ON THE EXPECTED VALUE OF RECURRENT GAMES OF CHANCE

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ABSTRACT. We define a recurrent game of chance, then provide formulas for calculating it's expected value

1. INTRODUCTION

Recurrent game of chance definition.

A betting game that starting with an original bet and a set of probabilities associated with differente payoffs recursively applies this game conditions to the result of each succesive step of the game.

x_0 initial ammount

2. SIMPLE EXAMPLE

x_0 is the original ammount.

Two possible outcames for each step with equal probability defined as having the current ammount multiplied by one of two coefficients (b, b') with equal probability.

p(b) = p(b') = 0.5

b >b' >0

Result of the recurrence at infinity:

if b' >1/b tends to infinity

if b' <1/b tends to 0

if b'= 1/b tends to x_0

Explain result geometrically–

Rant about b' = 1/b is the exact definition of a fair game.. go on about pascal triangle and binomial distribution

3. MULTIPLE OUTCAMES WITH EQUAL PROBABILITY

m number of possible outcames, each with same probability and associated with a coefficient b_1 to b_m

Result of the recurrence at infinity:

Let's define s = $\prod_{i=1}^{m} b_i$

if s >1 tends to infinity

if s <1 tends to 0

if s = 1 tends to x_0

Prove algebraically.

4. MULTIPLE OUTCAMES EACH WITH IT'S OWN PROBABILITY

m number of possible outcames, each with it's own coefficient b_i and it's own probability p_i
Result of the recurrence at infinity:
Let's define s = $\prod_{i=1}^{m} mp_i b_i$
if s $>$1 tends to infinity
if s $<$1 tends to 0
if s = 1 tends to x_0
Examine distributions of probabilities.. this one is harsher.. to prove
Define expected value of recurrence r_n
$r_0 = x_0$
$r_n = sr_{n-1}$
Explain based on the definition of the general expected value formula

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