Re: How to evaluate the propability distribution of two dices?

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- *From*: sbbrouwer.spam@xxxxxxxxx
- *Date*: 27 May 2007 06:27:18 −0700

Dear Andrey,

(1) Sorry for taking so long to reply.
(2) I just tried to post, but the post is not showing up anywhere,
so I'm trying again; sorry for possible double−posting.

Sietse wrote:

> > Let f−hat be the predicted frequency of the various outcomes. We
> > then have the following set of equations:
> >
> > f−hat(sum= 2) = N * (p(d1=1)*p(d2=1))

Andrey wrote:

> What is N here? Oh, do you mean that f−hat(sum= 2)/N is known
> probability of sum?

I meant
f−hat as the predicted frequency (predicted from p),
f as the observed frequency,
N as the total number of observations
p as the estimated probability.

So f−hat(sum=2)/N = p(sum=2) = p(d1=1)+p(d2=1), where p is the
estimated probability, not the known probability. Sorry to have
been unclear.

> Indeed, the number of equations ((12−2+1)−1 = 10, "−1" since the
> equation for 6+6 is depends fully from the rest equations +
> relations for probabilities)

I don't think I understand you completely, although I understand
that you're striking the dependent equations. I think I understand

the "−1" in (12−2+1)−1=10, but I don't understand the "−2" or the "+1", or why you start with 12 instead of 13. Could you perhaps explain it to me?

> is equal to the number of variables
> ((6−1)+(6−1)=10, since all the estimations of sum are known).

Yes, that makes sense.

> The great subtlety is in that: the real−value solution for probabilities exists not for every estimation of probabilities of sum. But we need some result which should be statistically correct (in some meaning).

Well, a criterion for correctness could be 'the best−fitting model', where we define 'best−fitting' as 'having the smallest sum of squares'. The 'sum of squares' is a measure for the total difference between model and observed values. It is the difference between the observed and the predicted value, squared, and summed over all observations. E.g.
we observe 2, 4, 7;
we predict 3, 4, 5;
the sum of squares is then (3−2)^2 + (4−4)^2 + (5−7)^2 = 5.

If we decide to use this approach, then we want to minimise
SUM((f−hat − f)^2) . (Please tell me if I'm being unclear.)

> And another subtlety: it looks like, the answer should not depend of the number of sides of dices and the number of dices:

I think you're right, it doesn't depend on the number of sides or the number of dice.

> at the origin we have only the data (d1[1],d2[1]), (d1[2],d2[2]), ... and estimation of probabilities P{d1+d2=x}. We can represent d1=e1+e2, where, for example, e2=0..5, then use the same procedure for estimation of probabilities of P{e1=x} and P{e2=z} and should get finally the same result (in some statistical meaning).

I don't quite get what you're describing here, sorry. Is it an extension of this method to three dice? Oh, do you mean that if we have 2 dice, d1 and d2; or we have 3 dice (e1, e2, and d2); then if e1+e2 has the same probability distribution as d1, then the 2−dice and the 3−dice model are the same? That sounds about right, yes. In which case it will be easier to compute the 2−dice solution than the three−dice solution.

I don't know exactly how to set about *finding* the solution, though. Perhaps Mathematica or Matlab knows how to solve it. Or perhaps you can write an algorithm that tries an iterative approach, getting ever−closer to the optimal solution.

> So, it's not a course. It's real practice, the severity of life :). I need this to make good algothims for odds calculation in sports betting.

May Lady Luck be with you, then −−− or, better yet, may you not need her. :−)

Regards,

Sietse

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