

## Safer Gambling

By Tristan Barnett

In 2010, the author published an article on applying mathematics to poker machine regulations, where it was demonstrated that poker machines within Australia could be considered as “unfair”, since important information on the probabilities associated with each outcome is not displayed directly on the machines, or can be calculated indirectly through the playing rules (as typically applies to casino table games). It was suggested as an approach towards responsible gambling and to increase consumer protection, to amend poker machine regulations such that the probabilities associated with each payout are displayed on each machine along with information that would advise players of the chances of ending up with a certain amount of profit after playing for a certain amount of time [1]. Consider the sample poker machine for a single trial given by table 1. The initial cost (the cost to play) is \$1, and the initial cost is given directly on every machine within Australia. The payouts for each possible outcome (column 2) are also given directly on every machine in the form of prices. However the probabilities associated with each outcome (column 3) are not given on the machine, and this fundamental piece of information is required to calculate the expected payouts (column 4), which enables the consumer to know how much he/she is expected to lose each spin of the machine. This expected loss is obtained as \$0.10 from table 1. It can also be readily shown that there is a 13.9% chance of ending up with any profit and a 60% chance of ending with a loss (losing the initial cost of \$1 to play the game).

Outcome	Profit (\$)	Probability	Expected Profit (\$)
O <sub>1</sub>	1000	0.000125	0.125
O <sub>2</sub>	100	0.00125	0.125
O <sub>3</sub>	10	0.0125	0.125
O <sub>4</sub>	1	0.125	0.125
O <sub>5</sub>	0	0.261125	0
O <sub>6</sub>	-1	0.6	-0.6
		<b>1</b>	<b>-0.1</b>

Table 1: The payouts with associated probabilities for a sample poker machine

Suppose there are 10 spins per minute on a typical machine. Then a player is likely to spin  $10 \times 60 = 600$  spins per hour, and this allows such calculations as the chances of ending up ahead, more than \$200 ahead or more than \$200 behind after 1 hour of play. This information is represented in table 2 and shows that even though a player is expected to lose  $600 \times 0.1 = \$60$  per hour, there is a 26.2% chance of losing more than \$200 per hour and a 8.9% chance of winning more than \$200 per hour. This type of information along with the type of information represented in table 1 could be readily displayed on each machine to enable the player to make decisions as to whether to play a particular machine and how long to play for. Furthermore, this statistical information could potentially be available for table games (e.g. blackjack, roulette) and distributed via computerized information kiosks at the particular gambling venue. Figure 1 represents the relevant statistics for roulette given Type of Bet: Red/Black, Initial Cost: \$10 and Plays per Hour: 45. These input parameters are used to generate information containing the probabilities for each outcome on a single play, average loss per play, average loss per hour, and the

chances of obtaining various payouts after 1 hour of play. The operations of the information kiosk are such that the input parameters (Type of Bet, Initial Cost, Plays per Hour) are defined by the player, and the statistical results are generated accordingly.

Hourly Profit (\$)	Chances
<-200	26.2%
-200 to -100	37.1%
-100 to 0	19.4%
0 to 100	7.1%
100 to 200	1.3%
> 200	8.9%

Table 2: The chances of obtaining various payouts after 600 spins of a sample poker machine

Roulette			
Parameters			
Type of Bet	Red/Black		
Initial Cost	\$10		
Plays Per Hour	45		
Outcome	Profit	Probability	Expected Profit
Player wins	\$10	0.486	\$4.86
Dealer wins	-\$10	0.514	-\$5.14
		<b>1</b>	<b>-\$0.27</b>
Number of Plays	Average Loss		
1	\$0.27		
45	\$12.16		
Hourly Profit	Chances		
< -\$100	9.1%		
-\$100 to \$0	47.5%		
\$0 to \$100	39.0%		
> \$100	4.4%		
	<b>100%</b>		

Figure 1: Relevant statistical information for the Red/Black bet in Roulette

#### Reference

[1] Barnett T (2010). Applying mathematics to poker machine regulations to increase consumer protection. *Gaming Law Review and Economics* 14(8), 601-607.