Bridge Theory for the Practitioners

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3. Searching for the Elusive Q

Most bridge players know the chant "8-ever and 9-never". This is a mnemonic for the correct percentage play when the queen is missing and the declarer and dummy together hold either 8 or 9 cards in that suit. The implied directive is to always finesse holding 8 cards and always play for the drop holding 9 cards.

We are playing Matchpoints and trying to make the maximum number of Tricks. Let us take a look at the various scenarios.

Case 1. Finesse or drop holding 8 cards

A J x x (North)

K x x x (South)

First Play the K and if the queen does not drop, one can think of two possible lines:

Line 1 (Finesse): Play small from South and take the finesse if West does not play the Q.
Line 2 (Drop): Play the A to drop the doubleton queen.

Let us ignore 4-1 or 5-0 breaks and consider only 3-2 breaks. Now, any *difference* between these two lines of play would show up when West has exactly Qxx (where Line 1 is successful but Line 2 is not) versus when East has exactly Qx (when Line 2 is successful but Line 1 is not). One can construct Qxx with West in more ways (6 possible ways) than Qx with East (4 possible ways). Thus, **finesse wins by a substantial margin**. The margin in favor of finesse actually increases when we consider 4-0 and 5-1 breaks.

Case 2. Finesse or drop holding 9 cards

A J x x x (North)

K x x x (South)

Again as before: First Play the K and if the queen does not drop, one can think of two possible lines:
Line 1 (Finesse): Play small from South and take the finesse if West does not play the Q.
Line 2 (Drop): Play the A to drop the doubleton queen.

As before, any *difference* between these two lines of play occurs when West has exactly Qxx (where Line 1 is successful but Line 2 is not) versus when East has exactly Qx (when Line 2 is successful but Line 1 is not). *But now only 4 cards are missing.* So when West has Qxx the suit must break 3-1 but when East has Qx, the suit must break 2-2. **This is the added complexity.** With 4 cards missing, these probabilities are 50% (for 3-1) and 40% (for 2-2), respectively as listed in the table last week. Thus, the probability that West has exactly Qxx is ½ times ¾ times 50% or 18.75%. The first fraction takes care of the fact that we are specifically considering West, where the second factor is needed as we are excluding a xxx holding with West. In a similar fashion, the probability that East has exactly Qx is ½ times 40% or 20%. **The play for the drop wins** but the difference is just a little more than 1% between the two lines of play!

Realize, however, that this way of thinking can be *misleading.* We need to know 1% extra out of what? It turns out that even in percentage terms the difference between the two lines is only about 1.6%. How can one chant "**9-never"** based on such slim margin?

But wait. Let's say that both opponents play (random) small cards when the King is played. And now when the suit is played from South, West plays another random small card. Has anything changed? Yes, it has. Now some distributions do not exist any more and they can be *deleted* from the probability calculation. Now only 2 possible distributions remain:

i) Q x x with West and x with East. And these x cards have been *revealed* already.
ii) x x with West and Q x with East. And these x cards have been *revealed* already.

What is the probability that West started with the Q and those *exact two x cards* that he has played already? That is ¼ of the probability that West started with 3 cards i.e. ¼ of 25% which is 6.25%. On the other hand, what is the probability that East started out with Q and the *exact x card* that he has played already? That is 1/3 of 20% i.e. 6.66 %. The difference between these two lines is now 0.41%. But as I said before just looking at the difference is misleading as we need to know 0.41% extra out of what? So, in percentage terms, we can say that **drop will be successful 6.66/(6.66+6.25) X 100% or 52% of the time while finesse will be successful 48% of the time.** The difference between these two lines is about 4% which is a bit better than 1.6% *a priori* probability that we have calculated before.

In any case the difference between the drop and the finesse is not substantially large when we hold 9 cards. It might pay off to try to locate the Q from other inferences (bidding, *not bidding*, opening lead, etc.). More on that in the next column.

References:

Detailed calculations of the raw math can be found in "Probabilities and Alternatives in Bridge" by A. Vivaldi and G. Barracho (Batsford, London, 2001). Vivaldi is a former European bridge champion while Barracho is a physicist. Physicists are good people.

Another book of interest is "Bridge Odds for Practical Players" by Hugh Kelsey and Michael Glauert (Cassell, London, 2001). Hugh Kelsey is a famous bridge writer and Glauert was a Mathematics professor. Mathematicians are good people too (Jeremy Martin, are you reading?).

Detailed answer to the game show puzzle: Think about this game as between two players: the host and you. When you pick a door randomly (door C), your chance of winning is 1/3. The host with two doors (A and B) under his possession has a chance of winning 2/3. Now if the host reveals one of his doors (door A) as not having the car, his 2/3 winning probability gets transferred to the door B. So you must switch to increase your chance of winning from 1/3 to 2/3 i.e. to double your chances.

According to Wikipedia:

A well-known statement of the problem was published in Marilyn vos Savant's "Ask Marilyn" column in *Parade* magazine in 1990 (vos Savant 1990). … Many readers refused to believe that switching is beneficial. After the problem appeared in *Parade*, approximately 10,000 readers, including nearly 1,000 with PhDs, wrote to the magazine claiming that vos Savant was wrong. (Tierney 1991) Even when given explanations, simulations, and formal mathematical proofs, many people still do not accept that switching is the best strategy.