

A study of Double Dummy Analysis – Presentation 2

by Andrew Simmons



1. FORWARD

Hand copies of deals generated by bridge duplicating software contain predicted outcomes. These are generated using sophisticated algorithms. The outputs, often referred to as “double-dummy” predictions, are made with the knowledge of the layout of all 52 cards and are therefore purely theoretical. Even so, many players use them for analysis of their games after receiving hand copies from a duplication session.

My database analysis of double-dummy predictions revealed facts about hand shapes and other issues that I found of interest. It particularly caught my attention that 4441 hand shape has trick making capacity in excess of expectation. Other issues such as trick making relative to trump fit and the merits of hand evaluation techniques like ‘suit quality test’ aroused my interest for further analysis.

Data is pure, simple and honest. Some analysis results challenge widely held belief but I have produced a truly random database and analysed it with due diligence and fairness. The information produced therefore has integrity. Also, outcomes that can be applied in terms of bidding method have been subjected to an objective trial that has supported the conclusions. Many examples of these trials have been recorded as evidence.

Material for analysis is out there in abundance. Therefore my analysis conclusions can readily be reproduced by anyone with a few database programming skills and a lot of time and patience.

2. METHODOLOGY

First of all I created an application using a standard database tool. I entered as many details as I could about each hand and its relationship to its partner's hand. At first I entered details for 1000 hands and checked out the results from that. Each hand is unique in terms of shape and high card quality and the performance of each hand is calculated by the double-dummy analysis produced by duplicator machine system software. I have recorded hand details and double dummy predictions straight from handout sheets as my raw data. Primary data being:

1. High Card Point Count - **HCP**
2. Partnership High Card Point Count – **PHCP**
3. Maximum Predicted Tricks – **MPT**
4. Maximum Predicted Score – **MPS**

My first analysis grouped the results by hand shape so that I could evaluate the relative merits of each. I followed this up with more detailed studies where the information pointed me.

At extreme HCP range there are often few hands in the sample and sometimes this throws up unusual results like two weak hands having a particularly good suit fit. It is tempting to apply statistical methods to rule out extreme results but I am determined not to manipulate the raw data in any way. I want recipients of the information produced to be in no doubt as to the honesty of the approach. So everything goes in, good or bad.

Benchmarks

Development of benchmarks has been undertaken in analysis of balanced hands for game making situations (Presentation 1) and hands that contained a 6-card suit for pre-emptive situations (Presentation 2). The benchmarks enable conceptualisation of the analysis results and produce compelling conclusions.

Benchmarks are derived from two widely used bidding strategies that are believed to be successful. This way the analysis is structured in a way that most bridge players can understand and believe in.

PRE-EMPTIVE BENCHMARK

Many are happy to bid weak at the two level with 6-card suits in the range 6-10 HCP. My analysis has shown that such hands are predicted by double-dummy to produce a trick making capability of between 7.7 to 9.5 MPT. Therefore it follows that the **“ZONE OF ACCEPTABILITY”** benchmark for pre-emptive bids is a hand that will achieve within the range 7.7 to 9.5 double-dummy MPT.

GAME MAKING BENCHMARK

Many people are happy with the concept that a pair of balanced hands with a combined total of 25 HCP should be bid to 3NT. Double-dummy analysis of my random collection of hands has shown that 50% of these hands are predicted to succeed and 50% to fail.

So the benchmark is that hands are worth bidding to **GAME level when there is a 50% double-dummy probability of success.**

These benchmarks are the foundation of the analysis. They relate to conventional wisdom. Achievement of MPT and MPS is factual, carefully documented and properly calculated. Also, the reader has no need to consider how good or bad double dummy predictions are because the information is all presented relative to the same method of calculating. All you have to believe is that the double dummy calculations are consistent (I know some people still don't trust computers).

Hand Pattern Probabilities

Throughout the analysis and presentation of results we are aware that hand shapes occur as follows:

Hand	Percentage	Hand	Percentage
4-4-3-2	21.55	6-4-3-0	1.33
5-3-3-2	15.52	5-4-4-0	1.24
5-4-3-1	12.93	5-5-3-0	0.90
5-4-2-2	10.58	6-5-1-1	0.71
4-3-3-3	10.54	6-5-2-0	0.65
6-3-2-2	5.64	7-2-2-2	0.51
6-4-2-1	4.70	7-4-1-1	0.39
6-3-3-1	3.45	7-4-2-0	0.36
5-5-2-1	3.17	7-3-3-0	0.27
4-4-4-1	2.99	Others	0.69
7-3-2-1	1.88		

Conventional Balanced Shape	47.6%
5 Card Suit with a Singleton or Void	17.0%
5 Card Suit with no Singleton or Void	26.1%
6 Card Suit	16.48%
Hands with a Void Suit	4.75%
Balanced 3 suited 4441 + 5440	4.23%
Hands with longest suit of 7 or more	3.41%

Fig 1 –Hand pattern probabilities summarised into groups for primary analysis

3. PRESENTATIONS

Information produced by the analysis is presented in a standard format for each hand shape analysed.

Ability of deals to produce varying card distributions (good and bad) is taken care of by using high sample numbers that evens out the effect of the variation. Double-dummy ignores that other big variation – the human intervention. For the analysis purposes therefore we are allowed to conclude that the trick making capability of the hands analysed is mainly influenced by:

- Strength of high cards – HCP
- Strength of high cards within a partnership – PHCP
- Degree of fit for a trump suit or extra trick making capacity

So the analysis uses these elements as necessary with the raw data summarised in tables that have been transcribed using spreadsheet charts into graphical form for presentation. This enables us to reach straightforward conclusions. All presentation of results is summarised for specific hand shapes. Typical outputs are:

A table of how a hand performs when you consider the HCP of one hand of a partnership. This is the only information that you have when making an opening bid and this analysis is of particular value when considering pre-emptive openings.

A table of how a partnership pair of hands perform when you consider the partnership strength PHCP. This is of particular interest for some bidding methods. Variability decreases when you add partner into the picture and so this data tends towards a straight-line progression except at the extreme ends of the PCHP range where there are fewer examples of hands in the data.

Probability of fit level is outlined in tables and charts to present what to expect in terms of MPT and Suit Fit Level based on the fit in one’s own longest suit and the best fit available in the partnership (that may not always be in your long suit).

Scope of the database

The following hand shapes were identified for analysis:

Hand Shape	Mathematical Probability	Actual Occurrence in Original Sample
Balanced hands	47.60	42.50
5 Card Suit with a singleton or void	17.00	18.20
6 Card Suits	16.48	19.30
5-4-2-2 Shape	10.58	8.50
Hands with a void suit	4.75	5.30
Hands with 7 or more cards in longest suit	3.41	0.56
4441 Shape hands	2.99	2.70

Fig 2 – How hand shapes in the sample approximated to mathematical expectation

Because of the impact of initial findings I added more random data sets so that the final analysis is more robust in selected areas:

There were only 27 hands of the 4441 shape and 53 of Void Suit shape in the original analysis because of their low frequency of occurrence. But these hands are performing well on the analysis and merit a more detail analysis. To do this I obtained random data for a further 128 of each of these hand shapes.

Hands where the longest suit is five but also contain a singleton are the second most common hand shape after balanced hands. I had a random data set of hands of 5-4-3-1 shape and these make up most of the 5 cards plus a singleton hand shape (13% of the 17% total). This hand shape has interesting analysis so the extra data is worthwhile.

Hands which have a longest suit of 6 cards are defining a benchmark for pre-emptive weak 2. So to strengthen the data set I pulled in details for more of these hands using randomly produced handout sheets available.

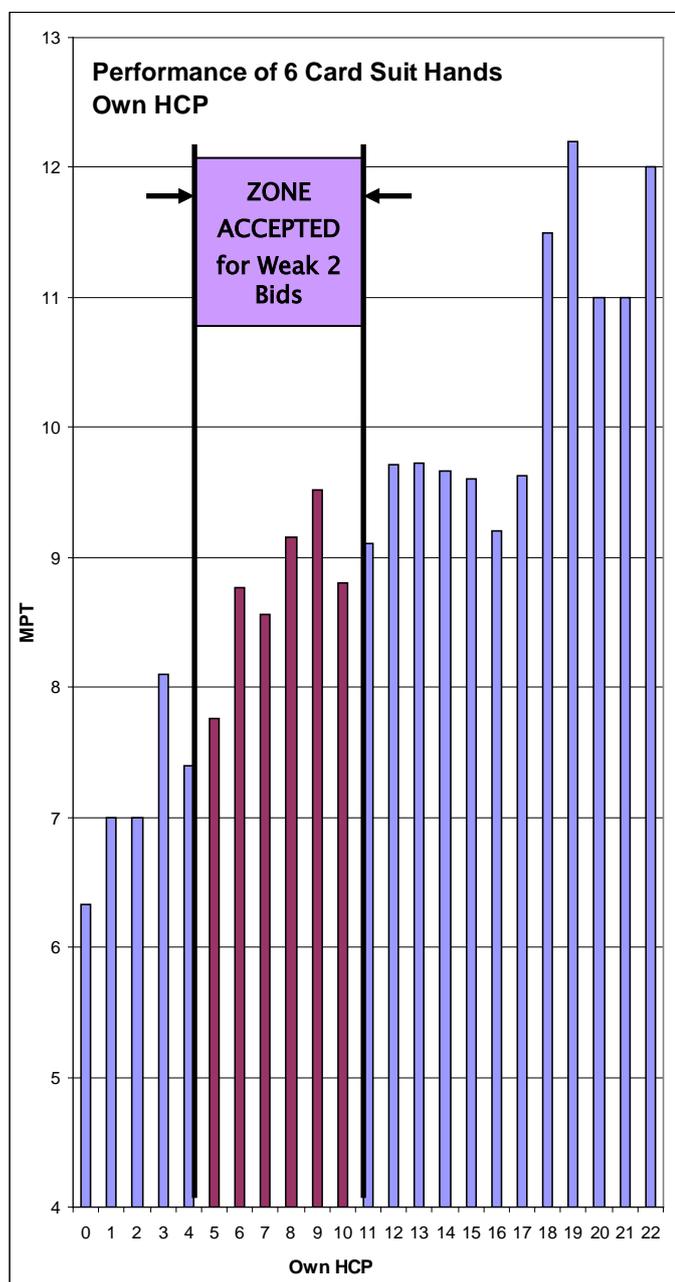
Outputs from the database have been further analysed using spreadsheets and charts. For example by grouping data in HCP band ranges. It is this further analysis that reveals what is going on.

PRESENTATION 2 - Hands with Longest Suit of 6 Cards

The second presentation deals with hands that have a longest suit of 6 cards. There is a widely used bidding strategy for these hands that will provide the background of information to produce a benchmark for further analysis of pre-emptive situations where they may exist in other hand shapes.

To promote understanding the results are tabulated in graphs and tables similar to the presentation of balanced hand outcomes

TRICK MAKING



**Fig 15 (Note Figs1-14 are in Presentation 1)
Trick Making Capacity of 6-Card Suit Shape Hands**

Trick making analysis puts these hands in good form with an average of 9.1 MPT. Therefore the custom of opening weak on these hands seems well founded. On the double-dummy analysis this hand shape with HCP range of 5 to 10 delivers a healthy average of between 7.7 and 9.5 MPT. So this provides us with a benchmark for opening pre-emptive bids.

BASED ON THE DOUBLE DUMMY ANALYSIS HANDS THAT WILL PRODUCE BETWEEN 7.7 AND 9.5 MPT ARE GOOD ENOUGH TO CONSIDER A PRE-EMPTIVE SITUATION – A FEATURE THAT I WILL MAKE USE OF IN ANALYSIS OF OTHER HAND SHAPES

Some hands found partner was void for your 6-card suit. This occurred with 17 of the 318 hands or 5% of the total. Even then, there was better fit elsewhere to help the hand score. I'm not saying how you get there in an auction. Some hands found partner had only one card in your 6-card suit. This occurred with 40 of the 318 hands or 13% of the total. There was still sometimes a better fit elsewhere in another suit. So your holding of a 6-card suit still adds value to the prospect of an 8-card fit or better although not exclusively in your suit.

An 82% chance of an 8 card fit or better is healthy odds and this is why these hands are popular as pre-emptive limit bid openers.

It has been implied that a 'Suit Quality Test' is an indication of the worthiness to bid a suit to a certain level. I tested this idea within my database. The conclusion is that for trick making performance you cannot trust a 'Suit Quality Test' calculated in the conventional way. Results of this analysis are produced in detail at Presentation 7

GAME GOING

The tables for GAME going situations are interesting. The primary analysis included all suit holdings. But Minor suit games are not usually going to be found this way because weak two bids are mostly used for hearts and spades. Because of this I conducted a supplementary analysis using only hands with 6 Card Majors and another using only hands with 6 Card Minors. This is a more realistic analysis for GAME going situations.

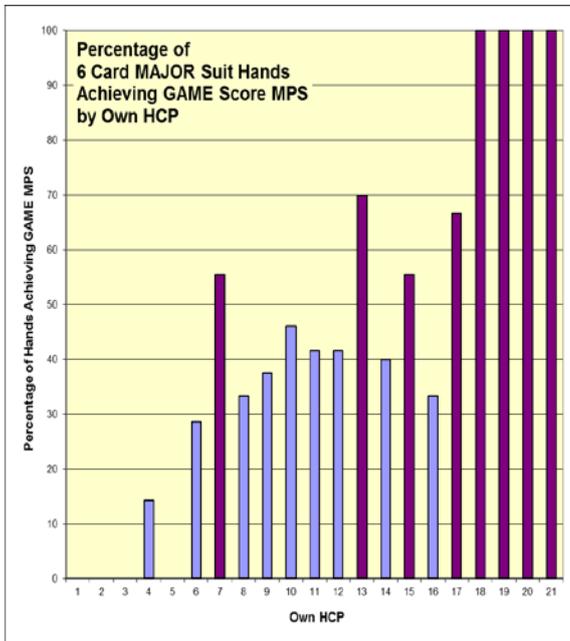


Fig 16

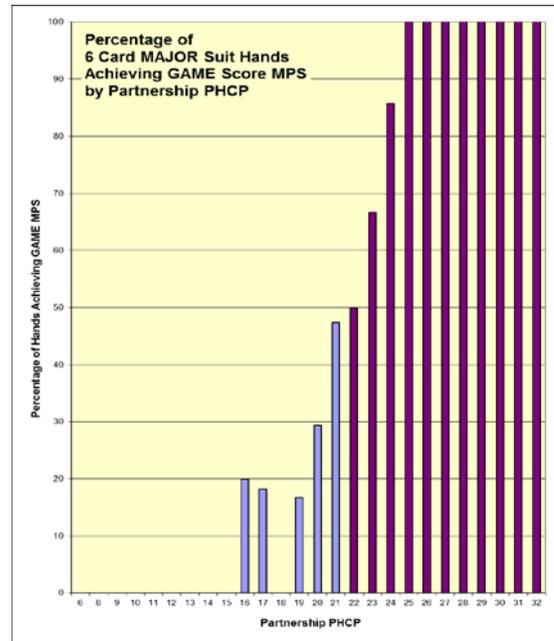


Fig 17

The tables for these hands show that you haven't got much clue to make any sensible judgement based on the 50% benchmark except when you have 17 or more HCP. With this kind of strength, regardless of where the HCPs are, you should realistically expect a GAME score to be achieved. You do not want your partner to pass and so this analysis suggests a forcing bid is required. Such a hand will certainly meet the extended rule of 25 although it's precise trick making ability may not be readily measurable on opener's hand alone. Here is an example:

♠ A Q 9 6 5 2	♠ J 7 4
♥ 10 4	♥ A 8
♦ K	♦ A 9 8 7
♣ A K J 8	♣ Q 9 6 5

	N	
W		E

Fig 18 – Example hand

If West does not open strong on this hand the partnership will find the GAME call but would it find the SLAM? Also, what if you took away one of East's Aces and gave it to the opponents. Partner now has a less attractive looking hand. It is flattish looking with only 6 HCP. Would they reach the GAME call?

Game-going potential is best realised by partner however, who can best assess the situation by reckoning the fit and strength capabilities of both hands based on the opening bid, especially after a weak opening limit bid. Analysis shows that GAME MPS is achieved at least 50% of the time where hands have a combined 22 PHCP (Fig 17).

When playing weak two bids this fits in neatly with the practice that GAME bids can be confidently explored by a partner holding 15 HCPs when the opener's range is 6-10 or 16 HCP if the opener's range is 5-9. Anything less might be considered risky.

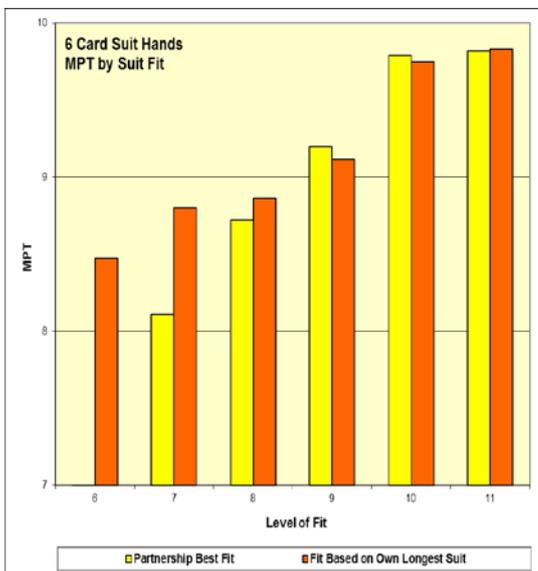


Fig 19. MPT by Suit Fit

MPT by Suit Fit shows the trick making capability based on fit alone, regardless of HCP or PHCP. This shows that trick making capability increases approximately proportional to increase in trump fit..

This demonstrates that, regardless of point strength, a partner might expect on average 8 tricks if he has one card of your suit (a 7 card trump fit) but each extra card is worth half a trick. With 5-card support (11-card trump fit) the hand shape is averaging 10 tricks. So one card +/- on the fit is worth half a trick +/- on the result. A partner should therefore be more optimistic if holding a good fit for the suit opened but pessimistic otherwise. It may be possible to produce a strategy that makes use of this finding. I looked at the trick making capacity of all hands with 6 card suits in the range 6 to 10 HCP that could therefore be classed as possible for a weak two bid.

The following graphs illustrate how the database hands performed at each fit level. Holdings of PHCP worth on average at least ten tricks are highlighted in red.

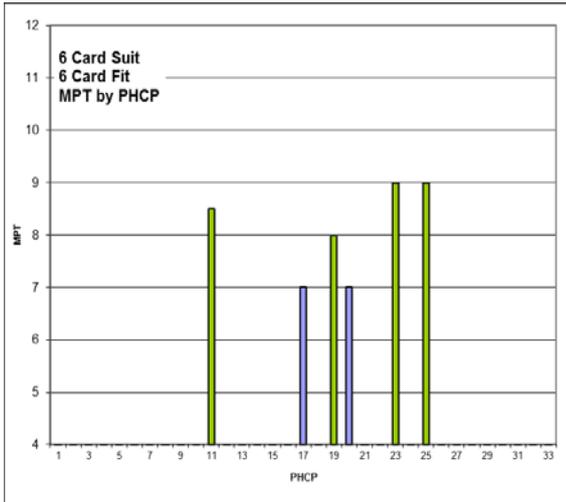


Fig 20

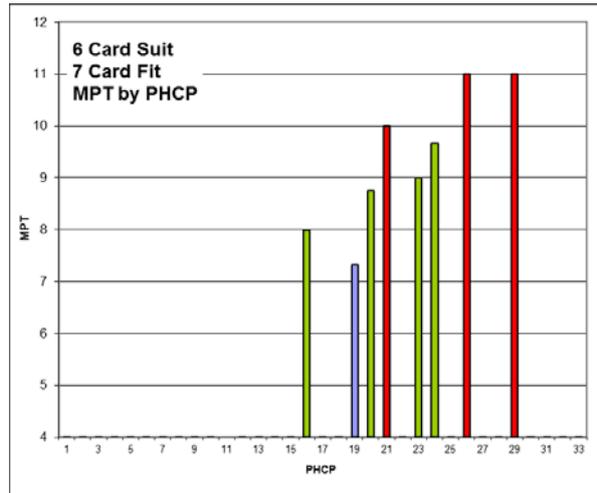


Fig 21

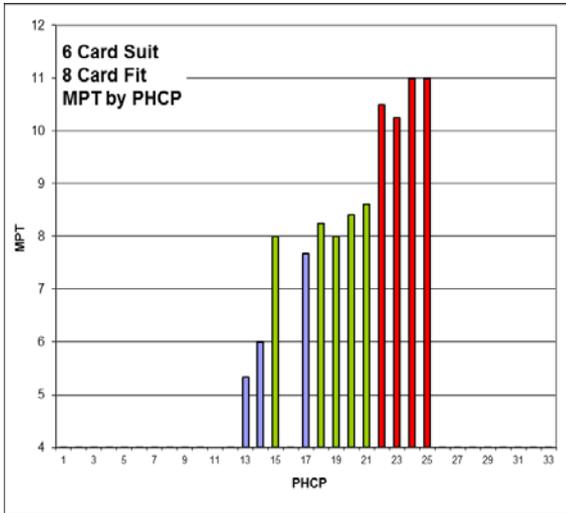


Fig 22

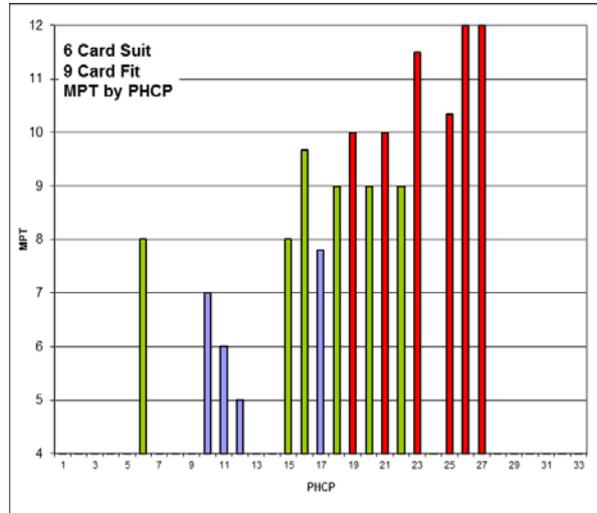


Fig 23

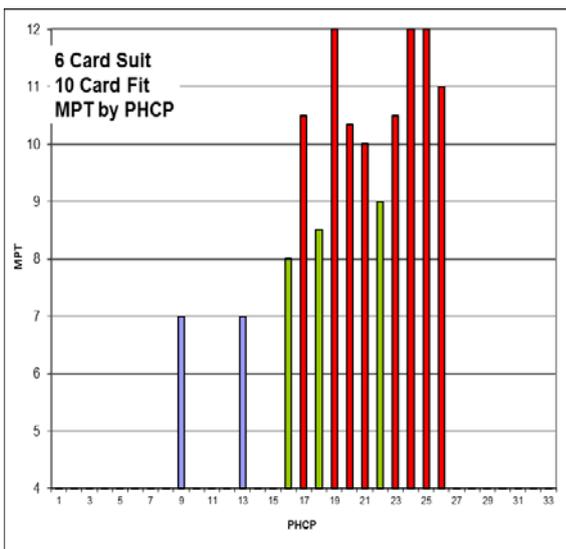


Fig 24

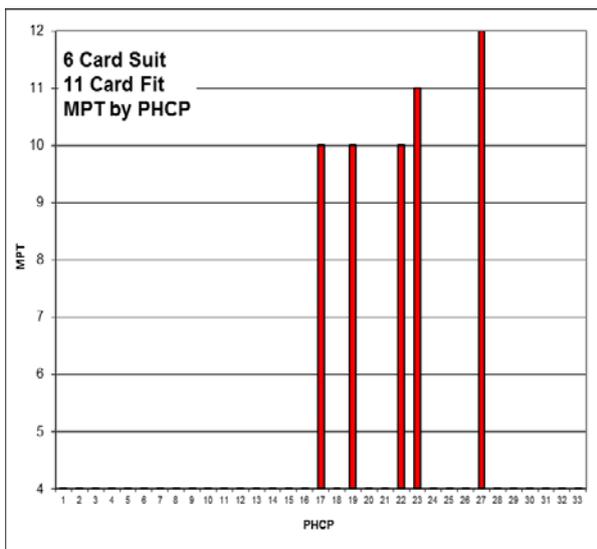


Fig 25

This suggests that an average 10 tricks are expected as summarised in the following **Fit Point Table**:

Level of fit	Average 10 Tricks with PHCP Holding
6	No Sample Hands Averaged 10 MPT for this fit level
7	26
8	22
9	19
10+	17

Fig 26 - Fit Point Table

I looked at each of the 48 hands that made up this part of the analysis to see if there was any kind of 'Losing Trick Count' method that could be applied but the results were too scattered to have analytical interest. The best I could reach still left 1 in 6 results missed. But if you can pin the opener's HCP range to the lower or higher end of the range, perhaps you could use the above table to give a better prediction? Problem is the table might not be easy to commit to memory.

Success or failure seems to have narrow margins. In the table of GAME making expectation with Partnership PHCP (Fig 17) it is clear that expectations rise sharply from almost nothing to 100% certainty within a small band of PHCP. Perhaps this **Fit Point Table** rule could be a useful tool in the quest for success?

A further analysis has been made to identify where the GAME scores are made. This table shows the results for Major Suits.

	Qty Hands	Percentage of Total
Game in My Longest Suit	53	82.8%
Game in Another Suit or NT	6	9.4%
Game Available only in NT	5	7.8%
Total	64	100%

Fig 27

Most of the time (82.8%) the GAME is in the suit opened. Partner should take appropriate action when it seems likely that the score lies elsewhere. For example, partner may hold an equally good suit but has a shortage in the openers suit. Mostly the situation will be clear enough.

Minors – Appendix 2, Sheet 5 of 7

Minor suits require an extra trick and so the GAME making capacity for these hands is obviously not as good. As with Major suits the table for these hands shows that you haven't got much clue to make any sensible judgement based on the 50% benchmark. The table for these hands suggests that you will need 18 HCP and above to have potential based on the openers hand alone. Again, the potential is best realised by partner however, who can best assess the situation by reckoning the fit and strength capabilities of both hands based on the opening bid. Analysis shows that GAME MPS is achieved at least 50% of the time where hands have a combined 24 PHCP.

The following table shows where the GAMEs were made when the opening 6 Card Suit was clubs or diamonds:

	Qty Hands	Percentage of Total
Game in My Longest Suit	37	63.8%
Game in Another Suit or NT	15	25.9%
Game Available only in NT	6	10.3%
Total	64	100%

Fig 28

The ability of the opened 6-card minor suit is reduced to 63% and NT features higher. Despite that, 63% is still a high number of hands where GAME can only be achieved in the suit opened. But the prospect of having to make 11 tricks is enough to put people off. Minor suit 6 card hands are obviously more challenging.

SACRIFICE POTENTIAL

24 Hands in the dataset, 7.6% of the total, had MPS Scores of –100 and below. This means that these hands could successfully be bid to a level beyond their MPT. Even so, they have been excluded from the analysis of MPS. The amount of hands that have sacrifice potential is small but not insignificant. It should be the subject of a separate analysis.

CONCLUSIONS

Findings from the analysis of performance of 6-card suit shape hands can be summarised as:

1. Trick making analysis puts these hands in good form with an average of 9.1 MPT.
2. The analysis has excellent conformance to the method of weak 2 openings described by custom and practice as I know it.
3. 82% probability of having an 8-card trump fit or better is good odds.
4. Suit Quality Test is unreliable as a measure of a hand's trick making potential and so is not so useful for pre-emptive bidding as might previously have been thought.
5. Potential of some hands may be overlooked. Analysis suggests opening strong with this shape of hand if it satisfies the ER25.
6. Trick making potential seems to vary consistently by half a trick for every one difference in trump fit level and this feature may provide a strategy like the ***FIT Point Table*** rule described to assess potential for GAME bids.
7. Minor suit GAMES are more challenging but Minor suits still have a pre-emptive quality and capacity for sacrifice bids.
8. An important conclusion is that the conformance of the analysis to well known practice validates the techniques used in the analysis and justifies the creation of the ***7.7 to 9.5 MPT analysis benchmark*** for looking at pre-emptive situations in other hand shapes.
9. The number of hands with sacrifice potential suggests a further analysis may be of value.

Analyst is Andrew Simmons

July 2015