Math BEhind Tamerlane

This link explains basic concepts behind counterbet discussed below: <http://math.stackexchange.com/questions/294329/need-help-with-proof-for-arbitrage-betting>.

Three outcomes:

* Home (payoff = h)
* Away (payoff = a)
* Draw (payoff = d)

If we bet H on Home @ 1+h then counterbet criteria is:

1. Total counterbet amount < H\*h

*[This is when Home wins]*

1. Pft from counterbet > H

*[This is when Home loses]*

**Aim** is to maximise the min of following two values:

1. H\*h – counterbet amount
2. Counterbet pft – H

In other words: **Maximise counterbet pft with minimum counterbet amount.**

Since counterbet profit is easily maximised for a given amount (see the link at the top of the page); the approach should be to:

1. Start with min counterbet amount and increment it in each iteration till we reach H\*h
2. In each iteration take min of following two values and put it in a collection

Value1 = H\*h – counterbet amount

Value2 = counterbet pft – H

1. Where max of the collection of mins above occurs is where we need to place the counterbet.

HOWEVER!! Because both values (1 & 2 above) are linear functions of counterbet amount, and because when value1 increases, value2 decreases, we don’t have to go through iterations. The maximum value is where value1 and value2 intersect, i.e. where:

**H\*h – counterbet amount = counterbet profit – H**

Remember that counterbet profit = counterbet amount \* (1/K – 1) where K = Arbitrage Percentage (see <http://www.sportsbettingworm.com/arbitrage-calculations/index.html>)

## Key Stats

**Max Counterbet Amount = H\*h**

# The Algo:

1. Find CBA using formula: ***CBA = TotalArbPercentage \* A \* O***.
2. Find risk-free payoff (RFP) as: ***RFP = A \* (O – 1) – CBA***.
3. Ask the decision engine if that RFP is worth placing bets. If yes then
4. Place bets for A1 @ O1 and A2 @ O2.