Double dummy analysis of bridge hands

Provided by Peter Cheung

This is the technique in solving how many tricks can be make for No Trump, Spade, Heart, Diamond, or, Club contracts when all 52 cards are exposed to all players. It assumes each player will make the best play possible when they select their cards to play. A double dummy database consists of 20 numbers for each bridge hand. The number of tricks the 4 declarers (north, south, east and west) can make in the 5 different types of contracts (spade, heart, diamond, club and no trump). From these 20 numbers the computer program can determine what the best score for the hand is, can a game or slam be made. The best score from the double dummy analysis is call par for the hand like in the game of gulf. This par value may not be a good number to use if you only look at one or two hands. If the only thing that is in question is which way to finesse a queen, the double dummy result will always find the correct direction. But on the other hand there are many hands the opening lead will give the declarer an extra trick which the double dummy result will never make that "mistake". If you use a large enough sample of bridge hands the double dummy par value for the hands are quite accurate and very realistic to be used in deciding what one should do. After studying hundreds of computer simulation results and thousands of hands manually, I notice the following small adjustment. The par value of double dummy analysis is a little bit higher then single dummy analysis for slam hands. This is due to more chances for two way finesse of queens and jacks and the dropping of singleton k and doubleton queens, and opening leads which do not give away a trick against slams is also a little bit easier to find.

How Random is the Game of Bridge?

We are told when we first start to play bridge that it takes about 26 points to make a game in NT or in the majors, about 29 points to make a minor suit game (11 tricks), about 33 points to make a small slam, and about 37 points to make a grand slam. Out of a random 1.4 million bridge hands, about 4.6% of the hands have 29 points between north and south. About 35% of the hands make 11 tricks. 38% make 10 tricks, 14% make 9 tricks and 9% make 12 tricks. Out of the same 1.4 million hands, about 3.8% of the hands have 30 points between north and south. About 43% of the hands make 11 tricks. 31% make 10 tricks, 8% make 9 tricks and 16% make 12 tricks. The above numbers show that bridge has a very high degree of randomness. On top of the above randomness, you can never be sure how many points you have between you and your partner. In most cases you will be off by one to three points. But even if you know exactly how many points your partnership has, you still have very diverse results.

Computer Analysis of NT Hands

There are also many different styles of 15-17 NT opening / response partnership agreements. I am not advocating any specific one. Since I only want to do analysis on one style and I choice the one I use. No 5 card major. No 7-card suit. No restriction on doubletons. I believe the result of including 5 card major may be different in the % of games made due to higher % of a major game. Other style may not have any significant effect on the %. All data in this section uses about 3.5 million deals and 7 million partnership hands. A Table of Probabilities follows.

Hand Condition	Do not make game	Make NT Game	Make Any Game	Make Any Small Slam	Make grand Slam
15 HCP	52%	33%	38.50%	7.5%	1.93%
No 5 Card Suit	52.50%	34%	39%	6.77%	1.61%
With 5 Card Suit	51.30%	31.20%	37.5%	8.75%	2.46%
With 6 Card Suit	49.40%	33.05%	37.14%	10.38%	3.22%
16 HCP	46.50%	36.04%	41.44%	9.58%	2.48%
No 5 Card Suit	46.70%	36.93%	42.23%	9.02%	2.21%
With 5 Card Suit	46.50%	34.38%	39.89%	10.53%	3.07%
With 6 Card Suit	44.80%	33.43%	39.57%	11.58%	4.04%
17 HCP	40.80%	39.81%	44.35%	11.37%	3.47%
No 5 Card Suit	41.20%	40.85%	45%	10.82%	2.94%
With 5 Card Suit	40.45%	37.59%	42.83%	12.37%	4.35%
With 6 Card Suit	37.43%	37.92%	43.68%	13.13%	5.76%

There are no surprises here. A long minor suit increases the value of the NT hand. The optimal condition for making a game contract is to have 15 -16 HCP and a 5-card suit. However, slams require a six-card suit.

When Should One Pass?

What kind of flat hands should one pass and not open the bidding? There are many styles of bidding and I am not recommending whether you should open conservatively in seat 1 and 2 or not. In this section I am only going to look at some types of flat hand and see on the average whether the hand belong to their side or not. We are ignoring which seat you are in as to how many hands have pass before this hand has to bid. If a hand type is very close to the average then you must also make slight adjustment for long suit ranks and honor in long suits. In 4432 if the two 4 card suits are the majors it worth more. If honors are in the 4 card suit it worth more etc.

For 13 HCP hands to my surprise there is one hand type that is below average; namely 4333 or 4432 with exactly one K and no A. (Herbert Wilton suggested that I do this simulation and the result surprises me a little since I open all 12 HCP hands). But they are extremely rare (a total of 0.003% of all hands or about one in 35,000) and I swear that I have never actually seen one (my excuse for being ignorant). For any practical purpose we can say one should open all 13 HCP hands.

For 12 HCP and 4333, all hands with one or less control are below average. All hands with 2 controls (even with 2 Ks and no A) are above average. 4333 with no A and two Ks is about as close to average as one can get. This hand type does better then average in NT contracts and worst then average in suit contract. Because NT is higher ranking then suit so this hand type is slightly above average overall.

For 12 HCP and 4432, all hands with one or less control are below average. All hands with 2 controls (even with 2 Ks and no A) are above average.

Hands with one or less control and 12 HCP are also very rare (a total of 0.016% of all hands or about one in 6,300 compare with about 2.52% for all 12 HCP 4333 and 4432 hands or about one in 40). For practical purposes, we can say one should open all 12 HCP hands.

For 11 HCP hands 4333 hands with 3 controls are below average, and 4 controls are above average and it does not make any difference what combination of A and K.

For 11 HCP hands 4432 hands with 2 controls are below average, and 3 controls are above average and it does not make any difference what combination of A and K. This is a small improvement over 4333.

Rule of 20

Since this is a rule for whether you should open the bidding, the result of opening these hands should be better then the average pass out deals and also better then the other side. There is no preemptive value in a regular opening at the one level. The average number of tricks for hands just pass the rule of 15 is 8.87 vs. 8.2 for the conservative pass out deals and 7.8 for the opponent side. If you open all hands using rule of 20 your side will have a significantly advantage. But the rule of 20

includes a lot of hands, which you will open anyway without using the rule of 20. So let us examine the situation a little bit more closely.

Let us first look at the conservative pass out deals of 12 or less high card length points. We will add the rule of 20 to the north hand and see what happens. The average number of tricks for hands just pass the rule of 15 is 8.71 vs. 8.2 for the conservative pass out deals and 7.83 for the opponent side. If you have a hand, which has 12 or less high card length points, and it passes the rule of 20 you should open the hand. It is a great advantage for your side.

Let us look at the most restrictive pass out deals with 11 or less high card length points. The computer program say there is no hand that can pass the rule of 20 and has 11 or less high card length points.

It turns out that rule of 20 include all 13 or more high card point hands; all 12 high card point hands except 4333 distribution; all 11 high card point hands except hands with no 5 card suit or 5332.

Let us look at two cases with 11 high card points and top two long suits of 8. The average number of tricks for hands with11 high card point and 5332 distribution is 8.27 with the other side taking 7.95 tricks. The average number of tricks for hands with11 high card point and 4441 distribution is 8.75 with the other side taking 7.8 tricks. The rule of 20 fails to select these 2 profitable situations. There is no surprise regarding this result. You can see the value of different hand patterns in the previous section and 4441 is very powerful; better then 6322 and 5422.

Rule of 15

Conservative pass hand (hands with 11 HCP or less and 12 HCP points or less)

Since this is a rule for whether you should open the bidding at fourth seat, the result of opening these hands should be better then the average pass out hands and better then the other side. The average number of tricks for hands just pass the rule of 15 is 8.8 vs. 8.2.

The first test is really not a fair test. Everyone will open the hand with 15 HCP and void in spade. This type of hand will make the result bias towards the rule of 15. Let us restrict ourselves to hands that satisfy the rule of 15 and have 11 or less high card length points. The average number of tricks for those hands is 8.478 with the other side taking 8.043 tricks. It has positive score on 62.7%

Let us look at the worse case of 11 HCP and 4333 with 4 spades. The average number of tricks for those hands is 7.93 with the other side taking 8.103tricks. Wait a minute; the rule of 15 still wins in this case. Even though it makes less tricks but it

has positive score 51.4% of the time. The reason is very simple. The rule of 15 produces a spade trump suit 33% of the time vs. the opponent having the spade trump suit only 10% of the time. When you have the spade trump suit you have a positive score if you can take the same number of tricks.

Let us look at the worse case of 10 HCP and 5332 with 5 spades. The average number of tricks for those hands is 8 with the other side taking 8.3 tricks. The rule of 15 did not work in this case. It has positive score 49.4%of the time.

Let us look at the worse case of 9 HCP and 6322 with 6 spades. The average number of tricks for those hands is 8.2 with the other side taking 8.7 tricks. The rule of 15 did not work in this case. It has positive score 46%of the time.

Let us look at the second worse case of 9 HCP and 6331 with 6 spades. The average number of tricks for those hands is 8.43 with the other side taking 8.74 tricks. The rule of 15 did not work in this case. It has positive score 48.5%of the time.

Let us look at the worse case of 8HCP and 7222 with 7 spades. The average number of tricks for those hands is 8.64 with the other side taking 9.1 tricks. The rule of 15 did not work in this case. It has positive score 47.5%of the time.

Aggressive pass hand (hands with 11 HCP or less and 11 HCL points or less)

This small change makes a big difference in some cases. The reason is very simple. There are 3 pass out hands and two of those are opponents. The better the pass out hands can be the less often you should open in 4th seat.

Since this is a rule for whether you should open the bidding at fourth seat, the result of opening these hands should be better then the average pass out hands and better then the other side.

 Let us restrict ourselves to hands that satisfy the rule of 15 and have 11 or less high card length points. The average number of tricks for those hands is 8.3 with the other side taking 7.8 tricks. It has positive score on 65%

Let us look at the worse case of 11 HCP and 4333 with 4 spades. The average number of tricks for those hands is 7.72 with the other side taking 7.84 tricks. It has positive score 52.1%of the time.

Let us look at the worse case of 10 HCP and 5332 with 5 spades. The average number of tricks for those hands is 8 with the other side taking 8.3 tricks. **The rule of 15 works in aggressive pass hand condition and did not work in the conservative pass hand condition**. It has positive score 52.6%of the time.

Let us look at the worse case of 9 HCP and 6322 with 6 spades. The average number of tricks for those hands is 7.97 with the other side taking 8.25 tricks. **The rule of 15 works in aggressive pass hand condition and did not work in the conservative pass hand condition**. It has positive score 51.1%of the time.

Hands with 12 HCP fail the rule of 15

I always open hands with 12 or more HCP and did not consider looking at those hands for the rule of 15 until Paul Hightower mention it in his post. Let us look at two worse cases of 12 HCP hands that fail the rule of 15.

For 12 HCP, 2 spades and no 5 card suits. The average number of tricks for those hands is 8.45 with the other side taking 7.53 tricks. It has positive score 67.6% of the time for aggressive pass condition. The average number of tricks for those hands is 8.56 with the other side taking 7.52 tricks. It has positive score 65% of the time for conservative pass condition.

For 12 HCP, 1 spade and no 5 card suits (1444). The average number of tricks for those hands is 8.98 with the other side taking 7.44 tricks. It has positive score 73% of the time for aggressive pass condition. The average number of tricks for those hands is 9.13 with the other side taking 7.62 tricks. It has positive score 63% of the time for conservative pass condition.

One should open all 12 HCP hands except very bad 12 HCP that is down graded to 11 HCP.