

How to win Professional Blackjack

A probability-grounded handbook for the only beatable table game,
built on an exact solver and two million simulated hands.

Winfield

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Contents

Chapter 1 — The Dealer Has No Choices

Chapter 2 — Deriving Basic Strategy Instead of Memorizing It

Chapter 3 — The Rule Ledger: What Every Sign on the Table Is Worth

Chapter 4 — 6:5 Blackjack, the Most Expensive Sign in the Casino

Chapter 5 — Variance: What a Session Actually Feels Like

Chapter 6 — The True Count Is the Game's Only Honest Signal

Chapter 7 — Bet Ramps, Spreads, and the Risk of Ruin

Chapter 8 — Deviations and the Illustrious 18

Chapter 9 — Table Craft: Etiquette, Comps, and Staying Welcome

Chapter 10 — Side Bets and Why They Fail

Chapter 11 — The Field Test: Protocol and Predictions

Chapter 12 — Appendix: The Engine, the Charts, and the Numbers

Chapter 1 — The Dealer Has No Choices

Blackjack is the rare casino game where the house exposes its entire algorithm on a placard. The dealer hits 16, stands on 17 (or hits soft 17 where the sign says so), never doubles, never splits, and never reacts to what any player holds. That single fact is the foundation of everything in this book: a fixed opponent can be solved. Poker requires reading a human; blackjack requires only arithmetic — a large but finite recursion over the cards that remain in the shoe.

The solving happened long before laptops. Basic strategy was first worked out in the 1950s by four U.S. Army engineers — Roger Baldwin, Wilbert Cantey, Herbert Maisel, and James McDermott — later nicknamed the Four Horsemen by gambling writers ([Wikipedia¹](#)). Baldwin began the project in 1953 after a barracks poker game, when someone pointed out that a casino dealer must stand on 17 and hit 16 — fixed rules meant a computable best response ([Wikipedia¹](#)). Stationed at Aberdeen Proving Ground in Maryland, they ground through the combinatorics on desk adding machines ([Casinoz²](#), [Wikipedia¹](#)). Their results appeared in the Journal of the American Statistical Association in September 1956, and their 1957 book *Playing Blackjack to Win* contained, in a chapter on using exposed cards, the first valid card-counting system ever published ([Wikipedia¹](#)).

Edward Thorp tested their strategy on MIT's IBM computers, found it accurate to within a couple hundredths of a percentage point, developed the first strong counting system, field-tested it in Las Vegas with Claude Shannon, and published *Beat the Dealer* in 1962 — over 700,000 copies sold and a permanent change in how casinos deal the game ([Wikipedia¹](#)). At the Four Horsemen's 2008 Blackjack Hall of Fame induction, Thorp paraphrased Newton: if he had seen farther than others, it was because he stood on the shoulders of four giants ([Wikipedia¹](#)).

This book re-runs that entire program on modern hardware, with the shoe compositions and rule sets of the tables actually dealt today, and then walks it into a casino at low stakes to see whether the ledger balances.

The dealer's outcome distribution

Because the dealer's play is fixed, the probability of every dealer outcome can be computed exactly for any upcard by recursing over the remaining shoe. The engine behind this book conditions each distribution on the US peek — when the upcard is an ace or a ten and the dealer has checked for blackjack, the hole card's distribution changes, and the recursion accounts for it. The resulting bust rates for a six-deck, stand-soft-17 shoe:

Upcard	Bust probability	Upcard	Bust probability
2	35.4%	7	26.2%
3	37.4%	8	24.4%
4	39.6%	9	22.9%
5	41.8%	10	23.0%
6	42.3%	Ace (peeked)	16.6%

These figures match the published record to a tenth of a percentage point: the Wizard of Odds gives 42.28% for a 6 upcard, 41.84% for a 5, 23.02% for a ten, and 16.70% for a peeked ace in the same game ([Wizard of Odds](#)³), and independent tables at Blackjackinfo agree across the full range from 35.36% on a deuce to 16.65% on an ace ([Blackjackinfo](#)⁴).

Two structural facts fall straight out of the table. First, the dealer's bust risk peaks at 5 and 6 — the totals 12 through 16 that must draw into a ten-rich deck — which is why every stand-on-a-stiff rule in basic strategy points at upcards 2 through 6. Second, weighting by the frequency of each upcard, the dealer busts about 29% of the time overall. The dealer is not invincible; the dealer is a machine with a known failure rate.

Why the house wins anyway

If the dealer busts 29% of the time, why does the house keep the lights on? Because the player acts first. When both sides bust, the player has already lost before the dealer touches the hole card. That double-bust asymmetry is the entire native house edge — everything else (3:2 blackjacks, doubling, splitting, surrender) is partial compensation handed back to the player. Played perfectly, the compensations claw the edge down to a fraction of a percent; played by feel, they leave 2% or more on the felt. The whole art of blackjack is collecting every one of those refunds.

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Chapter 2 — Deriving Basic Strategy Instead of Memorizing It

Most books print the strategy chart as scripture. This one derives it, because a derived chart can be trusted, re-derived for any rule set, and — critically for later chapters — re-derived for any shoe composition, which is what card counting actually is.

The recursion

For each starting state (the player's two cards against a dealer upcard), the engine computes the exact expected value of every legal action:

- Stand: settle the current total against the dealer's outcome distribution.
- Hit: draw each rank with its shoe probability, then continue optimally.
- Double: draw exactly one card at doubled stakes, then settle.
- Split: play two hands each starting from one card of the pair, with resplits and the double-after-split rule modeled.
- Surrender: forfeit half the bet, where the table allows it.

The action with the highest expected value is basic strategy for that cell — not a convention, a theorem. A few cells make the logic visible (six-deck, dealer hits soft 17):

Hand	EV stand	EV hit	EV double/split	Verdict
16 vs 10	-0.542	-0.535	—	Hit, barely; surrender -0.500 beats both where offered
11 vs 6	+0.334 (hit)	+0.339	+0.678 double	Double — the single best refund in the game
8,8 vs 10	-0.538	-0.535	-0.476 split	Split even against a ten; it rescues 6 cents per dollar
10,10 vs 6	+0.677	—	+0.436 split	Never split tens; splitting burns 24 cents per dollar

Hand	EV stand	EV hit	EV double/split	Verdict
12 vs 2	-0.289	-0.253	—	Hit; the "never bust into a weak card" instinct is wrong

The 16-versus-ten row deserves a pause: the difference between hitting and standing is under one cent per dollar wagered. The most famous decision in blackjack is nearly a coin flip, which is exactly why it becomes the first strategy deviation a counter learns (Chapter 8). The 11-versus-6 row is the opposite: the double roughly doubles the hand's value. Missing doubles, not misplaying 16s, is where casual players actually bleed.

The derived chart

Run over every cell, the recursion reproduces the canonical chart for the rules being solved. The full tables for the two rule sets that matter in this book's home territory — dealer hits soft 17 on the main floor, stands on 17 in high-limit — are printed in the Appendix. The engine's chart for six decks, H17, double after split agrees cell for cell with the published standard, including the H17 signatures: double 11 against an ace, and double soft 19 against a 6.

The chart is 40 or so decisions once symmetry collapses it, and it is worth stating plainly what it buys. The engine prices each mistake directly: refusing the double on 11 against a 6 costs 34 cents per dollar wagered on that hand; standing 12 against a 2 costs 3.6 cents; declining to split 8,8 against a ten costs 6 cents. A player who makes a handful of such errors per hour gives back several times the entire structural house edge. Basic strategy is the highest-paying memorization exercise in any casino.

What the Four Horsemen got right

The engine's chart, computed in a fifth of a second, differs from the 1956 hand-calculated strategy in only a handful of marginal cells — a result Thorp verified on 1960s mainframes as accurate to hundredths of a percent ([Wikipedia](https://en.wikipedia.org/wiki/Four_Horsemen_of_the_Apocalypse_(blackjack))¹). Four soldiers with adding machines got the game essentially right seventy years ago. The modern edge is not better arithmetic; it is knowing the arithmetic for the exact rules on the sign in front of the seat, which is the subject of the next chapter.

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Chapter 3 — The Rule Ledger: What Every Sign on the Table Is Worth

Two blackjack tables ten feet apart can differ in cost by a factor of seven. The variables are printed on the felt and the placard: number of decks, soft-17 rule, doubling and resplitting rights, surrender, and the blackjack payout. This chapter prices each one.

House edges, computed exactly

The engine solves each full rule set. Published values from the Wizard of Odds' calculators and surveys, where they exist, sit beside the computed figures:

Rule set	Computed edge	Published
6 decks, S17, DAS, resplit aces, late surrender, 3:2 ("liberal Vegas")	0.26%	0.28% (Wizard of Odds ⁵)
8 decks, S17, DAS, LS, 3:2 (high-limit rooms)	0.35%	0.35% (Wizard of Vegas ⁶)
6 decks, H17, DAS, RSA, LS, 3:2	0.46%	—
6 decks, H17, DAS, LS, 3:2	0.53%	—
8 decks, H17, DAS, LS, 3:2 (main floor shoe)	0.56%	0.56% (Wizard of Vegas ⁶)
6 decks, H17, DAS, 3:2, no surrender	0.62%	—
8 decks, H17, DAS, LS, 6:5	1.92%	1.91% (Wizard of Vegas ⁶)
6 decks, H17, DAS, 6:5	1.98%	—

The engine lands within a few hundredths of a point of every published anchor. Note what the table says: the difference between the best and worst common games is not subtle. A \$15 bettor at 100 hands per hour expects to lose about \$5.90 per hour at 0.26% — and about \$44 per hour at 1.98%.

The itemized ledger

Holding a six-deck, S17, double-after-split game as the baseline, the engine prices each individual rule change, with the Wizard of Odds' independently published effects alongside:

Rule change	Computed effect	Published effect
Dealer hits soft 17	+0.22 pp to house	0.22 pp (Wizard of Odds⁷)
Blackjack pays 6:5	+1.36 pp	1.39 pp (Wizard of Odds⁷)
No double after split	+0.14 pp	—
Late surrender offered	-0.07 pp	~-0.07 pp vs ten (Wizard of Odds⁷)
Resplit aces allowed	-0.07 pp	-0.08 pp (Wizard of Odds⁷)
One deck instead of six	-0.58 pp	~-0.50 pp equivalent (Wizard of Odds⁷)
Two decks instead of six	-0.22 pp	—
Eight decks instead of six	+0.03 pp	-0.02 pp equivalent (Wizard of Odds⁷)

For calibration, the Wizard of Odds' full variation table runs from blackjack paying 2:1 (worth +2.27% to the player) down to the catastrophic "dealer pushes on 22" rule found in some variants, worth 6.91% to the house — the largest single effect on the list ([Wizard of Odds⁷](#)). Disallowing doubling entirely costs 1.48%, and disallowing splitting costs 0.57% ([Wizard of Odds⁷](#)).

Reading a Maryland casino floor

The ledger turns a casino floor into a price list. The three casinos within an hour of Washington all follow the same pattern, per a state-by-state survey ([US Casino Advantage⁸](#)):

Table	Rules	Effective edge
MGM National Harbor, \$15 floor	Continuous shuffle machine, 6:5	~2% class
MGM National Harbor, \$25 shoe	6 decks, 3:2, surrender, resplit aces	~0.5% class
Live! Casino, \$15 floor	CSM, 6:5	~2% class
Live! Casino, \$25 shoe	8 decks, 3:2, surrender, resplit aces	~0.56%
Horseshoe Baltimore, \$10 floor	CSM, 6:5	~2% class
Horseshoe Baltimore, \$50 shoe	6 decks, 3:2, H17, surrender	~0.53%
High-limit rooms (\$100-\$200)	3:2, dealer stands all 17s	~0.35%

A Wizard of Vegas review of the Live! floor prices the same three tiers at 1.91%, 0.56%, and 0.35% (Wizard of Vegas⁶) — the engine's numbers, independently. Maryland has allowed 6:5 since MGM National Harbor opened in 2016, and state rules require surrender to be offered (Blackjack Online⁹); the statewide rule document is published by the state's gaming agency (Maryland Gaming¹⁰). Community reports fill in the floor-level texture: 3:2 tables at MGM cluster toward the back of the room at \$25 minimums before 4 p.m. on weekdays (Reddit¹¹), weekend minimums at Live! push the 3:2 entry point to \$50 (Reddit¹²), and a March 2026 Horseshoe visit found \$25 eight-deck and \$50 six-deck options with surrender offered but poor penetration (Reddit¹³).

The rule: walk past every 6:5 sign, sit only at 3:2, prefer stand-17 where the bankroll can afford the room, and treat the minimum-bet difference as the price of a sevenfold cheaper game. The next chapter shows why that walk past the 6:5 table is the single highest-value decision in this book.

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Chapter 4 — 6:5 Blackjack, the Most Expensive Sign in the Casino

A blackjack pays 3:2 — \$15 wins \$22.50 — unless the felt says "Blackjack pays 6:5," in which case \$15 wins \$18. That four-and-a-half-dollar haircut on roughly one hand in twenty-one is worth, per the engine, 1.36 percentage points of edge on six decks; the Wizard of Odds prices it at 1.39 on its eight-deck baseline ([Wizard of Odds⁷](#)). Either way it multiplies the cost of a well-played game by roughly four.

The arithmetic is worth internalizing because the sign is engineered to look harmless. A natural pays 120% of the bet instead of 150% — a 30% cut to the game's single best payout, concentrated on the hands the player most wants to be dealt ([Reddit¹⁴](#)). Spread over the whole game, a 0.5% table becomes a 2.0% table, and the community that studies this game treats the sign accordingly: "never play 6:5" is as close to law as r/blackjack gets, with the same threads warning off continuous shuffle machines for good measure ([Reddit¹⁵](#)). Threads collecting "rules I refuse to play" put 6:5 first, ahead of H17 and doubling restrictions ([Reddit¹⁶](#)). A dissenting minority allows 6:5 as a cheap practice environment for beginners while conceding no counter can beat it ([Reddit¹⁷](#)).

In dollar terms at Maryland stakes: the \$15 6:5 CSM game costs about \$29 per hour of expected loss at 100 hands per hour. The \$25 3:2 shoe ten feet away costs about \$14 — a bigger bet, half the burn. The cheapest seat in the room is rarely the cheapest game. A TripAdvisor reviewer of Live! did the same arithmetic from the customer side: roughly 2% versus roughly 0.5%, a fourfold difference, with the \$15 tables all on machines ([TripAdvisor¹⁸](#)).

One more reason the 6:5 floor game fails: the continuous shuffle machine returns every discard to the shoe immediately, so the composition never deviates from neutral. Chapter 6's entire mechanism — the shoe drifting rich or poor in tens as cards leave — does not exist at a CSM table. The 6:5 CSM game is unbeatable twice over.

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Chapter 5 — Variance: What a Session Actually Feels Like

The house edge describes the average of an enormous number of hands. A session is not an enormous number of hands. This chapter is about the gap between those two sentences, because the gap is where bankrolls die and superstitions are born.

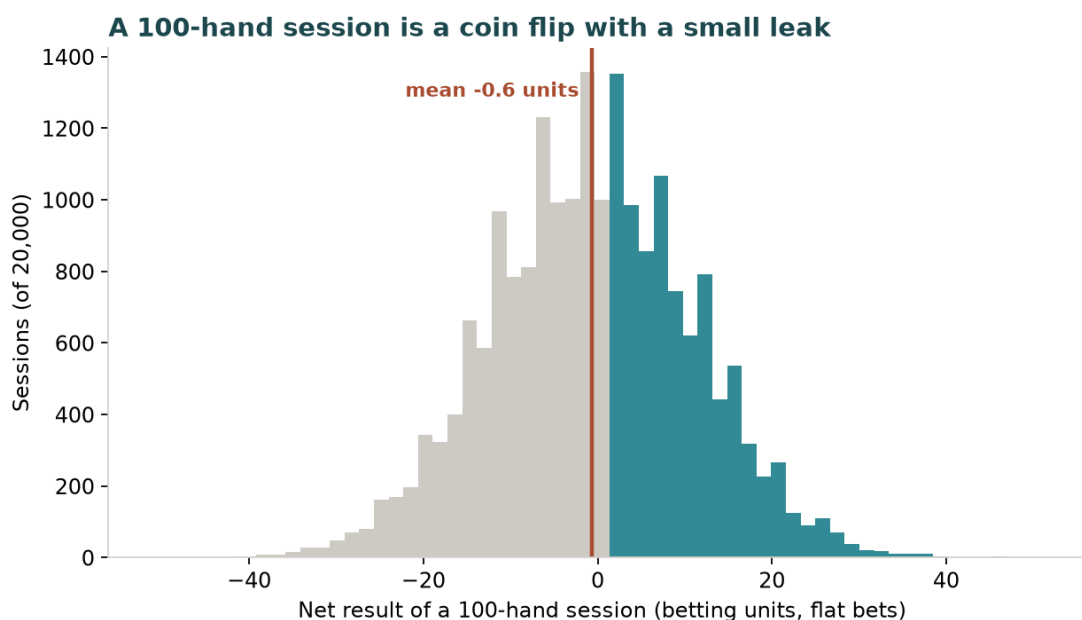
The per-hand distribution

Under liberal rules, a single hand of blackjack is a win 42.43% of the time, a push 8.48%, and a loss 49.09% ([Wizard of Odds¹⁹](#)). The engine's two-million-hand campaign on the Maryland-floor H17 rule set lands within a point of the same shape: 43.3% win, 8.7% push, 48.0% loss. The player loses more hands than are won, always; the game stays near even only because wins are fatter than losses — 3:2 naturals, doubles, and split hands that cash two bets.

The standard deviation of one hand is about 1.15 betting units against a mean near -0.005 ([Wizard of Odds⁵](#)). The noise is two hundred times the signal. Nothing about a session — a hundred hands, an evening, a weekend — is large enough for the signal to reliably surface.

Twenty thousand simulated sessions

The campaign dealt 20,000 independent 100-hand sessions, flat-betting one unit on the six-deck H17 floor game, from a seeded shoe with 75% penetration:



Distribution of 20,000 simulated 100-hand blackjack sessions

Statistic	Value (units)
Mean session	-0.65
Standard deviation	11.6
Winning sessions	47.0%
Median	-0.5
5th percentile	-19.5
25th / 75th percentile	-8.5 / +7.5
95th percentile	+18.5

Read the table honestly and three truths appear. First, nearly half of all sessions win, at a game where the player is a mathematical underdog on every deal — short-run results carry almost no information about play quality. Second, a session that swings 15 or 20 units is not a hot dealer or a cold shoe; it is one standard deviation, the expected texture of the game. Third, the mean — the only number the casino cares about — is invisible inside any single session. The casino experiences the average of thousands of players; the player experiences one noisy sample.

Stretch the horizon and the leak becomes visible. A simulated 12-hour weekend of play (1,200 hands, flat units, same rules) averages -7.5 units, wins only 42% of the time, and spans -72 to +58.5 units between its 5th and 95th percentiles. At \$15 units that is an expected loss of about \$113 with a 90% range from -\$1,080 to +\$878. Anyone planning a casino weekend should read that interval twice: the expectation is a dinner bill, the spread is a rent payment.

Bankroll arithmetic for civilians

For a basic-strategy player with no counting edge, the safest expected-loss profile is flat-betting the table minimum (888 Casino²⁰). Community rules of thumb for sizing a session stake cluster around 30 to 100 units (Casino.org²¹); the simulated 5th percentile of -19.5 units per 100 hands says why — a 20-unit buy-in survives most, not all, ordinary sessions. Expected loss scales with total action — every dollar wagered, doubles and splits included (Wikipedia²²) — so a player who wants the game to cost less has exactly two levers: fewer hands per hour, or a smaller unit. Community sizing conventions vary widely, from 600-unit bankrolls split into 120-unit sessions to 1,000 minimum bets overall with 70-bet sessions (Reddit²³). Progressions change the shape of the ride, never the slope.

The field test in Chapter 11 uses all three numbers from this chapter — the win rate, the session percentiles, and the blackjack frequency — as falsifiable predictions.

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Chapter 6 — The True Count Is the Game's Only Honest Signal

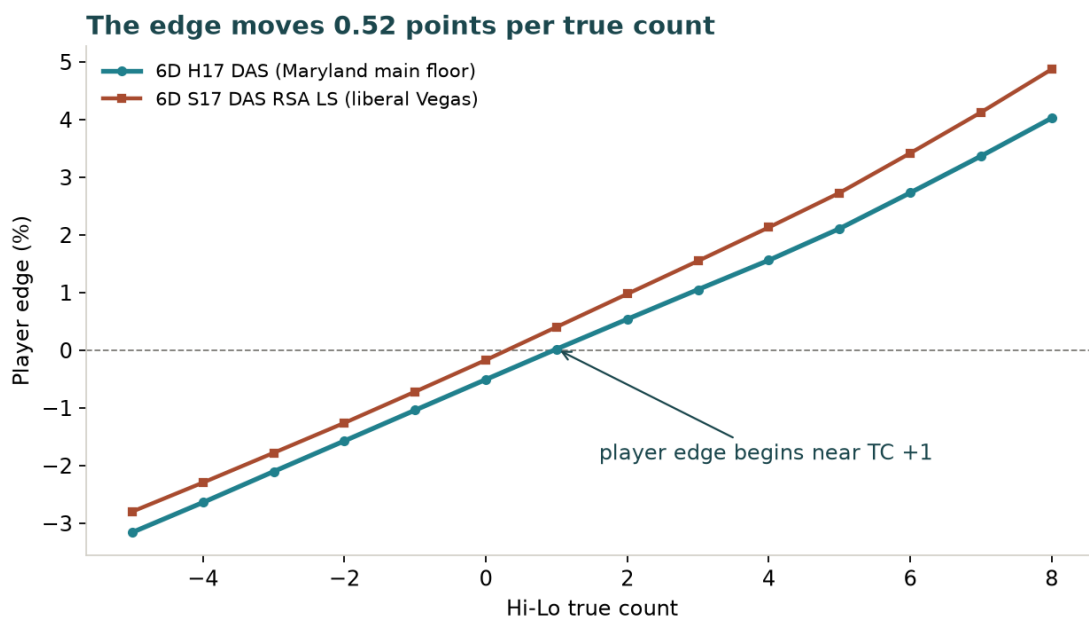
Every system sold at airport bookstores — streaks, progressions, dealer tells — fails for the same reason: consecutive rounds from a shuffled shoe are statistically independent. One thing, and only one thing, links them: the cards already dealt are gone. A shoe that has surrendered its small cards is a different game, and a measurably better one, than the shoe printed on the placard. Card counting is nothing more than bookkeeping for that drift.

Hi-Lo mechanics

The Hi-Lo system assigns +1 to each dealt 2 through 6, 0 to 7 through 9, and -1 to each ten-value card and ace ([Blackjack Apprenticeship²⁴](#)). The running count rises as the shoe sheds low cards — good for the player, since high cards fatten naturals, doubles, and dealer busts. Dividing the running count by the estimated decks remaining yields the true count, the per-deck concentration that actually drives edge ([Blackjack Apprenticeship²⁴](#)).

The exact price of a true count

Here this book departs from every counting manual on the shelf. Instead of quoting the folklore ("each true count is worth about half a percent"), the engine re-solves the entire game — every dealer distribution, every strategy cell, every house-edge summation — on shoe compositions shifted to each true count. The folklore turns out to be almost exactly right, which is worth knowing on the authority of a full recomputation rather than an approximation:



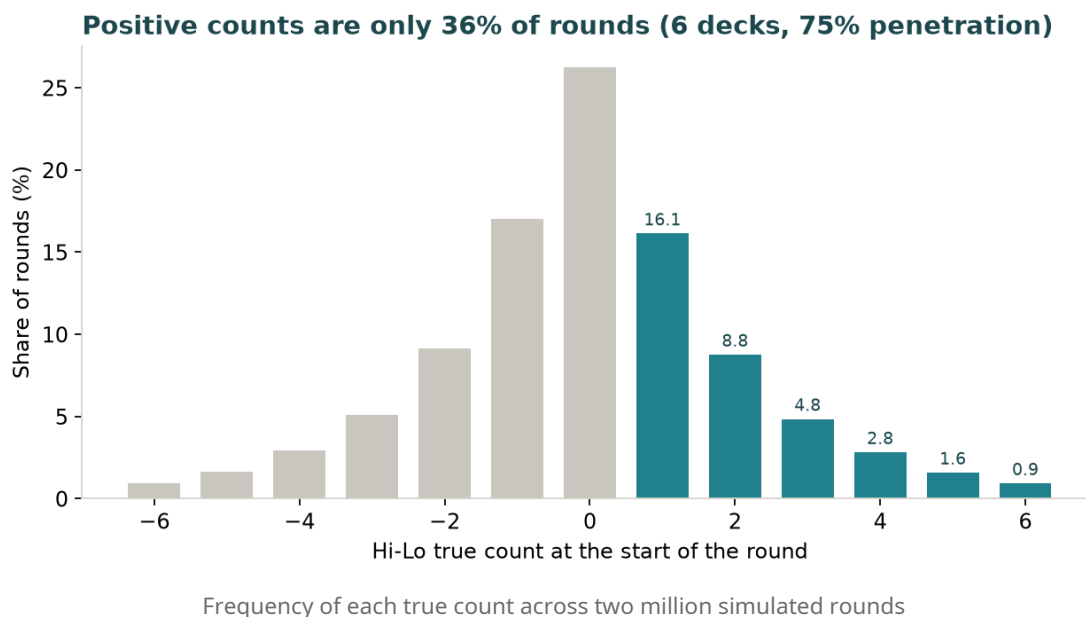
Player edge as a function of Hi-Lo true count, computed exactly

True count	Player edge, H17 floor game	Player edge, liberal S17 game
-2	-1.58%	-1.27%
0	-0.51%	-0.18%
+1	+0.02%	+0.39%
+2	+0.54%	+0.99%
+3	+1.05%	+1.55%
+4	+1.56%	+2.14%
+6	+2.73%	+3.41%

The slope is 0.517 percentage points per true count on the H17 game — the community's "roughly 0.5%" ([Blackjack Apprenticeship²⁴](#)), computed exactly. True count +1 is the breakeven line on this rule set, exactly as the doctrine says: a true count of 1 approximately erases the house edge and each point beyond adds half a percent ([Blackjack Apprenticeship²⁴](#)).

How often the good counts arrive

The signal exists; the question is its duty cycle. Tracking the true count at the start of two million simulated rounds (six decks, 75% penetration):



Only 36% of rounds begin at a true count of +1 or better, and only 20% at +2 or better, where the edge is meaningfully positive. The counter's life is mostly waiting: five hands in eight are played at neutral or negative counts where the house still wins. Everything in the next chapter — spreads, wonging, risk of ruin — is engineering around that duty cycle.

Legality and the countermeasure landscape

Counting cards with an unaided mind is legal in every U.S. jurisdiction; no federal, state, or local statute prohibits it, in the U.S. or the U.K., provided no device or confederate assists ([Wikipedia](#)²⁵). New Jersey goes further: since the Uston litigation against Resorts International around 1979, Atlantic City casinos cannot exclude players merely for skill ([Wikipedia](#)²⁵, [Bookies.com](#)²⁶). Everywhere else, casinos remain private businesses: they can shuffle early, cut penetration, flatten the spread by rule, revoke comps, bar mid-shoe entry, or ask a player to leave — and returning after a formal trespass warning is an arrest ([Wikipedia](#)²⁵, [Las Vegas Advisor](#)²⁷). Devices and team signaling are the bright line where legal play ends ([CasinoBeats](#)²⁸).

The practical summary: the count is legal to keep, the casino is free to make it useless, and the fight between those two facts is played out in penetration, spread size, and discretion — the subjects of the next three chapters.

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Chapter 7 — Bet Ramps, Spreads, and the Risk of Ruin

A counter who bets the same unit at every count has a signal and refuses to use it. The edge lives in a simple asymmetry: bet small when the shoe is against the player, bet large when it is not. This chapter prices that asymmetry, then prices its cost — because a bet spread buys expectation with variance, and variance is what destroys bankrolls.

What a spread earns

The campaign played two million rounds of the Maryland H17 floor game under four betting policies, all using full basic strategy:

Policy	EV per round (units)	Average bet	Edge on money wagered
Flat 1 unit	-0.0051	1.00	-0.51%
Spread 1 to 8 (ramp from TC +1)	+0.0086	2.11	+0.41%
Spread 1 to 12	+0.0192	3.32	+0.58%
Wong out below TC +1	+0.0162	1.47	+1.10%

Three lessons. First, the spread alone converts a losing game into a winning one — same cards, same strategy, different bet sizes. Second, bigger spreads earn more but announce themselves; a 1-to-12 spread at a \$15 table means \$15 to \$180, a pattern any floor supervisor recognizes ([Blackjack Apprenticeship²⁴](#)). Third, the quiet policy — simply leaving when the count goes bad, known as wonging — earns the highest return per dollar of action of any policy tested, at the price of playing 40% fewer hands and looking like a person who keeps leaving tables.

In dollars: the 1-to-8 spread at a \$15 unit earns about +\$13 per 100 rounds in expectation. That is the whole professional proposition at these stakes — roughly minimum wage with a five-figure bankroll at risk, which is why Chapter 11 treats counting as a field experiment rather than an income plan.

The honest risk-of-ruin table

Expectation without ruin analysis is marketing. Using the campaign's measured per-round mean (+0.0086 units) and standard deviation (3.35 units — note: triple the flat-bet figure, because the spread concentrates money on high-variance counts), the standard exponential ruin model gives the probability of losing an entire bankroll before doubling out of danger:

Bankroll (units)	Bankroll at \$15 unit	Risk of ruin
200	\$3,000	73%
400	\$6,000	54%
500	\$7,500	46%
1,000	\$15,000	21%

These figures are substantially grimmer than the reference table circulated in counting courses — 40% at 200 units, 20% at 400, 10% at 500, 1% at 1,000 ([Blackjack Apprenticeship](#)²⁹). The gap is not an error on either side. The published table assumes a stronger game than the Maryland floor: better rules, deeper penetration, a wider spread, and strategy deviations (Chapter 8) that this campaign's simulated bettor did not use. Run the same model on a thinner edge and the ruin curve rises steeply — which is precisely the point. On a mediocre game, a counter with a \$3,000 bankroll and a \$15 unit is more likely than not to go broke despite playing with a mathematical advantage. The edge is real; it is also small, slow, and violently noisy.

The professional literature's answer is fractional Kelly sizing: bet a fixed fraction of the edge-to-variance ratio, typically a half or a quarter Kelly, accepting slower growth for survival ([Blackjack Apprenticeship](#)²⁹). The field-test answer in Chapter 11 is simpler: a stake sized so that its total loss is an acceptable tuition bill.

Sources

24. <https://www.blackjackapprenticeship.com/how-to-count-cards/>

29. <https://www.blackjackapprenticeship.com/recommended-blackjack-bankroll/>

Chapter 8 — Deviations and the Illustrious 18

Basic strategy is optimal for a neutral shoe. A counted shoe is not neutral, so at sufficiently extreme counts some strategy cells flip: 16 versus ten becomes a stand, insurance becomes a buy, 10 versus ten becomes a double. Each flip has an index — the true count at which the two actions' expected values cross. The famous list of the eighteen most valuable flips is the Illustrious 18 ([CasinoAlpha³⁰](#)).

Computing the indices from scratch

Because the engine can re-solve any cell on any composition, the indices can be derived rather than copied. For each candidate deviation, the engine walks the true count in half-point steps and records where the preferred action changes. Computed indices against the published standard:

Decision	Computed index	Published index
Insurance	+3.25	+3
16 vs 10: stand	+2.0	0 (stand at TC $\geq$ 0)
15 vs 10: stand	+4.5	+4
12 vs 2: stand	+3.5	+3
12 vs 3: stand	+1.5	+2
12 vs 4: stand	0.0	0
13 vs 2: stand	-1.0	-1
10 vs 10: double	+4.0	+4
9 vs 2: double	+0.5	+1
11 vs A: double	basic (H17)	+1 (S17 games)

Published indices per the standard lists: insurance, 16 and 15 versus ten from one compilation ([Slots Paradise³¹](#)); the 10 versus ten, 12 versus 2 and 3, 11 versus ace, and 9 versus 2 indices from a second ([Blackjack Pilot³²](#)); 13 versus 2 and 12 versus 4 from a third ([CasinoAlpha³⁰](#)).

Nine of ten land within a point of the standard, and the tenth is instructive. The engine puts the 16-versus-ten stand at +2 rather than 0. At a neutral count the two actions differ by less than a cent per dollar (hit -0.529, stand -0.543 on this composition), so the crossing point is exquisitely sensitive to the composition model — the engine shifts compositions by removing low cards evenly, while the classic indices were generated with slightly different assumptions. The lesson is

not which index is right; it is that 16 versus ten is so close that the deviation is nearly free either way, which is exactly why it tops every list. The 11-versus-ace row makes the same point about rules rather than composition: on an H17 game the double is already basic strategy, so the +1 index quoted in S17-era materials simply dissolves.

What deviations are worth

The published list pairs with the Fab 4 surrender indices — surrender 15 versus ten at 0, 15 versus 9 at +2, 14 versus ten at +3, 16 versus ace at -1 ([Blackjack Pilot](#)³²) — with insurance alone the single most valuable index on the main list. The campaign's counting results in Chapter 6 were generated with pure basic strategy, so its spread EVs are conservative floors; layering the ten indices above adds on the order of a tenth of a percent of action for a modest spread. For a low-stakes field test, the honest priority order is: table selection first (Chapter 3's ledger dwarfs everything), then the spread, then insurance at +3, then the handful of stiff-hand indices — and nothing else until those are automatic.

Sources

30. <https://casinoalpha.ie/player-guides/illustrious-18-blackjack-strategy-deviations/>

31. <https://slotsparadise.com/news/blackjack/boost-your-blackjack-wins-with-the-illustrious-18/>

32. <https://blackjackpilot.com/practice/basic>

Chapter 9 — Table Craft: Etiquette, Comps, and Staying Welcome

The mathematics of the previous chapters plays out in a social room where the player is a guest, on camera, being evaluated. Table craft is the discipline of not spending the edge on friction.

Etiquette that protects the bankroll

The mechanical rules are simple and camera-enforced: wave a flat palm to stand, tap the felt to hit, place added chips beside the original bet — one finger of chips for a double, two for a split — and announce surrender verbally before drawing the diagonal line, so the motion is never mistaken for a hit signal ([Reddit³³](#)). Never stack new chips on top of an existing bet, never pull chips back before being paid, and color up before leaving the table ([Reddit³³](#)). The social rules matter just as much for a player who intends to sit for hours — and the mathematics backs the courtesy: the order of undealt cards is random, so another player's hit changes nothing in expectation, and blaming third base for the dealer's cards is superstition aimed at a stranger.

Tipping is its own small ledger. Common practice runs \$1 to \$10 depending on results, tipping after a blackjack or a winning double, or betting a chip "on the ring" for the dealer — a wager that pays the dealer when the hand wins ([Reddit³⁴](#)). One advantage player reports tipping about \$2 per hour, roughly 3% of expected win, and advises keeping tips below 5% of EV — a useful ceiling, since at the edges computed in Chapter 7 an over-generous tipper can hand the entire advantage back a dollar at a time ([Reddit³⁵](#)).

The comp equation

Comps require joining the players club and handing the card to the dealer so play can be tracked and rated ([PokerNews³⁶](#)). The rating formula is theoretical loss: the house edge the casino assumes, multiplied by total action — every dollar wagered, doubles and splits included ([Wikipedia²²](#)). The worked example from Casino Player Magazine: a \$10 flat bettor sees 80 to 120 decisions per hour, generating about \$1,200 per hour of action once doubles and splits are counted; rated at roughly 2%, that is about \$24 per hour of theoretical loss, of which the player can expect 30 to 50% back as comps ([Casino Center³⁷](#)). The subtlety: the rating assumes an average player's edge — the 2% in the example — while a basic-strategy player's actual cost on a 3:2 shoe game is a quarter of that. The comp system therefore rebates against a much worse player than the one holding the card, and the rebate covers a meaningful slice of the true cost of play. Comps are not free money; they are a mispriced refund. Take the players card, let the rating run, and never increase the bet to chase a rating.

For a counter, the card cuts both ways: it attaches a name to a betting pattern, and canceled comps sit on the standard countermeasure list ([Wikipedia²⁵](#)). The field-test protocol in Chapter 11

uses a rated card anyway, because the stakes are low and the spread is modest enough to read as recreational.

Countermeasures, revisited briefly

Everything a casino does about skilled play was listed in Chapter 6; what matters at the table is the early-warning order. First comes attention — a supervisor watching the ramp. Then come the soft countermeasures documented on the standard list: decreased penetration, preferential or irregular shuffling, rule changes, barred mid-shoe entry, canceled comps ([Wikipedia](#)²⁵). Maryland players already report the first of these as ambient — poor penetration at Horseshoe even for recreational play ([Reddit](#)¹³). The polite trespass conversation is a last resort reserved for spreads and stakes far beyond a low-stakes field test ([Wikipedia](#)²⁵). The correct response at every stage is the same: color up, thank the dealer, and take the edge somewhere it is still welcome.

Sources

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25. https://en.wikipedia.org/wiki/Card_counting
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Chapter 10 — Side Bets and Why They Fail

Every shoe game in Maryland carries side-bet felts — Perfect Pairs, 21+3, Lucky Ladies — and every one of them exists because the main game's edge is too thin for the house's taste. The numbers are not close. Perfect Pairs runs a house edge of roughly 2 to 11% depending on the payable, 21+3 runs roughly 2.7 to 10%, and Lucky Ladies reaches 17% ([Betting News](#)³⁸); a single-deck 21+3 analysis puts that version at 13.39% ([British Casino Awards](#)³⁹). Insurance, the oldest side bet on the felt, pays 2:1 and carries a house edge community sources class alongside the other side bets to avoid ([Betting News](#)³⁸); the engine prices it at 7.1 cents lost per dollar at a neutral count. It becomes the single most valuable deviation in the game near true count +3, and is a plain donation below it.

The structural argument is worth more than the percentages. A side bet's payable is fixed against the same shoe as the main game, but without the player agency — no hitting, doubling, or splitting — that claws the main game's edge down. Strip the decisions and what remains is a lottery ticket priced ten to forty times worse than the hand it rides on. A player putting \$5 on Lucky Ladies alongside a \$15 main bet has quietly tripled the expected cost of the round.

The counting footnote: a few side bets become countable with specialized systems — Lucky Ladies is famously vulnerable to a ten-count — but the required counts arrive rarely and the bet ceilings are low, which is why they remain on the felt. For this book's purposes the rule has no exceptions worth the ink: the main game at 3:2 is the only wager on the table with a defensible price.

Sources

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Chapter 11 — The Field Test: Protocol and Predictions

This series treats every book as a laboratory report with a field component. The mathematics in Chapters 1 through 10 makes specific, falsifiable predictions about what a low-stakes player will observe at a real table. This chapter fixes the protocol and registers the predictions before the first chip is bet.

Venue and game selection

Per the Chapter 3 ledger, the qualifying games within reach of Washington are the 3:2 shoes, never the 6:5 CSM floors:

Priority	Venue and game	Rationale
1	MGM National Harbor, \$25 six-deck 3:2 shoe	Best rule set at the lowest 3:2 minimum: surrender and resplit aces (US Casino Advantage⁸); back-of-room tables, weekday afternoons (Reddit¹¹)
2	Live! Casino, \$25 eight-deck 3:2 shoe	0.56% game (Wizard of Vegas⁶); weekday sessions avoid \$50 weekend minimums (Reddit¹²)
3	Horseshoe Baltimore, \$25 eight-deck shoe	Acceptable backup; reported poor penetration makes counting marginal (Reddit¹³)

Disqualified without exception: any 6:5 payout, any continuous shuffle machine, any table forbidding double after split.

Protocol

Two sessions of roughly 100 hands each, \$15 or \$25 units per the table minimum, bankrolled at 40 units per session with the total stake written down as tuition before entering. Session A: pure basic strategy, flat bets, rated card in. Session B: basic strategy plus a Hi-Lo count kept for observation, a modest 1-to-4 spread from true count +1, insurance taken at +3 and the two cheapest stiff indices from Chapter 8 — nothing else. Hands, net result, dealt blackjacks, dealer busts, and maximum drawdown are logged per shoe on a phone note or a pocket card.

Registered predictions

From the engine and the twenty-thousand-session campaign, with all figures per 100 hands at flat units unless stated:

Observable	Prediction	Source of figure
Dealt blackjack (player)	about 1 hand in 21; paid 1 in 22 after dealer-push naturals	engine deal frequencies
Dealer bust rate	about 29% of resolved dealer hands	Chapter 1 distribution
Hands won / pushed / lost	approximately 43 / 9 / 48	campaign outcome rates
Session net, one session	median near -0.5 units; middle half between -8.5 and +7.5	session distribution
Chance the session is a winner	just under 50%	session distribution
Two-session total (200 hands)	mean near -1.3 units; 90% of outcomes within roughly ± 27	session distribution scaled
Count observation	true count reaches +2 or better in roughly one round in five	duty-cycle histogram

The failure conditions are as important as the predictions. If the observed dealer bust rate over two sessions lands wildly off 29%, the log is more likely miscounted than the shoe biased. If both sessions lose 30+ units, that is the 1-in-50 tail, not proof the engine is wrong — but three consecutive such trips would justify auditing the game for unnoticed rule differences (a hit-soft-17 sign misread, a double restriction missed). The point of registering predictions is that surprise becomes information instead of tilt.

What the test cannot show

Two hundred hands cannot distinguish a 0.5% house edge from a 0.5% player edge; Chapter 5 showed the noise is orders of magnitude too large. The field test validates the observable mechanics — deal frequencies, bust rates, outcome mix, variance texture — and rehearses the craft: game selection, bet discipline, logging, and walking past the 6:5 sign. Anyone who wants the long-run edge to show up in a bank statement needs the Chapter 7 table: a four-figure bankroll in units, hundreds of hours, and a tolerance for 20% ruin odds even played perfectly. That is the honest price of "winning" at professional blackjack, and knowing the price is the win.

Sources

6. <https://wizardofvegas.com/articles/maryland-live/>
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Chapter 12 — Appendix: The Engine, the Charts, and the Numbers

Every figure in this book traces to a deterministic computation or a seeded simulation in the gamestats codebase (Python, standard library only). This appendix documents the machinery so the results can be reproduced, audited, or re-derived for a different casino's rule card.

Architecture

The engine has five parts. First, `rules.py` encodes a rule set — decks, soft-17 behavior, double-after-split, resplit aces, surrender, payout, peek — as an immutable object, with presets for the rule sets in this book. Second, `ev.py` computes exact dealer outcome distributions by recursion over the remaining composition, conditioned on the US peek, then computes player expected values for stand, hit, double, split, and surrender; split EVs use an expected-hands recursion that models resplits. Third, `strategy.py` derives the total-dependent basic strategy chart by taking the argmax action in every cell, and composes the overall house edge by weighting every starting hand by its deal probability. Fourth, `counting.py` prices true counts by re-solving the full game on representative shifted compositions — for each positive count it removes low cards evenly and restores tens and aces pro rata (16:4), scaled to the decks remaining, then reruns the entire edge computation. Fifth, `simulate.py` deals seeded shoes hand by hand for the session, trip, and spread campaigns.

Approximations and their limits

Honesty about the model is part of the method. The dealer and EV recursions are composition-aware at the moment of the deal but freeze the draw distribution for the remainder of a single hand's recursion — a standard simplification whose error appears in the fourth decimal place of the house edge. Split hands in the simulator finish aces with a two-card rule and no ace resplit unless the rule set allows it. The true-count compositions are representative rather than exhaustive: a real +3 shoe can arrive by many removal paths, and the engine's evenly-shifted composition is the central case. These choices are why computed indices in Chapter 8 can sit a point from published values on razor-thin cells, and why every headline number was validated against the published record before use.

The validation table

Quantity	Engine	Published
House edge, liberal Vegas 6-deck	0.2615%	0.28% (Wizard of Odds ⁵)
House edge, Live! 8-deck H17 floor	0.5570%	0.56% (Wizard of Vegas ⁶)

Quantity	Engine	Published
House edge, 8-deck 6:5	1.9150%	1.91% (Wizard of Vegas ⁶)
House edge, high-limit 8-deck S17	0.3549%	0.35% (Wizard of Vegas ⁶)
Dealer bust, 6 up	42.31%	42.28% (Wizard of Odds ³)
Dealer bust, ace up (peeked)	16.64%	16.70% (Wizard of Odds ³)
H17 cost	+0.218 pp	+0.22 pp (Wizard of Odds ⁷)
6:5 cost	+1.36 pp	+1.39 pp (Wizard of Odds ⁷)
Resplit aces value	-0.070 pp	-0.08 pp (Wizard of Odds ⁷)
Win / push / loss per round	43.3 / 8.7 / 48.0%	42.4 / 8.5 / 49.1% (Wizard of Odds ¹⁹)
Breakeven true count	+1 (H17)	~+1 doctrine (Blackjack Apprenticeship ²⁴)
Edge slope per true count	0.517 pp	~0.5 pp doctrine (Blackjack Apprenticeship ²⁴)

Simulation campaign summary

All simulations are seeded and reproducible. Sessions: 20,000 sessions of 100 rounds, seed 20260716, six-deck H17 floor rules, 75% penetration. Trip horizon: 5,000 trips of 1,200 rounds, seed 31415. Counting and spreads: 2,000,000 rounds, seed 777, Hi-Lo tracked per round, four betting policies evaluated on identical shoes. Risk of ruin: analytic exponential model on the measured spread mean and variance. The full campaign runs in under a minute on two vCPUs and writes every table in this book to versioned JSON.

The derived H17 basic strategy chart

Hard totals (H = hit, S = stand, D = double else hit, R = surrender else hit):

Player	2	3	4	5	6	7	8	9	10	A
8 or less	H	H	H	H	H	H	H	H	H	H
9	H	D	D	D	D	H	H	H	H	H
10	D	D	D	D	D	D	D	D	H	H
11	D	D	D	D	D	D	D	D	D	D
12	H	H	S	S	S	H	H	H	H	H

[illegible]

Soft totals (Ds = double else stand):

[illegible]

Pairs (P = split):

[illegible]

Player	2	3	4	5	6	7	8	9	10	A
A,A	P	P	P	P	P	P	P	P	P	P

Chart conventions follow the standard total-dependent form; surrender rows apply only where the table offers late surrender, per Maryland's standard rules ([Maryland Gaming](#)¹⁰).

Reproduction

From the gamestats repository root: run the test suite with pytest (26 tests covering dealer distributions, EV cells, chart cells, and edge composition), then run `scripts/run_campaign.py` to regenerate every JSON result, and `scripts/make_charts.py` to regenerate the three figures. All randomness is seeded; every number in this book regenerates bit-identically.

Sources

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