



Lecture 3: Hand Ranges

Hand Ranges

What are hand ranges?

When we talk about a range of hands, what we are talking about is all the hands either you or your opponent will be playing in any given situation. Take as an example a tight player raising under the gun at a 9 handed table. What hands does he raise with here? Well, he will be raising with the big pairs, AA-TT, probably 99 and 88 as well, and also big unpaired hands; AK, AQ and AJ suited or unsuited. His range is therefore made up of all these hands; every hand that he raises from that position makes up his hand range.

Why are we interested in hand ranges?

Until now, we have considered hands as isolated events. We have hand x, and our opponent has hand y, and we can work out our equity and pot odds based on our opponent having this specific hand. We've been looking at hands in this way because the fundamental theorem of poker tells us how we should play in order to make a profit *if our hands are face up*. For some situations, this is fine. When we consider our hands after we have played them and we know our opponent's hand, we can see whether we have played our hand correctly according to the fundamental theorem, or whether we have made a mistake in how we have played.

Last lecture we started to address some problems we hit when we consider our hands in this way. Since poker is a game of incomplete information, we can never know for sure what hand our opponent does in fact have. Now we are faced with situations in which *some of the time* our opponent has one hand, and *some of the time* he has another. Or situations in which *some of the time* our opponent will call our bet and *some of the time* he won't. What we need therefore is a way of applying the fundamental theorem of poker in situations of incomplete information. We need to be able to quantify our actions over all these different possible scenarios so we can know if we are making the correct actions in hands without knowing our opponent's exact hand. Hand ranges allow us to do just this.

I can't emphasise enough just how important hand ranges are in poker!!! Since using hand ranges are our way of applying the fundamental theorem of poker to the real game, any player without a good understanding of hand ranges will not be able to play poker to a high standard.

How and why has the “hand ranges” approach to poker developed?

Conventional wisdom about poker told us to “put our opponent on a hand”, then work from there as though our hands were face up. In the past, this was the best way we had of applying the fundamental theorem to the game. In many situations in poker, our opponent's betting line (how he has played the hand) can tell us a lot about the type of hand he has. So if we could put our opponent on a huge hand or a draw, we could make the correct action according to the fundamental theorem of poker.

There are a few major major drawbacks in trying to put our opponent on a hand in this way. The first is expressed above; it's that sometimes our inference about our opponents hand will be correct, but sometimes we will have got it totally wrong. When we put our opponent on a specific hand and get it right, we feel great: “I KNEW he had AA!!”. We feel like we are great players, and really know how to play. But when we get it wrong, we feel slightly stupid, or a bit confused. We know that we have made a mistake according to the fundamental theorem of poker, but how can we learn from this mistake? One common tendency is to think “I should have played the hand *this* way instead. Next time I am in this same situation, I will play the hand that way”. But what happens when next time we are in this same situation our opponent has a different hand instead? Now we have compounded our previous error by trying to correct it. Many players who have played a lot of poker will recognise this thought pattern; we end up doubting our ability as players, our ability to improve, and confused as to how to make the best plays in the long run.

The second problem is connected to this. It concerns what we should interpret a “mistake” in poker to be. According to the fundamental theorem, the idea of a mistake is very clear: whenever we play a hand differently from the way we would have played it if our hands were face up, we have made a mistake. The method of putting your opponent on a hand reflects this interpretation. However, the situation of incomplete information again makes this interpretation very problematic. Let's take an extreme example: Suppose we have KK and our opponent has AA, and our opponent raises us all in preflop. Have we made a mistake by calling all in? According to the fundamental theorem of poker, yes, we have. We have played our hand differently to the way we would have played if our hands were face up; instead of getting all in, we should have in fact folded getting incorrect odds to outdraw AA. But nobody in their right mind would tell us that we have actually made a mistake in this situation. They will say “nothing you could have done”, or “you have to get it all in there”. But why do they say this? Are they right?

One reason we could give for why it is in fact correct to get all in with KK against AA is that it is the sum total of our opponent's errors minus our own that gives us our profit in poker. Since our opponent would make the exact same mistake when he has KK and we have AA, it will turn out to be a zero sum error in the long run.

A better reason is simply that our opponent will not have AA *every* time he wants to get all in with us preflop. This brings us back to hand ranges: AA will generally only make up part of his range for getting

all in preflop. Sometimes he will have AA, but sometimes he will have QQ, JJ, or TT. Sometimes he will be going all in on a pure bluff. So we can see that folding on the assumption that our opponent has AA will in fact lead to us making bigger errors and more mistakes according to the fundamental theorem in the long run. For all the times we fold correctly against AA, we will fold incorrectly a number of times against hands worse than our own.

Of course, this example is an extreme one, which almost every player would agree what the correct move is. Most situations in poker are not so clear cut. If we can't apply the fundamental theorem in a situation of incomplete information to every decision to tell us whether we are making correct plays or not, we need a way of working out when exactly we are making mistakes. Hand ranges allow us to do this.

Are we saying that the fundamental theorem is incorrect then?

I don't want you to think from this that we are contradicting the fundamental theorem in any way, we are definitely not!!! Although analysing hands in terms of hand ranges will in some cases tell us that a play that we are making is correct, despite the fact that we will be making a mistake according to the fundamental theorem against some of the hands in our opponent's range, *in the long run* we will be making smaller errors and less mistakes by playing in this way. It is simply a way of applying the fundamental theorem in our situation of incomplete information, that in the long run allows us to play more often in accordance with it.

How can we use hand ranges to tell us what the correct play is?

What hand ranges essentially allow us to do is to turn our situation of incomplete information into a situation of complete information. Now, instead of thinking about poker in terms of individual hands, we must think about it in terms of individual *actions*. Every action a player ever makes – all bets, raises, checks, calls, and folds will have a range associated with it. The range of hands we should assign to our opponent for any given action should in theory give us the complete set of hands that a player will make that action with in that exact situation. Every individual time he makes a particular play, he will have one of the hands from the range we have assigned him for that action. But *in the long run*, for one particular action, he will have ALL the hands assigned to him in that range. So long as we have assigned our opponent the correct range, we now have complete information over the long run about that particular action.

So how can we use this information? Well, the good news is that since we can calculate our equity against a single hand, we can also calculate our equity against a range of hands. Our equity against a range of hands is worked out by averaging our equity against all the individual hands in that range, adjusted for how often we will be dealt each type of hand. The program we used to calculate our equity against a single hand, "Pokerstove", will also calculate our equity against a range for us.

(Show them how to use pokerstove to calculate equity both pre and postflop against a range of hands. Also show them how to include a hand to represent their bluffing range, and how to deal with situations in which an opponent will only play his hand that way some of the time by including e.g. only half the

combinations. It's probably also the best time to talk about hand distribution, how many combinations of hands there are, how the range represents the % of hands they play, etc.)

Now that we can work out our equity against a range of hands, it's easy to tell exactly when we are making the correct play in a certain situation and when we aren't, and how to adapt our interpretation of the fundamental theorem to apply it to the real game of poker. Instead of calculating our equity against our opponent's exact hand to decide whether we are "winning in a hand", we should calculate our equity against our opponent's range in order to find out whether we are winning in the long run for a particular action. And we can calculate our pot odds against our equity vs. his range to find out if we are making correct decisions in just the same way we would against our equity vs. his exact hand.

How should we assign our opponent's range?

Over the coming lectures, we will be focusing on how to adapt *your* range to various situations and player types, and how to exploit player tendencies. Hopefully by the end of these lectures you will also have picked up a few ideas about how to assign hand ranges to your opponents. Player statistics are an extremely useful tool in helping to identify a player's range; this will be covered in a later lecture. But ultimately, there is unfortunately no easy way anyone can teach you how to accurately assign players ranges, especially for postflop action. This is something that comes mainly through experience; through playing thousands of hands, and seeing how people actually play. Poker is a game that is constantly evolving, and new trends, ideas, and ways of playing are emerging all the time. It is through observing these, and playing a lot, that you can best learn how to identify range.

How does a player's range change through the course of a hand, and how should we make decisions based on our opponent's range?

Preflop:

At the beginning of a hand, before any action is made, we all have hand ranges of 100%, since we are dealt 100% of hands over time. Since we will fold some % of hands that we are dealt, any action that we make therefore narrows our range, and should weight it towards the top end of our hand distribution. Note that our range for calling preflop should not include hands that we reraise preflop for value instead. Our reraising range preflop will be narrower than our raising range is, and should in theory be weighted to hands at the very top end of our hand distribution, and bluffing hands. The major factors that should affect our range preflop are position, stack size, and what type of players we are playing.

When we make a decision preflop, we should be considering which play will give us the best equity against our opponent's range. We should be looking to avoid making plays which narrow our opponent's range sufficiently to give us bad equity against their range. We can say that at all points, our bets should fall into one of two categories; we should either be betting for value, or we should be bluffing. All our calls should be for value (remember we can also call small bets for value with hands with bad equity but good implied odds). But it's important that you know exactly why you are making the action that you are making. Lets take as an example the decision between reraising and calling a bet. Suppose our opponent's range for calling a reraise is AQ+, JJ+. Now we can no longer raise KQ *for value*. If we reraise

KQ, we are now turning our hand into a bluff, because KQ has bad equity against our opponent's calling range. We don't want our opponent to call our reraise. If we call instead, we keep our opponent's range wide enough to include hands that we are beating, and so our equity against his range increases. So we should be looking to *call for value* with a hand like KQ, instead of reraising.

Postflop:

After the flop, the major factors that affect our range for a type of action should now include board texture, as well as those factors that affected our preflop range: position, stack size, and what type of players we are playing. But we can say the following things in general about postflop action:

Checking: A player's range for checking should be made up of those hands that have now missed the board and are prepared to fold, those hands that have hit the board very well and are now strong enough to slowplay, and those hands that have hit the board but not strongly enough to bet which are now pot controlling. Hands which want to pot control in this way are those hands with some *showdown value* (could win at showdown) but that *if they bet, they will only be called by better hands*. In other words, we want to check hands when we have some showdown value, but if we bet, we will narrow our opponents hand range for calling to only those hands that beat us (this is similar to what we discussed about reraising or calling preflop).

Betting: A player's range for betting should again be made up of those hands he is betting for value, and those hands that have missed the board and now want to bluff. When we bet, we narrow our opponent's range since he will fold some % of his hands at this point. Our betting range should always take into account our equity against our opponent's calling range. When our opponent bets, his range is now narrowed to all his hands he is betting for value, and those hands he is bluffing. It should be clear from this that against certain opponents, check-calling can be a very profitable line. Your opponent's range for betting should in general be wider than his range for calling a bet. So in this way, we can keep our opponent's range wide enough to have good equity against it.

Calling: A player's range for calling should be restricted to those hands that are calling for value (including implied value). Because of this, a player's calling range will in general be much narrower than his betting range is, and will generally include only hands that have hit the board in some way. (There are some exceptions to this, but these will be discussed in a later lecture.)

Raising: A player's range for raising is similar to his range for betting, in that it will include hands that are reraising for value, and bluffing hands. But our raising range should be narrower than our betting range, and weighted towards hands at the top end of our range (hands with the best equity) for the reasons discussed above about always taking your equity against your opponent's calling range into account.