Introducing EV

Throughout this book there will be references to EV (Expected Value). This usually refers to the mathematical expectation of a certain play, and can be expressed as +EV meaning a play with a positive expectation (i.e. a profitable one), –EV (a negative one) or EV neutral (one with neither positive or negative expectation), but we will also apply it in more detail to late game play with specific values or percentages attached to certain plays or stack sizes.

It is important to note that in sitngos, because you are paid based on the position in which you finish, your tournament chips do not have a linear real money value as they would in a cash game. For this reason, we must think purely in terms of $EV (the expectation of a play in terms of real money) rather than cEV (its expectation in terms of tournament chips). This is particularly important since some plays can show a profit in terms of tournament chips won, but a loss in terms of real money (i.e. they are +cEV but -$EV) and therefore should not be made.

In order to do this we must first have a method of calculating the worth of tournament chips in real money for any given situation so that different outcomes can be considered. We will therefore now look at ICM (the Independent Chip Model), which is considered the best way of doing this.

Introducing ICM (the Independent Chip Model)

It should be obvious to even a beginning player that the value of your chips in a sitngo is non-linear. That is, despite receiving a certain amount of chips at the start of a sitngo for your buy-in, because you are paid based on your finishing position and are unable to cash them in during the game, their real money value is going to change throughout the event depending on the number of players remaining, their relative stack sizes and the payout structure.

For example, consider a 10-player $100 sitngo with a standard 50%/30%/20% payout structure where each player starts with 1000 chips. Despite the initial conversion rate of 1 chip = 10 cents, by the end of the

sitngo when the winning player has all 10,000 chips those chips have only secured him the $500 first prize, meaning the conversion rate has dropped to 1 chip = 5 cents. However, if a player has only 1 chip when four players remain and another player is eliminated in an all-in confrontation the conversion rate of his last chip in now fractionally more than 1 chip = $200 as he is guaranteed to finish in at least third place.

The most accurate way of calculating the real money value of tournament chips at points in a sitngo where it is less obvious than in these examples is known as ICM (the Independent Chip Model). ICM is a way of calculating the value of tournament chips in real money by considering the stacks of all players and the prize structure, and then calculating their relative chances of finishing in certain places and the total real money equity they would accrue by doing so. It is extremely complicated to work out by hand and most players use programs that do such calculations for them instantaneously (see next chapter), but here is one detailed example considering the following situation:

Player	Stack Size	Payout Structure	Tournament Equity ($EV)
A	4000	1st $500	?
B	3000	2nd $300	?
C	2000	3rd $200	?
D	1000	4th $0	?

Here each of the four remaining players has a different proportion of the chips in play (40%/30%/20%/10%) and there are three prizes available on a standard payout structure of 50%/30%/20%. From this we need to calculate the current real money value of their chips (not withstanding factors like the position of the blinds and the players' relative ability which are addressed in the chapter 'The limitations of ICM' on page 113). We can do this according to ICM by calculating each player's chances of finishing in each position and multiplying this by the payout for that place, then adding together those values to find out each player's overall $EV.

The probability that each player finishes first is easy to calculate since it correlates directly to the proportion of the chips in play they have. For example, the probability of Player A winning is 4000/10,000 which equates to 0.4 or 40%. Therefore we can begin to tabulate our results as follows:

Player	Stack Size	P (1st)	P (2nd)	P (3rd)	P (4th)
A	4000	40%	?	?	?
B	3000	30%	?	?	?
C	2000	20%	?	?	?
D	1000	10%	?	?	?

After this we must calculate the other finishing probabilities, which is where things become more complicated. If we consider Player A first of all, his chances of finishing second are the sum total of the situations in which one of the other players wins and he beats the remaining two players. There are three possible cases here and each can be tabulated by multiplying the chance of another player winning the sitngo by the chance that Player A will have of beating the remaining players, with the latter measured as the proportion of chips Player A has of those remaining three players after the winners' chips are removed.

So for example if Player B wins (which we know will happen 30% of the time), there are now 7000 chips remaining and Player A will have a 4000/7000 chance of beating the other two players. Calculating and adding all these values together will give us the total probability that Player A has of finishing second:

Outcome	Calculation	Probability
P (B wins and A beats C and D for 2nd)	0.3*(4000/7000)	= 0.1714

P (C wins and A beats B and D for 2nd)	0.2*(4000/8000)	= 0.1
P (D wins and A beats B and C for 2nd)	0.1*(4000/9000)	= 0.0444
P (All cases where A finishes 2nd)		**= 0.3158 (31.58%)**

Calculating the odds of Player A finishing third is even more complicated. We must consider the probability of another player winning outright, and multiply this by the chances that among the three remaining players another player wins this mini-tournament (to finish second overall) and then Player A beats the remaining player to finish third. There are six possible cases in which this can happen and they can be considered according to the exact finishing positions of the player from first to last. When tabulated this looks like:

Outcome	Calculation	Probability
P (finishing order of BCAD)	0.3*(2/7*4/5)	= 0.0686
P (finishing order of CBAD)	0.2*(3/8*4/5)	= 0.06
P (finishing order of BDAC)	0.3*(1/7*4/6)	= 0.0286
P (finishing order of DBAC)	0.1*(3/9*4/6)	= 0.0222
P (finishing order of CDAB)	0.2*(1/8*4/7)	= 0.143
P (finishing order of DCAB)	0.1*(2/9*4/7)	= 0.0127
P (All cases where A finishes 3rd)	**0.3*(2/7*4/5)**	**= 0.2064**

Having calculated the probability of A finishing first to third it is now easy to calculate his chances of finishing fourth since this is simply:

P (A finishes 4th) = 1 – P (A finishes 1st-3rd) = 0.0778 (7.78%)

This gives us a complete set of results for Player A and the same approach can be used for each player giving us the following results for all players and all positions:

Player	Stack Size	P (1st)	P (2nd)	P (3rd)	P (4th)
A	4000	40%	31.58%	20.64%	7.78%
B	3000	30%	30.83%	26.19%	12.98%
C	2000	20%	24.13%	31.75%	24.12%
D	1000	10%	13.45%	21.43%	55.12%

So, having calculated the probabilities for all finishing positions all we need to do now to get a real money value for each player's stack size is multiply their chance of finishing in a certain position by the payout for that position and add these values (note that fourth places can be excluded as it pays nothing). For Player A this would be as follows:

$EV of Player A = (0.4 * $500) + (0.3158 * $300) + (0.2064 * $200) = $336.02

And so the overall worth of each player's stack from the $1000 prize pool (allowing for rounding off) looks like this:

Player	Stack Size	Payout Structure	T'nmt Equity ($EV)
A	4000	1st $500	$336.03
B	3000	2nd $300	$294.87
C	2000	3rd $200	$235.89
D	1000	4th $0	$133.21

Harnessing the power of ICM

Performing calculations like this by hand takes a long time and is very impractical, but in the later stages of sitngos where the blinds are high and players usually move all-in with or fold most hands, understanding how your $EV is affected by such decisions is essential. For this reason most sitngo players use programs called ICM calculators, which not only calculate the $EV of your chips in any given situation but also determine whether certain all-in plays are profitable or not by considering the differences in your $EV between moving all-in and folding a given hand (and between calling and folding when another player has moved all-in), based on the situation and user-inputted hand ranges.

Of these, two products that are highly recommended are Sitngo Endgame Tools (www.sngegt.com) and Sitngo Wizard (www.sngwiz.com), both of which offer similar options to help work out whether you should move all-in ('push') or fold in certain situations according to ICM. Their relative merits are debatable, for example SNGEGT has a cleaner interface and a 'live play' version that you can use in real time[2], whereas Sitngo Wiz is capable of analysing more complex situations like multiple all-in scenarios. However, both offer free versions for you to decide which you prefer and so should be experimented with. At least one such program will be essential to your success as a sitngo player.

[2] Although some sites (such as PokerStars) have now banned this function. Please check with your site's terms and conditions if in doubt.