected value per purchase and the bankroll's account size choice. The rules table's own header reads "YOU MAY BE ELIMINATED", which is discretionary, so the documents do not settle it and only the firm can. Proposition 9 shows the choice does not change W once the account is dead; what it changes is where the account ends.

- **P(paid)** is the firm's discretion and cannot be measured by reading. Its two breakevens are the paper's answer to that.
- **The news rule's calendar.** Section 13 uses ForexFactory's high-impact set for all currencies. The rulebook does not name its source or say whether a release in a currency the pair does not carry counts. A narrower list would cut the round trips exiting for news pays, and a list the firm reads differently would leave a breach the calendar did not see. The venue side of the rule is measured: deleting a protective leg by its id detaches it with the position left open, and a PATCH re-attaches both under new ids.
- Unverified in the firm's documents: whether the 35% distribution cap applies during the assessment, whether any recurring charge exists once funded, whether "account opening" in the 14-day payout clock means the assessment account or the funded one. The liquidation rule was on this list and is settled by Proposition 9. The complaint policy that precedes arbitration is read [3]: a complaint goes by email or live chat, and arbitration follows it [2].

Measurable without risking an account.

- **The cost stack.** The commission is documented [1] and the spread only as raw from 0.0 pips [6], with the live figure behind the login; 0.5 pip is the conservative figure used. Between the derived 1.67% and the stress 5% of the risk the pass rate moves 5.3 points, the largest sensitivity here. Evaluation accounts carry standard swaps [1]. The rate is not published, and Section 12 assumes a typical retail one, 0.75 pips a night against the long side and 0.25 in favour of the short.
- **The instrument.** Section 9 ranks cost, on spread snapshots from one day and swaps read on that day; swap rates move with rates and with the firm. The days per trade that turns a swap per night into a cost per trade is EURUSD's, applied to every instrument, and the top-ranked instrument's own days per trade is unmeasured. A ranking on the side that earns swap selects for swap credit, which interest parity argues is not free and which the rulebook's swap-arbitrage clause sits next to. The API lists 320 instruments and the interface 174; the paper trusts the interface.

Modelling choices and their limits.

- **The target cap in live trading.** Corollary 2 is worth 6.4 points on the Markov chain and 6.0 on the real path, and holds either way the loss limit is read, 6.2 points with a hard one. The strategy caps through `set_account`, netting the cost it is given; the live runner does not call it yet, and a cap that nets less than the live round trip lands a win short of T and stalls there.
- **A bar carries no path, and a weekend is one long bar.** Both the bar replay and the real-path control book a stop at its own price however far the bar ran through it. Across the cohort's 146 calendar breaks the close-to-close gap is 9 pips at the median and 43 at the ninety-fifth percentile, with a largest of 131; 14% of breaks exceed the deployed sigma stop and 3% exceed the 60-pip one. A trade held 3.6 trading days spans a break most weeks. For the trade's own profit and loss the truncation is close to symmetric at $RR = 1$, since a gap through the target is booked at the target just as a gap through the stop is booked at the

stop. For the loss limit it is not symmetric: an adverse gap understates how far below $-D$ equity actually travelled, which is the same direction as the loss limit reading above.

- **Zero edge is exactly zero.** Real execution is probably slightly negative, and over 8.60 assessment trades and 21.3 funded ones that compounds.
- **One trade a day.** The daily loss limit never fires at one trade of 4% risk. At several trades a day it does, and the `eval_convexity` topic measured pass rates falling from 36.5% to 0.0% between one and four trades a day of the same notional.
- **The correlation between accounts.** Section 11.6 gives every pair of accounts the correlation of two entry hours, 07:00 and 16:00 UTC, measured once on one pair over 718 days. A third account needs a third hour, and hours closer together correlate more, so the staggered family is optimistic beyond two accounts. 12 hand-placed brackets a day is an assumed ceiling. The rules permit the accounts [2]; what a risk team makes of one person holding several at payout time is not priced here.
- **The pair’s daily sigma.** $\sigma_p = 60$ pips was the input to Proposition 16. Measured on the sample it is 44.7, with a 10th to 90th percentile range of 29.3 to 59.5 by the daily filter, which is why Section 12 sets the stop in sigmas.

Settled.

- **The 0.01-lot minimum.** Table 19 assumes it, and the platform confirms it: the instrument details of the TradeLocker account read a minimum lot and a lot step of 0.01, recorded in the instrument’s `meta.json`.
- **The fee’s timing, not its total.** The venue charges its \$5 per lot entirely at the open; the framework’s `commission_per_side` charges half on each fill. Opens and closes pair, so the total per round trip is exact, but simulated equity sits above the venue’s for the life of every trade, and the 9% loss limit is an equity test that runs while a position is open. The deferred half is 0.185% of the loss limit at the traded stop, and moves the pass rate by 0.09 of a point, visible only in the loss limit-capped treatment because no other model evaluates equity mid-trade. Recorded rather than repaired: a fee-timing field in `meta.json`’s account block would buy less than the measurement costs to state.

21 Reproduction

Every number in this paper is written by `paper/make_numbers.py` into `numbers.tex` and the `tab_*.tex` files, and the notebook `prime_academy.ipynb` carries the same results with the working shown, section by section. Sections 4 to 11 come from `modules/prime.py`. The MNQ control uses `eval_convexity`’s bracket engine over the committed one-minute bars. The EURUSD control and the walk-forward, Sections 11 and 12, use `modules/fxcontrol.py` over hourly bars pulled by `historical_data/pull_yfinance_fx.py`, with the daily sigma from the framework’s `VolatilityKF`. Section 9 reads the firm’s book through `modules/instruments.py`; the scrape it ranks is committed under `data/` with its provenance headers. The pooling of Section 11.6 is `modules/spread.py`.

Sections 13 and 19 are the two whose numbers do not come from a research module. Those of Section 13 are the engine’s replay of the deployable strategy, `src/strategies/prime_academy_strategy/` on branch `prime-academy`, over the same hourly bars laid out per day by `historical_data/layout_eurusd_ohlc.py`, run by that directory’s `news_battery.py` and read here through `modules/news.py` from a cached result committed at `reports/_cache/prime_academy/news_battery.json`. Those of Section 19 come from sections 20 to 22 of the same notebook on that branch, which write them to `paper/broker_results.json`.

with the commit that produced them, 7d5cc05; `make_numbers.py` reads that file and stops if it is missing. The strategy's `acceptance.py` holds it to the walk of Section 11 bin for bin in both compile modes before any of its numbers are quoted. Seeds are fixed throughout. Run the scripts from the repository root and build with `latexmk`.

A Proofs

Each proof is headed by the statement it proves and the page it is stated on, in the order the paper states them.

Proposition 1 (Scale invariance), page 10.

Proof. The stop is one distance measured two ways. In price it is ℓ pips from entry. In money it is r of the account balance, the loss the account books when price reaches it. The lot size L is what turns one into the other, and the whole argument is about keeping the units apart. The commission k is in dollars per lot. The spread s and the stop ℓ are in pips. On a standard lot one pip is worth \$10, so a move of ℓ pips on L lots is $10\ell L$ dollars.

The position. The stop at ℓ pips must lose exactly rB dollars, so

$$10\ell L = rB \implies L = \frac{rB}{10\ell} \text{ lots.}$$

The cost in dollars. The commission is k dollars on each lot, so kL dollars. The spread is s pips on each lot, and a pip is \$10, so $10sL$ dollars. Together,

$$kL + 10sL = (k + 10s)L = (k + 10s) \frac{rB}{10\ell} = \left(\frac{k}{10} + s \right) \frac{rB}{\ell} \text{ dollars.}$$

The two terms scale differently in L because k is already in dollars while s is in pips and has to be converted; that is where the factor 10 sits.

The cost as a fraction of account balance. Dividing by B ,

$$c = \left(\frac{k}{10} + s \right) \frac{r}{\ell},$$

and B is gone. This c is the cost the walk above charges each trade.

The cost as a share of the risk. Dividing by r ,

$$\gamma = \frac{c}{r} = \frac{k/10 + s}{\ell},$$

which depends on the stop alone, not on the account balance and not on the risk. That is why cost is quoted as a share of the risk throughout, and why fixing the stop in Section 8 is what turns γ into a number.

Since c and r are both fractions of B , the walk S_n is identical at every account size and so is every functional of it. $\square$

Proposition 3 (Exact identity, cost-free), page 11.

Proof. S_n is a martingale with bounded steps and τ has finite mean, so by Proposition 2, $0 = E[S_\tau]$. The account either passes or fails, so the mean of S_τ is the weighted sum of its mean on a pass and its mean on a fail, which is the two-point mean of Appendix B applied to the outcome. By the definition of the overshoots those two means are $T + o_u$ and $-(D + o_d)$, so

$$0 = P(T + o_u) - (1 - P)(D + o_d).$$

Collecting the terms in P ,

$$P(T + o_u + D + o_d) = D + o_d,$$

and dividing gives the identity. $\square$

Corollary 1 (Which side of the familiar value), page 11.

Proof. Putting the two fractions over a common denominator,

$$P - \frac{D}{T + D} = \frac{(D + o_d)(T + D) - D(T + D + o_u + o_d)}{(T + D)(T + D + o_u + o_d)}.$$

The denominator is positive. Expanding the numerator, the terms DT , D^2 and Do_d cancel and what is left is

$$o_d T + o_d D - D o_u - D o_d = o_d T - o_u D.$$

With $T = D$ that is $D(o_d - o_u)$. □

Corollary 2 (Aiming at the target), page 11.

Proof. A bracket with price distance a to the target and b to the stop is a fair game when it wins with probability $b/(a + b)$, for any a and b : the mean before cost is $\frac{b}{a+b}a - \frac{a}{a+b}b = 0$. Shortening a therefore moves the win probability and leaves the game fair, and a win lands on T by construction, so $o_u = 0$. Differentiating the identity of Proposition 3,

$$\frac{\partial P}{\partial o_u} = -\frac{D + o_d}{(T + D + o_u + o_d)^2} < 0,$$

so the pass rate is largest when o_u is zero, for any o_d . □

Proposition 4 (Drift-barrier form), page 12.

Proof. Given the first n trades $e^{\lambda S_n}$ is a known number and the next trade does not depend on them, so $E[e^{\lambda S_{n+1}} | X_1, \dots, X_n] = e^{\lambda S_n} E[e^{\lambda X_{n+1}}] = e^{\lambda S_n}$, which is the martingale property. It starts at $e^{\lambda S_0} = 1$. Optional stopping at the barriers with the landing points taken as exactly T and $-D$ gives

$$1 = P e^{\lambda T} + (1 - P) e^{-\lambda D}.$$

Collecting the terms in P ,

$$P(e^{\lambda T} - e^{-\lambda D}) = 1 - e^{-\lambda D}, \quad P = \frac{1 - e^{-\lambda D}}{e^{\lambda T} - e^{-\lambda D}},$$

and multiplying numerator and denominator by $e^{\lambda D}$ gives the form stated. For λ , the equation $p e^{\lambda(RRr-c)} + (1-p) e^{-\lambda(r+c)} = 1$ has exactly one non-zero root. Expanding $e^x \approx 1 + x + x^2/2$ for small steps turns it into

$$1 + \lambda E[X] + \frac{1}{2} \lambda^2 E[X^2] = 1 \implies \lambda (E[X] + \frac{1}{2} \lambda E[X^2]) = 0,$$

whose non-zero root is $\lambda = -2E[X]/E[X^2]$, and $E[X^2] = \text{Var}(X) + (E[X])^2 = \text{Var}(X) + c^2 \approx \text{Var}(X)$. □

Proposition 5 (First-step equations), page 13.

Proof. From state i the next trade goes up a units with probability p or down b units with probability $1 - p$, and the probability of eventually passing is the weighted average of the probabilities from the two states reached. For n_i the trade itself counts one. Uniqueness: the difference of two solutions satisfies the same equations with zero boundary values, and a bounded sequence that equals a strict weighted average of its neighbours at every interior point cannot have an interior maximum or minimum: at such a point both neighbours would have to equal it, and following them from neighbour to neighbour reaches the boundary, where the difference is zero. So it is zero everywhere. In matrix form, with Q the alive-to-alive transition matrix and $\mathbf{b}_u$ the vector whose entry i is the one-step probability of crossing the target from state i , the two systems read $(I - Q) \mathbf{h} = \mathbf{b}_u$ and $(I - Q) \mathbf{n} = \mathbf{1}$, which is how they are solved. □

Proposition 6 (The Markov chain gives the whole distribution), page 13.

Proof. $\mathbf{v}_n$ is the law of the process on the alive states, and resolving at trade n means being alive in some state i after $n - 1$ trades and taking the step that crosses, which is the inner product. The account resolves in finite expected time, so $Q^n \rightarrow 0$ and the Neumann series $\sum_n Q^n = (I - Q)^{-1}$ converges, which gives $\mathbf{G}$. An account lands on overshoot level $(i + a)u_0 - T$ exactly when it is in state i and wins, and it is in state i on G_i trades in expectation, each of which is followed by a win with probability p . $\square$

Proposition 7 (Wald), page 13.

Proof. $E[S_{n+1}^2 \mid X_1, \dots, X_n] = E[(S_n + X_{n+1})^2 \mid \dots] = S_n^2 + 2S_n E[X_{n+1}] + E[X_{n+1}^2] = S_n^2 + \sigma^2$, since the cost-free step has mean zero and second moment σ^2 . Subtracting $\sigma^2(n + 1)$ from both sides gives the martingale property. Optional stopping gives $E[S_\tau^2] - \sigma^2 E[\tau] = 0$. With landing points exactly at the barriers, $P = D/(T + D)$ and $1 - P = T/(T + D)$, so

$$E[S_\tau^2] = \frac{D}{T + D} T^2 + \frac{T}{T + D} D^2 = \frac{TD(T + D)}{T + D} = TD.$$

$\square$

Proposition 8 (Conservation), page 13.

Proof. On a trading day $G_{n+1} - G_n = X_{n+1} + c$, which has mean zero. A withdrawal moves the same amount out of eq and into W , leaving G unchanged. So G is a martingale. Its increments are bounded. Equity is bounded above, because the whole of it is withdrawn at most fourteen days after it clears the request rule, and from any equity below that bound a long enough run of losses reaches the loss limit. Such a run has a fixed positive probability, so the life of the account has a geometric tail and $E[\tau] < \infty$. Then $E[G_\tau] = 0$, which is the identity. $\square$

Proposition 9 (The liquidation rule is the firm's problem), page 14.

Proof. Withdrawals are taken only while the account is alive, so W is a functional of the path up to $\tau - 1$. The two rules differ only in the value of eq_τ , which is never withdrawn. $\square$

Proposition 10 (The funded cycle, with the clock), page 14.

Proof. Before trade t_w a request is refused whatever the equity, so the only absorbing set is the loss limit and the law after t_w trades is the t_w -fold product with the loss limit rows removed. At trade t_w and after, the request rule is a barrier at M and the loss limit is a barrier at $-D$, which is the two-barrier problem of Proposition 5 from each starting state, weighted by $\mathbf{v}_{t_w}$. A payout resets equity, the clock and the largest-win record to the values they had at funding, and the loss limit does not move, so the next cycle has the same law and is independent of the past by the strong Markov property. A geometric count of independent identically distributed summands is the stated mixture. $\square$

Proposition 12 (Ruin before the first payout), page 15.

Proof. Purchases are independent, each returns cash with probability $1 - q$, and n_F consecutive failures empty the bankroll. A ruined bankroll stays ruined. $\square$

Proposition 13 (Pooling), page 15.

Proof. Linearity gives the mean. A correlation ρ between two flows of variance v means their covariance is ρv , and there are $n_a(n_a - 1)/2$ pairs, so the covariance identity of Appendix B gives

$$\text{Var}(\Delta) = \sum_{i=1}^{n_a} \text{Var}(\Delta_i) + 2 \sum_{i < j} \text{Cov}(\Delta_i, \Delta_j) = n_a v + 2 \cdot \frac{n_a(n_a - 1)}{2} \rho v = n_a v (1 + (n_a - 1) \rho).$$

Dividing its square root by the mean,

$$\frac{\sqrt{n_a v (1 + (n_a - 1) \rho)}}{n_a m} = \frac{\sqrt{v}}{m} \sqrt{\frac{1 + (n_a - 1) \rho}{n_a}} = \frac{\sqrt{v}}{m} \cdot \frac{1}{\sqrt{n_{\text{eff}}}}.$$

For n independent accounts the same steps with $\rho = 0$ give $(\sqrt{v}/m)/\sqrt{n}$, which is why n_{eff} reads as a count of independent accounts. At $\rho = 1$ every Δ_i is the same flow, so $\Delta = n_a \Delta_1$: every fee and every payout is n_a times that of one account, which is the flow of one account n_a times the size. $\square$

Proposition 14 (The assessment depends on the gain per win alone), page 16.

Proof. $\lambda = 2c/(RRr^2) = 2\gamma r/(ur) = 2\gamma/u$. For $T = D$ write $A = e^{\lambda D}$, so $e^{\lambda(T+D)} = e^{2\lambda D} = A^2$ and

$$P = \frac{A - 1}{A^2 - 1} = \frac{A - 1}{(A - 1)(A + 1)} = \frac{1}{A + 1}.$$

As u grows λ falls, A falls towards 1, and P rises towards $\frac{1}{2}$; the derivative never changes sign. $\square$

Proposition 15 (The distribution cap sets the cash frequency), page 16.

Proof of the two branches. Here $\lambda = 2\gamma/u$, so λ falls as u rises. Below the kink $M = m_{\min}$ is fixed. The logarithm of the barrier probability has derivative in λ

$$\frac{D}{1 - e^{-\lambda D}} - \frac{D + M}{1 - e^{-\lambda(D+M)}},$$

and $x/(1 - e^{-\lambda x})$ increases in x , so the derivative is negative: the probability falls in λ , and rises in u . Above the kink $M = u/0.35$, so $\lambda M = 2\gamma/0.35 = \kappa$ is a constant. Writing $A = e^{\lambda D}$ the probability is $(A - 1)/(Ae^\kappa - 1)$, whose derivative in A is

$$\frac{e^\kappa - 1}{(Ae^\kappa - 1)^2} > 0,$$

and A falls as u rises, so the probability falls in u . $\square$

Proposition 16 (The stop is a corner solution), page 16.

Proof. The day count is Proposition 7 in pips: the barriers are $RR\ell$ and ℓ from entry and the variance per day is σ_p^2 , so $E[\text{days}] = RR\ell \cdot \ell/\sigma_p^2$. Setting it to one,

$$\frac{RR\ell^2}{\sigma_p^2} = 1 \implies \ell^* = \frac{\sigma_p}{\sqrt{RR}}.$$

Cost falls in ℓ up to that cap, so the cap is the optimum, and

$$\gamma^* = \frac{k/10 + s}{\ell^*} = \frac{(k/10 + s)\sqrt{RR}}{\sigma_p}.$$

$\square$

Proposition 17 (Direction is free), page 17.

Proof. Zero edge is assumed for a bracket on either side: a long with its target above and its stop below, and its mirror-image short, each win RRr with probability $1/(1 + RR)$ and lose r otherwise, by Section 3. The side is chosen before the trade resolves, from the past alone. So given the choice, the outcome has that two-point law whichever side it is, and the law of the outcome is the same under any rule for choosing the side. The swap is w on one side and a different value on the other, and that is the only term the side reaches. $\square$

Proposition 19 (The instrument enters through one ratio), page 17.

Proof. The steps are those of Proposition 1 with U in place of the \$10. A stop of ℓ units on L lots loses $U \ell L$ dollars, and risking r of the account balance sets

$$U \ell L = rB \implies L = \frac{rB}{U \ell}.$$

The commission is k dollars on each lot and the spread is s units on each lot, worth sU dollars, so the round trip costs

$$kL + sU L = (k + sU) \frac{rB}{U \ell} = \left(\frac{k}{U} + s \right) \frac{rB}{\ell} \text{ dollars.}$$

Dividing by B and then by r ,

$$c = \left(\frac{k}{U} + s \right) \frac{r}{\ell}, \quad \gamma = \frac{c}{r} = \frac{k/U + s}{\ell}.$$

The stop corner solution of Proposition 16 does not depend on the unit: the bracket resolves in $RR\ell^2/\sigma^2$ days whatever ℓ and σ are measured in, so $\ell^* = \sigma/\sqrt{RR}$ still. Substituting,

$$\gamma^* = \frac{k/U + s}{\sigma/\sqrt{RR}} = \sqrt{RR} \frac{k/U + s}{\sigma},$$

and multiplying numerator and denominator by U gives $\sqrt{RR}(k + sU)/(\sigma U) = \sqrt{RR}C/V$. With $U = 10$ this is Proposition 16. $\square$

Proposition 20 (Obeying the rule is free in expectation), page 33.

Proof. The profit and loss before costs is a martingale in the price, and the moment the trade closes is a stopping time under any such rule: at every bar the decision depends only on the path so far and on a calendar fixed in advance. The equity of a single trade is bounded by the finite-time argument of Section 4.1, so optional stopping gives $E[\text{PnL}] = 0$. Legs that return at their original prices give the trade the ratio it opened with. $\square$

Proposition 21 (Fair legs), page 37.

Proof. Write X_t for the price measured from entry, so $X_0 = 0$, and let τ be the first time X_t reaches $+a$ or $-b$. Without drift X_t is a martingale: its expected value tomorrow, given today, is today's value. Between the two exits it is bounded, $-b \leq X_{t \wedge \tau} \leq a$, and it leaves the interval in finite time, so the optional stopping theorem of Section 4.1 applies:

$$E[X_\tau] = X_0 = 0.$$

At τ the price is at one exit or the other, so X_τ is a two-point quantity, $+a$ with probability p and $-b$ with probability $1 - p$. Its mean by Appendix B is

$$E[X_\tau] = pa - (1 - p)b.$$

Setting the two equal,

$$p a - (1 - p) b = 0 \implies p(a + b) = b \implies p = \frac{b}{a + b}.$$

□

Proposition 22 (Renewal), page 38.

Proof. A payout returns the equity to zero and leaves the loss limit where it was, so after a payout the account is in the state it opened in. The Markov chain is Markov: what happens next depends on the state and not on how it got there. So every cycle is an independent copy of the first, pays with probability a and ends with probability $1 - a$, and the account lives until its first dying cycle. Exactly k payouts means k paying cycles and then a dying one, which has probability $a^k(1 - a)$. At least one payout is the complement of dying in the first cycle, $1 - (1 - a) = a$. The mean of the geometric law follows by differentiating the geometric series:

$$\mathbb{E}[K] = \sum_{k \geq 0} k (1 - a) a^k = (1 - a) a \sum_{k \geq 1} k a^{k-1} = (1 - a) a \frac{1}{(1 - a)^2} = \frac{a}{1 - a}.$$

The withdrawn total is $W = S_1 + \dots + S_K$. The sizes of the paying cycles are independent of how many there are, since whether a cycle pays and how much it pays are both read from the same copy of the Markov chain and the copies are independent, so the mean of the random sum is the mean count times the mean size, $\mathbb{E}[W] = \mathbb{E}[K] \mathbb{E}[S]$. The same argument on lengths gives $\mathbb{E}[L]$, the K paying cycles and the one dying cycle. For the whole pmf, the generating function of a sum of independent pieces is the product of theirs. Given $K = k$ the life is k paying lengths and one dying length, and weighting by $\mathbb{P}(K = k)$ is exactly what the unnormalised $\hat{\pi}$ and $\hat{\delta}$ do, since they carry the factors a and $1 - a$:

$$G_L(z) = \sum_{k \geq 0} \hat{\pi}(z)^k \hat{\delta}(z) = \frac{\hat{\delta}(z)}{1 - \hat{\pi}(z)},$$

the geometric series in $\hat{\pi}(z)$, which converges because $|\hat{\pi}(z)| \leq a < 1$ on the unit circle. □

Proposition 23 (The cash rate), page 47.

Proof. One account's purchases form a renewal process: a purchase starts on the day after the last one ends, and its outcome is independent of the past. The reward of a cycle is its paid cash less the fee. A refused request withdraws the equity and pays nothing, so the paid cash has mean $h \alpha B P \mathbb{E}[W]$, and the cycle lasts $\mathbb{E}[n_A] + P \mathbb{E}[L_F]$ trades. By the renewal-reward theorem the long-run reward per unit time is the mean reward of a cycle over its mean length. The N accounts add. □

B The single trade, derived

This appendix derives the mean and variance of one trade and of the equity, stated in Section 3, and the swap's place in the cost-to-risk ratio, stated in Section 8.

The mean of a two-point quantity. A quantity Y that takes the value a with probability p and b with probability $1 - p$ has expectation, or mean, equal to the probability-weighted sum

$$\mathbb{E}[Y] = p a + (1 - p) b.$$

Expectation is linear: the mean of a sum is the sum of the means, and a constant passes through it unchanged. Both facts are used below without further comment.

Zero edge fixes p . Write X_0 for the cost-free step, $+RRr$ on a win and $-r$ on a loss. Zero edge means the bracket is fair before cost, $E[X_0] = 0$. By the two-point mean,

$$pRRr - (1-p)r = 0 \implies p(RR+1) = 1 \implies p = \frac{1}{1+RR}.$$

So a two-to-one bracket wins one time in three, a one-to-one bracket one time in two, and a bracket that risks two to make one wins two times in three. Every ratio is the same bet before cost, and the rest of this paper is about what the rulebook and the cost do to the differences between them.

The step with cost. The cost comes off both outcomes, so the daily increment is $X = X_0 - c$,

$$X = \begin{cases} +RRr - c & \text{with probability } p, \\ -r - c & \text{with probability } 1-p, \end{cases}$$

and by linearity its mean is

$$E[X] = E[X_0] - c = -c.$$

The variance of one trade. Variance is the mean of the squared distance from the mean, $\text{Var}(Y) = E[(Y - E[Y])^2]$, so a constant shift leaves it unchanged and a zero-mean quantity has variance $E[Y^2]$. The cost is a constant shift and the cost-free step has mean zero, so

$$\text{Var}(X) = \text{Var}(X_0 - c) = \text{Var}(X_0) = E[X_0^2].$$

The square X_0^2 is itself a two-point quantity, $(RRr)^2$ with probability p and $(-r)^2 = r^2$ with probability $1-p$, so its mean is the weighted sum:

$$\text{Var}(X) = p(RRr)^2 + (1-p)r^2 = \frac{RR^2r^2 + RRr^2}{1+RR} = \frac{RRr^2(RR+1)}{1+RR} = RRr^2.$$

Write $\sigma^2 = RRr^2$ for it. The cost sits in the mean of a trade and nowhere in its variance.

The equity after n trades. Equity is the sum $S_n = X_1 + \dots + X_n$ of independent trades with the same law. By linearity the means add,

$$E[S_n] = \sum_i E[X_i] = -cn.$$

The variance of a sum is the sum of the variances plus twice the sum of the pairwise covariances,

$$\text{Var}\left(\sum_{i=1}^n X_i\right) = \sum_{i=1}^n \text{Var}(X_i) + 2 \sum_{1 \leq i < j \leq n} \text{Cov}(X_i, X_j),$$

where $\text{Cov}(X_i, X_j) = E[X_i X_j] - E[X_i]E[X_j]$. The identity is the definition of variance applied to the sum: the square of the sum of the centred trades is every centred trade squared, which is a variance, plus twice every product of two different ones, which is a covariance. For independent trades the mean of a product is the product of the means, so every covariance is zero and only the variances remain. Each is the variance of one trade, σ^2 , so

$$\text{Var}(S_n) = \sum_{i=1}^n \sigma^2 = n\sigma^2.$$

This is Bienaymé's identity. For correlated trades the covariances do not vanish and it fails.

The swap in the cost-to-risk ratio. Let w be the swap in pips per lot per night, negative for a debit, and ν the nights a trade is held. On L lots the swap is worth $10 w \nu L$ dollars, and it joins the round-trip cost of Proposition 1 with the opposite sign:

$$kL + 10 s L - 10 w \nu L = (k + 10 s - 10 w \nu) \frac{rB}{10\ell} = \left(\frac{k}{10} + s - w \nu \right) \frac{rB}{\ell} \text{ dollars.}$$

Dividing by B and then by r gives the cost-to-risk ratio of Section 8,

$$\gamma(\ell) = \frac{k/10 + s - w \nu(\ell)}{\ell}.$$

C The Markov chains' durations, derived

This appendix derives the duration formulas stated in Section 14.

The assessment's durations. Let v_t be the row vector of probabilities of being alive in each state after t trades. The account starts at zero, $v_0 = e_0$, and one trade moves it by Q :

$$v_t = v_{t-1} Q = e_0 Q^t.$$

The probability that the account passes on trade t exactly is the mass alive after $t - 1$ trades that the t -th trade carries through the target,

$$f_t^+ = v_{t-1} r^+, \quad f_t^- = v_{t-1} r^-,$$

and the pmf of the trades to resolve is $f_t = f_t^+ + f_t^-$. Summing f_t^+ over t gives P(pass) again, a check on the two computations. The median is the first t at which the running sum of f_t reaches one half, and the 90th percentile the first at which it reaches 0.9. The mean needs no sum over the pmf. The account is still alive before trade t with probability $v_{t-1} \mathbf{1}$, and the number of trades N satisfies $E[N] = \sum_{t \geq 1} P(N \geq t)$, so

$$E[N] = \sum_{t \geq 0} v_t \mathbf{1} = e_0 \sum_{t \geq 0} Q^t \mathbf{1} = e_0 (I - Q)^{-1} \mathbf{1},$$

the geometric series of a matrix whose rows lose mass at the exits. The duration given a pass is $f_t^+ / P(\text{pass})$.

A trade's length in days. Proposition 7 gives it for the account; the same argument gives it for one bracket in price. With the price's daily variance σ^2 , $X_t^2 - \sigma^2 t$ is a martingale, so optional stopping gives $E[X_\tau^2] = \sigma^2 E[\tau]$. By Proposition 21,

$$E[X_\tau^2] = \frac{b}{a+b} a^2 + \frac{a}{a+b} b^2 = \frac{ab(a+b)}{a+b} = ab,$$

so

$$E[\tau] = \frac{ab}{\sigma^2} = \frac{RR \ell^2}{\sigma^2} \text{ days}$$

for an uncapped bracket.

References

- [1] Prime Academy, *Rules and Conditions*, V.2, 31 August 2026. <https://primeacademyfx.com/wp-content/uploads/2026/08/Prime-Academy-Rules-and-Conditions-V2.-31.08.26.pdf>. Target, drawdown, daily loss, minimum days, leverage, commission, swaps, payout rules, distribution cap, the definition of the Funded Stage as a split of simulated net profits.

- [2] Eightcap International Ltd, *Prime Academy General Terms and Conditions*, V.2, 29 July 2026. <https://primeacademyfx.com/wp-content/uploads/2026/07/Prime-Academy-General-Terms-and-Conditionsfile.pdf>. Clause 7.2, simulated environment only; governing law, arbitration, termination, forfeiture.
- [3] Eightcap International Ltd, *Prime Academy Complaint Management Policy*, V1.0. <https://primeacademyfx.com/wp-content/uploads/2026/07/Prime-Academy-Complaint-Management-Policy-V1.0file.pdf>.
- [4] Eightcap International Ltd, *Prime Academy Participant Verification Policy*, V1.0. <https://primeacademyfx.com/wp-content/uploads/2026/07/Prime-Academy-Participant-Verification-Policy-V1.0file.pdf>.
- [5] Eightcap International Ltd, *Prime Academy Website Terms and Conditions*, V1.0. <https://primeacademyfx.com/wp-content/uploads/2026/07/Prime-Academy-Website-Terms-and-Conditions-V1.0file.pdf>.
- [6] Prime Academy, *FAQ*. <https://primeacademyfx.com/faq/>. Fetched 2026-09-10. Commission schedule, raw spreads from 0.0 pips, leverage by asset class, TradeLocker platform.
- [7] Prime Academy, *Checkout*. <https://primeacademyfx.com/checkout/>. Fetched 2026-09-09. Account size fees, and the 90% profit-share add-on measured account size by account size at $1.35\times$ the fee.
- [8] D. Williams, *Probability with Martingales*, Cambridge University Press, 1991. Chapter 10, the optional stopping theorem.
- [9] *eval_convexity*, this repository, `src/notebooks/reports/topics/eval_convexity`. The Top-step zero-edge study whose bracket engine runs the real-price control, and whose trade-count corollary reappears in Section 5.