If the stake is fixed in advance, you choose to bet $0 \leq B \leq A$; i.e., your (bot-tal) action space is $\mathcal{S}_B := \{0 \leq B \leq A\}$ (uncountably infinite action space).

You can bet with (known) probability $0 < p < 1$.

$\mathbb{E} =$ value of stake after sample if win, stake goes from $A$ to $(A+B)$

lose $(A-B)$ as $p$, optimal $B^*$
\( f(x) = \begin{cases} 
1 & \text{if } x = A + B \\
A - B & \text{else} 
\end{cases} \)

\[ U_1(\mathbf{x}) = A \]

\[ U_2(\mathbf{x}) = 1 + \log(\mathbf{x}) \]

Case 1: \( U_1(\mathbf{x}) = A \)

\[ E[U_1(\mathbf{x})] = E(A) \]

\[ = (A + B) p + (A - B)(1 - p) \]


\[ = 2 p B - B = B(2 p - 1) + A \]

Holding \((A, p)\) constant this is linear in \(B\), optimal \(B^*\) minimizes \(E[U_1(\mathbf{x})]\)
usual method: \[ \frac{d}{d\theta} E[U(B)] = 0 \] set \( d \theta \) solve for \( B \)

\[ E[U(B)] = A + B(2\mu - 1) - g(B) = 0 \quad \text{iff} \quad \mu = \frac{1}{2} \]

\[ S(B) = A + B(2\mu - 1) \]

\( y \)-intercept \( A \)

slope \( < 0 \) if \( \mu < \frac{1}{2} \)

slope \( = 0 \) if \( \mu = \frac{1}{2} \)

slope \( > 0 \) if \( \mu > \frac{1}{2} \)
\[ s(B) = A + B(2p-1) \]

\[ = A \quad \text{(constant)} \]

\[ s(A) = A + A(2p-1) = A + 2pA - A = 2pA \]

Feasible B: \[ 0 \leq B \leq A \]

\[ p < \frac{1}{2} \]

\[ E[u(B)] \]

\[ B^* = 0 \]

Reasonable because you expect to lose.

\[ p = \frac{1}{2} \]

\[ B^* = \text{any amount between 0 and } A \]
$S(B) = A + B (2 \mu, \nu)$

$S(A) = 2 \nu \mu$

$B^* = A (\beta + i + 11)$

Now, instead,

$U_2(X) = 1 + \log(X)$

$E[U_2(X)] = E[1 + \log(X)]$

$= 1 + E[\log(X)]$

**Lotus**

$= 1 + \log(A + B) \cdot p + \log(A - B) \cdot (1 - p)$

We won't converge.
\( P(0; \frac{1}{2}) \)  

\[
\begin{align*}
\frac{d}{d\theta} E(U_2(\theta)) &= \frac{A(2p-1) - B}{(A-B)(A+B)} = 0 \\
\text{if } B &= B^* = A(2p-1) = 2A(p-\frac{1}{2})
\end{align*}
\]