**Proposal: Double dummy hand evaluations and “myth-busters” for bridge world**

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1. **Background and Motivation:**

Ever since modern contact bridge was invented, people have been looking for ways to best evaluate their hand strengths. The HCP (high card points), in which Ace, King, Queen, Jack are counted as 4-3-2-1 points respectively, become popular and the mainstream for bridge players. However, many experts may agree that this kind of evaluation overestimates the value of Queens and Jacks (especially those unsupported ones) while underestimates the power of Aces and Kings. There are alternative systems of hand evaluation such as 6-4-2-1, but still experts have different opinions on them and there is no consensus.

On the other hand, over the past century, bridge experts have put forward a lot of “rules” that will improve decision-making during a competitive contract bidding process. One of them is the law of total trumps, which says, “The total number of tricks available for both sides is equal to the total numbers of trump cards both sides hold in their respective best suits.” Marty Bergen and Larry Cohen popularized this law, but another expert Michael Lawrence listed a great many hands where the law does not work well. So is it a law or somehow a vague statement? This will be a hard problem without statistics, since people will find as many deals favoring the law as against the law. Matt Ginsberg gave us the answer by his analysis of his own database of over 700000 double dummy deals: 70% of the time the law is accurate. So with the help of statistical tools, there is a loose conclusion to the quarrel.

In this study, following three questions will be discussed by analysis of double dummy data:

* How good is HCP as well as other systems working on hand evaluation?
* What kind of modifications may we apply based on different hand shapes so that the hand evaluation system will be more accurate?
* In what kinds of hands are Law of total tricks does not work? And what other rules put forward by experts may not be so correct?
1. **Data and Tools**

Using double dummy data of Matt Ginsberg’s double dummy library has pros and cons. The tricks sometimes are not achievable in the real world since players tend to play a line that has higher probability of success instead of the “ideal” one, which is actually taken by double dummy results. But still, using these deals is better than using real life results because there is no worry about whether the player detected some facial expression at table or if they made naïve mistakes avoidable during some hands. The measure of how many tricks a hand can achieve becomes more “pure” in double dummy.

I will be using a binary file that is saved by someone else since Ginsberg’s original website has now expired. I will first decode the data get a better version of hands in python, and then I will do analysis on these deals with R. I will evaluate different hands by their offense and defense trick winning ability both in no trump contracts and suit contracts. And I will calculate the correlation between the results and different ways of hand evaluation to find out the best way to estimate one’s hand value in different conditions. Finally I will analyze different rules of bridge by calculating the expectations and probabilities of hands that are favorable to these laws and rules.

1. **Resources**

Matt Ginsberg’s paper on Law of total tricks:

<http://bocosan.tripod.com/ginsberg/total.HTML>

Explanations of binary file of double dummy library:

<http://bocosan.tripod.com/ginsberg/library_notes.HTML>

Wikipedia pages for hand evaluation and law of total tricks:

<https://en.wikipedia.org/wiki/Hand_evaluation>

<https://en.wikipedia.org/wiki/Law_of_total_tricks>

Laws of duplicate bridge by American Contract Bridge League (ACBL):

<http://www.acbl.org/acbl-content/wp-content/uploads/2014/01/Laws-of-Duplicate-Bridge.pdf>