

Game Theory in Practice: A Tale of Two Hands

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Goals of This Talk

✧ Goals:

- Learn to apply game theory at the table
- Provide tools to become critical consumers of poker advice
- Tools to continue developing game

Structure of This Talk

✧ Anatomy of a poker hand

- Typical/exploitive play
- Game theoretic play
- Game theory-informed exploitive play

✧ Digressions

- Tells
- Decision-making biases
- Harry Potter

First, some hands

Hero: 1,800,000
Villain: 2,700,000
Blinds: 12k-24k
Ante: 3k

Hero (2 off button): A  A  raise to 65,000,
Villain calls from BB

Flop: K  J  8 

Villain checks, hero bets 75,000, Villain calls

Turn: 5 

check, hero bets 205,000, villain calls

River: K 

POT = 720,000

Villain bets 1,080,000 – What's your play?







**FULL
Tilt**
POKER.NET

**MAKE
THE
MOUTH**



Three (exploitive) Strategies

- ✧ My hand vs. your hand
- ✧ My hand vs. your distribution
 - Distribution: *the frequency distribution of hands a player might hold, given all the action that has occurred*
- ✧ My distribution vs. your distribution

TMI, Even in Poker

- ✧ Tells don't work like that
- ✧ The Siren song of reads
- ✧ End the vicious cycle of leveling!

*"The trouble is, the other side can
do magic too"*

-Cornelius Fudge

Meanwhile, over in Greece . . .

1. *Know Thyself*
2. *Nothing in Excess*
3. *Make a Pledge and Mischief is Nigh*



AKQ Game

- ✧ Three card deck with A, K, Q
- ✧ High card wins
- ✧ A are nut hands, K is bluff catcher, Q is bluff

River Decision

✧ Recall:

- Solve for the calling frequency that makes Y indifferent to bluffing

$$\begin{array}{c} \text{Loses when X calls} \\ \text{(pot size) * (frequency X folds)} \end{array} = \begin{array}{c} \text{Y wins when X folds} \\ \text{(bet size) * (frequency X calls)} \end{array}$$

- **Call** = $1 / (1+S)$ of hands that can beat a bluff
- $\alpha = S / (1+S)$ = ratio of bluffs to value bets

How is this different from pot odds?

Mapping the AKQ Game

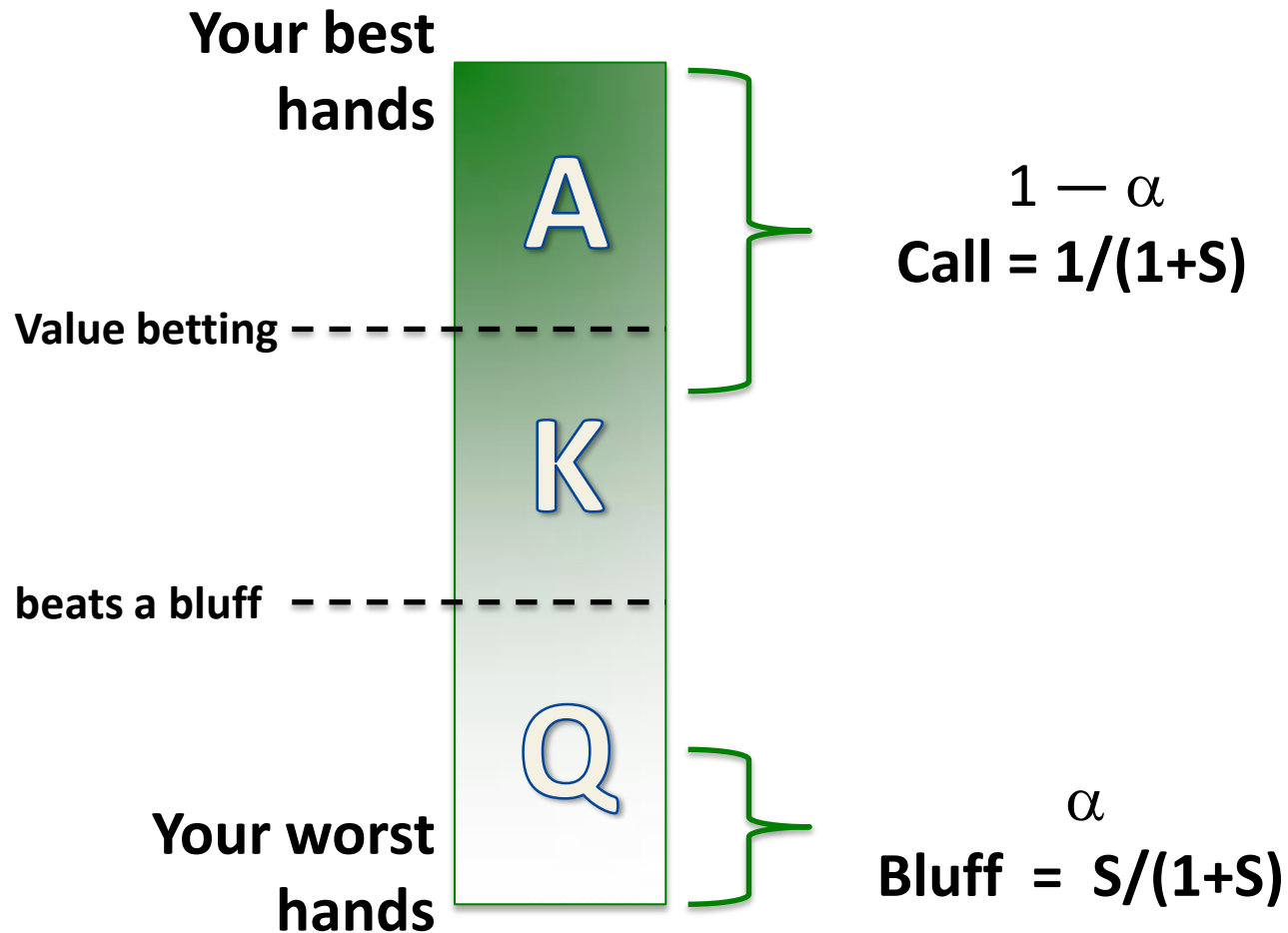
✧ For betting:

- Choose the worst hand you would value bet
(maps to an Ace)
- Bluff α of your worst hands
(maps to a Queen)

✧ For calling:

- Choose the worst hand that can beat a bluff
(maps to a king)
- Call with top $(1 - \alpha)$ of that region

Which hands?



Read Your Own Hand

- ✧ What you do with one hand depends on what you'd do with your other hands
- ✧ Most important skill in poker
- ✧ Two updates for each street:
 - Account for card removal
 - Weight the decision node

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Preflop Distribution

	Hand	Combos		Hand	Combos
pairs	22	6	no gap	AK	16
	33	6		KQ	16
	44	6		QJ	16
	55	6		JT	16
	66	6	one gap	86s	4
	77	6		97s	4
	88	6		T8s	4
	99	6		J9s	4
	TT	6	2 gaps	QT	16
	JJ	6		KJ	16
suited conn	QQ	6		AQ	16
	KK	6		KT	16
	AA	6	3 gaps	AJ	16
	T9s	4		K9s	4
	98s	4		AT	16
	87s	4		A2s-A9s	32
	76s	4	total		
	65s	4			
				total	310

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Flop Update

K♥ J♦ 8♠

Hand	Combos	Hand	Combos
22	6	AK	16
33	6	KQ	16
44	6	QJ	16
55	6	JT	16
66	6	86s	4
77	6	97s	4
88	6	T8s	4
99	6	J9s	4
TT	6	QT	16
JJ	6	KJ	16
QQ	6	AQ	16
KK	6	KT	16
AA	6	AJ	16
T9s	4	K9s	4
98s	4	AT	16
87s	4	A2s-A9s	32
76s	4	total	310
65s	4		

Flop Action

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Villain bets 1,080,000 – What's your play?

Flop Action Update

Villain checks,
hero bets 75,000

Hand	Combos	Hand	Combos
22	6	AK	12
33	6	KQ	12
44	6	QJ	12
55	6	JT	12
66	0	86s	0
77	0	97s	0
88	3	T8s	0
99	0	J9s	3
TT	0	QT	16
JJ	3	KJ	9
QQ	6	AQ	0
KK	3	KT	12
AA	6	AJ	12
T9s	4	K9s	4
98s	0	AT	0
87s	0	A2 A9s	0
76s	4	total	161
65	4		

Turn + Turn Action

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Villain bets 1,080,000 – What's your play?

Turn Action Update

K♥ J♦ 8♠ 5♣

Villain checks,
hero bets 205,000,
Villain calls

Hand	Combos
------	--------

22	0
---------------	--------------

33	0
---------------	--------------

44	0
---------------	--------------

55	3
----	---

88	3
----	---

JJ	3
----	---

QQ	6
----	---

KK	3
----	---

AA	6
----	---

T9s	4
-----	---

76s	4
-----	---

65s	0
----------------	--------------

Hand	Combos
------	--------

AK	12
----	----

KQ	12
----	----

QJ	12
----	----

JT	0
---------------	--------------

J9s	0
----------------	--------------

QT	16
----	----

KJ	9
----	---

KT	12
----	----

AJ	12
----	----

K9s	4
-----	---

total	121
-------	-----

River Action

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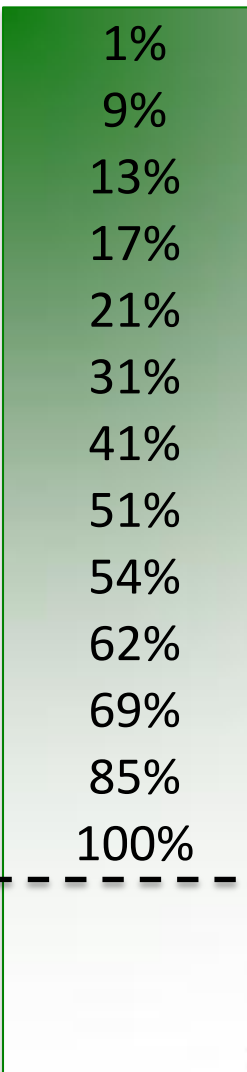
Villain bets 1,080,000 – What's your play?

Some Math

$$S = 1,080,000 / 720,000 = 1.5$$

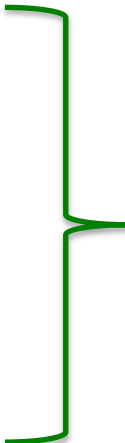
$$\text{Call} = 1.5 / (1 + 1.5) = 40\%$$


Know
Thyself!



KK	1%
KJ	9%
JJ	13%
88	17%
55	21%
AK	31%
KQ	41%
KT	51%
K9s	54%
AA	62%
QQ	69%
AJ	85%
QJ	100%
QT	
T9s	
76s	

beats a bluff


$$\text{Call} = 1/(1+S)$$



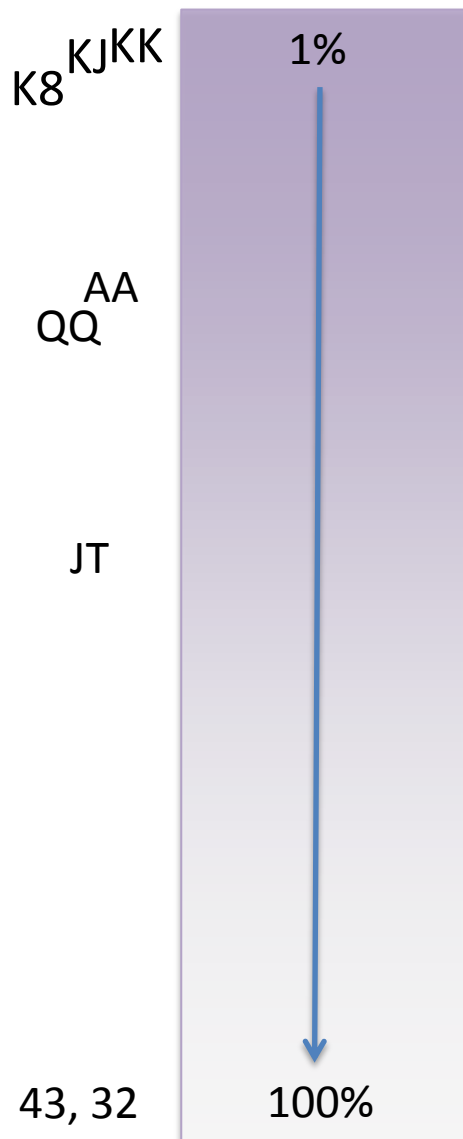
Nothing in
excess!

Recap

✧ Solved! Fold AA, Fold AJ, Even fold KQ

Not so fast . . .

✧ Gut check: Do we want a distribution where we have to fold trips?



- Model assumes balance of value bets, bluff catchers and bluffs!
- **Rule of thumb:** if you'd bet it for value, you want a distribution where you don't have to fold it
- Correlate pot size to hand strength
- **Digression:** Fundamental Theorem of Chasing

Turn Action Update

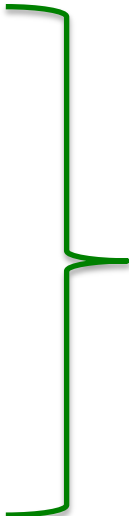
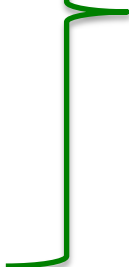
K♥ J♦ 8♠ 5♣

Hero bets 205,000

Hand	Combos	Hand	Combos
22	0	AK	12
33	0	KQ	12
44	0	QJ	12
55	3	JT	12
88	3	J9s	3
JJ	3	QT	16
QQ	6	KJ	9
KK	3	KT	12
AA	6	AJ	12
T9s	4	K9s	4
76s	4		
65s	0	total	136

- We can fix our river distribution by adding more value hands in on the turn

- That's a start . . .

KK	1%	 $\text{Call} = 1/(1+S)$
KJ	8%	
JJ	11%	
88	14%	
55	17%	
AK	26%	
KQ	34%	
KT	43%	
K9s	45%	
AA	52%	
QQ	58%	
AJ	71%	
QJ	84%	
JT	97%	
J9s	100%	
beats a bluff	-----	
QT		
T9s		
76s		

- Can also construct distribution where we call with AA

	KK	1%	} Call = 1/(1+S)
	KJ	6%	
	JJ	9%	
	88	11%	
	55	14%	
	AK	21%	
	KQ	27%	
	KT	34%	
	K9s	36%	
	AA	41%	
	QQ	46%	
	AJ	56%	
	QJ	67%	
	JT	77%	
beats a bluff	J9o, J8o, J7s	100%	
	QT		
	T9s		
	76s		

One more thing about that turn . . .

Hand	Combos	Hand	Combos
22	0	AK	12
33	0	KQ	12
44	0	QJ	12
55	3	JT	12
88	3	J9s	3
JJ	3	QT	16
QQ	6	KJ	9
KK	3	KT	12
AA	6	AJ	12
T9s	4	K9s	4
76s	4		
65s	0	total	136

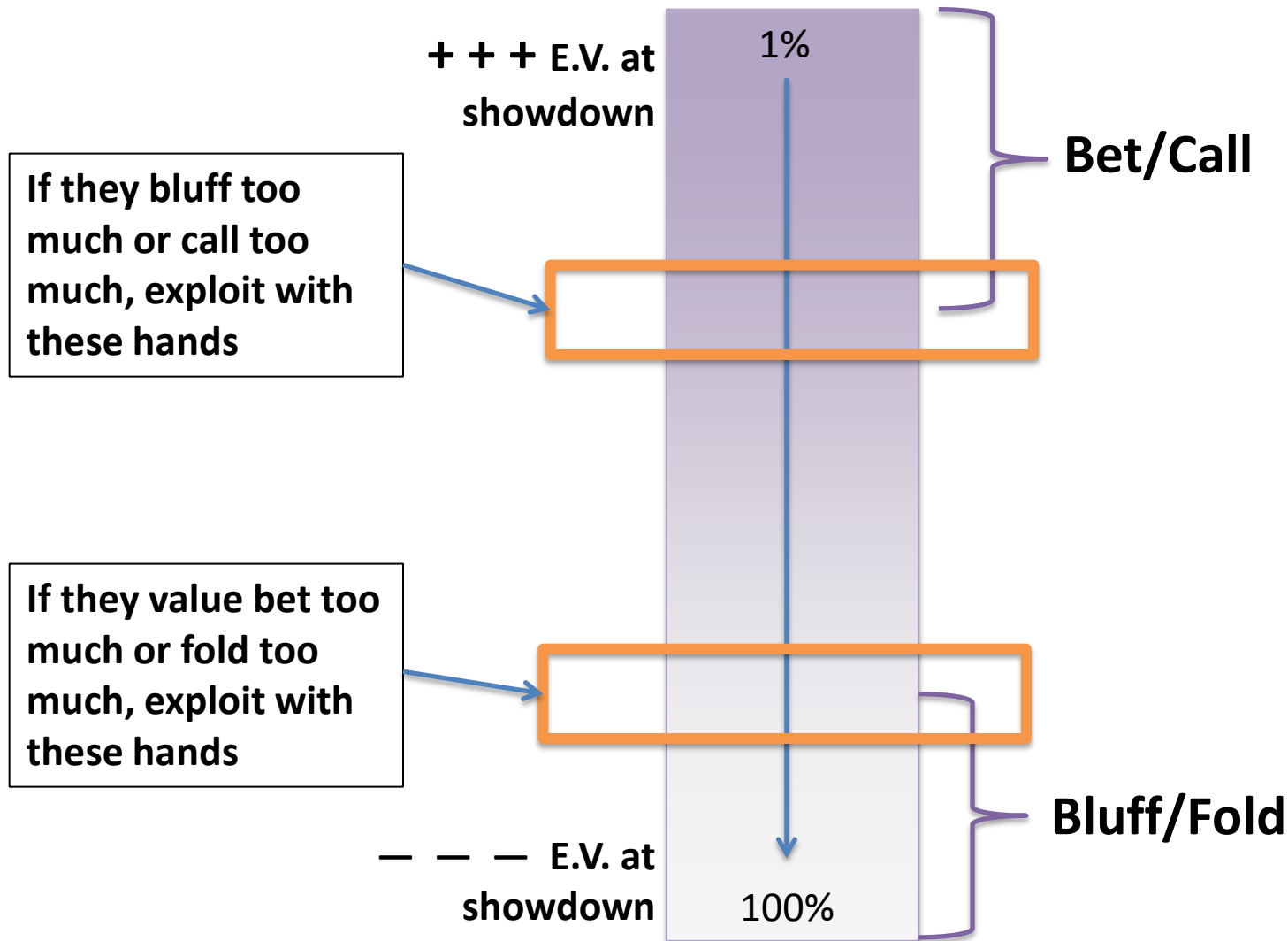
✧ For this bet size, $\alpha = 0.4$

✧ In this distribution, we are only bluffing 18%

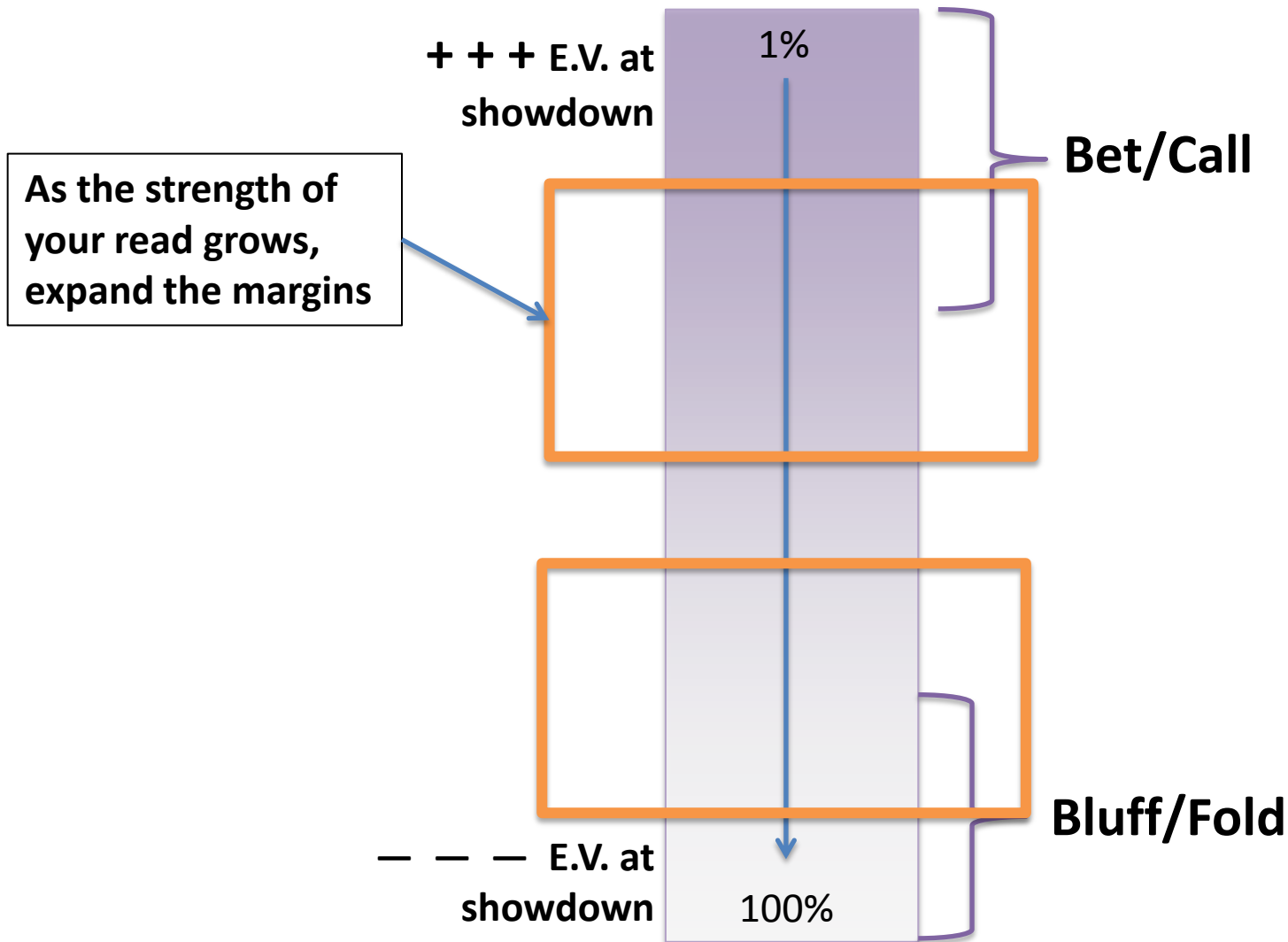
RYOH Redux

- ✧ Fix the glaring errors
- ✧ Don't needlessly bifurcate your distribution: bet the same amount with all hands!
- ✧ Do the tree for all possible actions, not just the path you took
- ✧ Identify where you tend to become imbalanced, then look for that in opponents

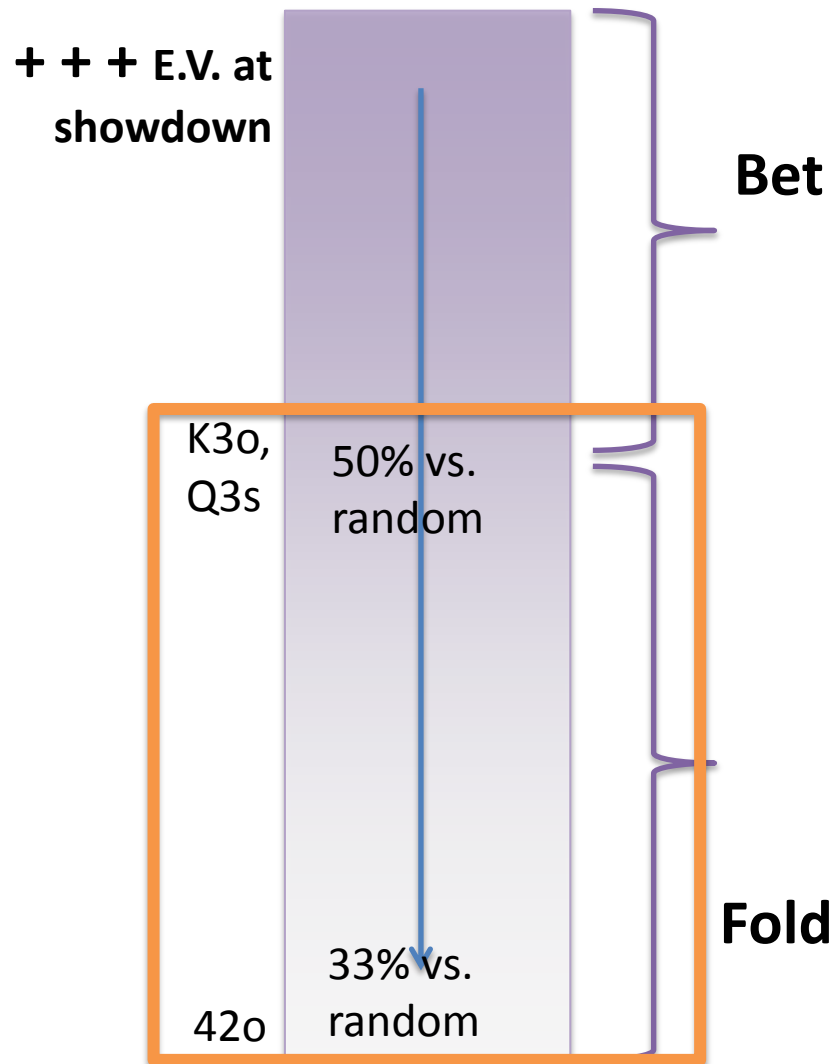
Exploit at the Margins



Exploit at the Margins



Return of 42o



With our Example Hand

nd

KK	1%	}	Call = 1/(1+S)
KJ	8%		
JJ	11%		
88	14%		
55	17%		
AK	26%	}	
KQ	34%		
KT	43%		
K9s	45%		
AA	52%		
QQ	58%	}	
AJ	71%		
QJ	84%		
JT	97%		
J9s	100%		
QT			
T9s			
76s			

beats a bluff

Exploit Downstream

✧ Don't forget about this part of the equation!

$$\alpha = S / (1 + S)$$

Remember These Four Things

1. Know Thyself
2. Nothing In Excess
3. Make a Pledge and Mischief is Nigh
4. Exploit at the margins

