I. CLAIRVOYANCE COIN GAME

Setup: two players, A and B. The game is *not* zero-sum: at the beginning there's P in the pot. Player A flips a coin and looks at it. Player B cannot see the coin. Player A wins when the coin is head and looses otherwise. Player A can make a bet of b after he sees the card. Player B can call or fold if A bets. If A just checks then B also checks. The expected winnings for A strategy in which it bluffs q of the tails and bets every head, and B calls r of the times, is

$$
\begin{aligned}
E[W_A] &= \frac{1}{2}\left(r\left(P+b\right)+\left(1-r\right)P\right)+\frac{1}{2}\,q\left(r\left(-b\right)+\left(1-r\right)P\right) && (1)\\
&= \frac{1}{2}\,rb+\frac{1}{2}P+\frac{1}{2}q\left(P-(P+b)r\right)\,, && (2)\\
E[W_B] &= \frac{1}{2}\,r\left(-b\right)+\frac{1}{2}\left(q\,r\left(P+b\right)+\left(1-q\right)P\right) && (3)\\
&= \frac{1}{2}\,P(1-q)+\frac{1}{2}\,r\left(q(P+b)-b\right)\,. && (4)
\end{aligned}
$$

Therefore A in order to minimize earnings of B, and at the same time make B indifferent to B's call rate, will bluff $q = P/(P+b)$ times. Similarly B in order to make A indifferent to its bluff rate, and to minimize A's earnings, will call $r = b/(P+b)$ times.