

THE OUTLOOK FOR THE BIG GAMES

THE MOST LIKELY SCENARIO IS THAT WE WILL ARRIVE AT THE END OF 2016 WITH BIGGER SALES IN BOTH GAMES THAN WE SAW IN 2015, BUT WITH THE SAME RISKS ON THE HORIZON

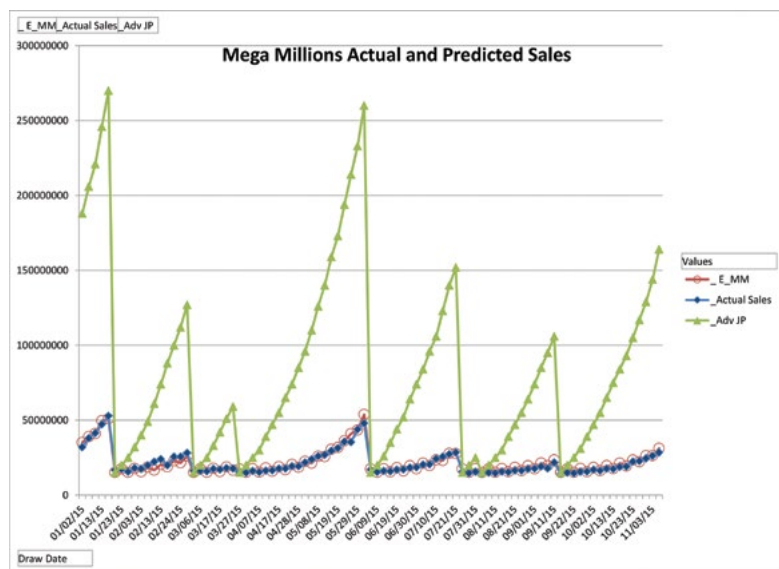


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One year ago, in the November/December 2014 issue of *Insights*, I described how I had studied sales in Mega Millions and Powerball at the national level in order to build mathematical descriptions of how players had spent in response to jackpots during that year. These descriptions included the idea that there is a “core” population of players in each game, who play over a wide range of jackpots, and also a “jackpot chaser” population who join only when the top prize reaches a certain size.

I then used these descriptions to drive “thousand year models” of each game, in order to get a projection of likely jackpot and sales development during 2015. An assumption in that work was that players would continue to respond to developing jackpots in 2015, much as they had in 2014.

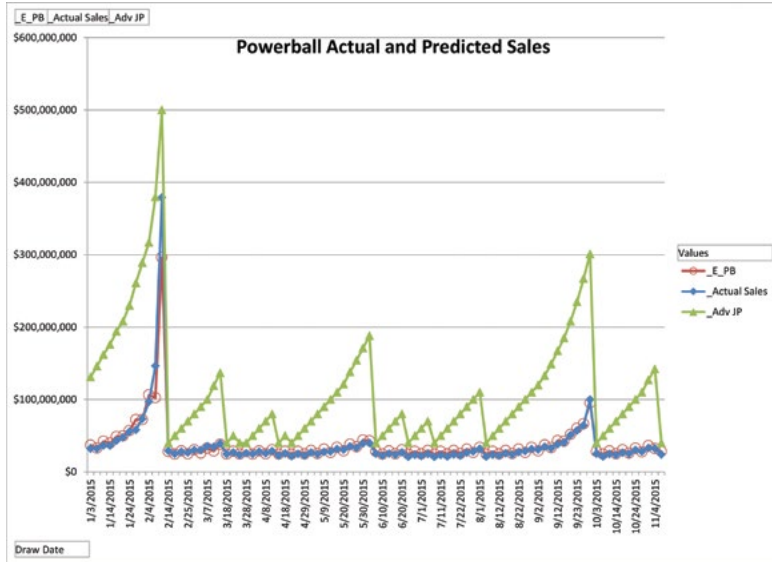
Now, at mid-November 2015, we



see that actual behavior did match that assumption. Given the way jackpots developed in 2015, sales in both Mega Millions and Powerball were precisely 98 percent of what we expected. That is to say, players responded to the jackpots that developed in 2015 just as they did in 2014. In the accompanying charts, jackpot amounts are represented in green, actual sales in each drawing in blue, and the model predictions in red.

The actual development of jackpots disappointed many. But how unusual was it? And even more important, how likely is it that next year will be similar?

With regard to jackpots, we have special interest in those that grow to \$300 million or beyond. This is the level where we now expect to see real excitement and acceleration of sales. Mega Millions had no jackpot bigger than \$270



million in 2015. Powerball broke the \$300 million barrier for three draws in February 2015, resulting in a \$500 million win, and for a single draw at the end of September, for a total of two jackpots won at over \$300 million.

In my 2014 article I estimated the likelihood of a year with no Mega Millions jackpot larger than \$300 million as 23 percent. So I would suggest that what we saw in 2015 was not all that unusual: the year that developed just corresponded to the bottom quarter of the theoretical distribution.

In the case of Powerball in 2015, having four draws for jackpots over \$300 million put that year in the upper half of the theoretical distribution.

Next year is likely to be a better year in Mega Millions: player behavior is unchanged,

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the game is unchanged, and a year with at least one \$300 million jackpot is more likely than a year with none. The outlook for Mega Millions in 2016 is very much as it was in 2015, and is unaffected by the fact that 2015 was a “low” year. The middle ground for Mega Millions, comprising more than 2/3 of the simulation outcomes, corresponds to a year with one or two draws for a jackpot of over \$300 million.

In describing the likely behavior of a game, we speak of number of draws between wins (i.e., the length of a “run”). In Mega Millions, simulations indicate that about half the runs are likely to be shorter than 10 draws, and half longer: 10 is thus the projected median run length. The jackpot that builds up over 10 draws is expected to be about \$110 million.

National sales corresponding to this sort of game behavior are about \$2.7 billion per year for Mega Millions.

In Powerball, however, the matrix did change in October 2015. In the few weeks since the likelihood of the top-prize win changed from 1 in 175 million to 1 in 292 million, there is no sign that player behavior has changed.

Since the likelihood of the top prize being won is smaller, the average number of draws between wins, and the average size of those jackpots, is expected to increase. This should have the intended effect of increasing sales.

It is also true that any year of 104 drawings will now sample fewer jackpot “runs.” Any single year thus represents a smaller slice of the life of the game, and consequently any single year is likely to differ more from the long-term average than was the case in the past. Any particular year is likely to

deviate even more from the long-term average than was the case up to now.

When I first ran simulations of sales for the new matrix, I was shocked both by the size of the expected sales increase, and by the size of the increase in year-to-year variability in results. Then I realized that some of the extreme values in the simulation

I ESTIMATE THAT THERE IS ABOUT A 95 PERCENT PROBABILITY THAT 2016 WILL BE A BETTER SALES YEAR FOR POWERBALL THAN WAS 2015. THE MATRIX CHANGE MAKES A YEAR WITH THREE TO FIVE JACKPOTS OVER \$300 MILLION HIGHLY LIKELY.

resulted from years where the jackpot grew to \$1 billion or more before being won, without changing players’ later enthusiastic response to jackpots that just passed \$300 million.

I have not heard anyone say that they expect a \$1 billion jackpot to have no effect on how players respond to a \$300 million jackpot. Consequently I reject these simulated years as unrealistic.

I am humbled by the inability of my simulations to deal precisely with these unknowns. Without pretending to understand too much, I can offer a

few suggestions about what to expect from Powerball in 2016.

I estimate that there is about a 95 percent probability that 2016 will be a better sales year for Powerball than was 2015. The matrix change makes a year with three to five jackpots over \$300 million highly likely.

The likelihood of a game-changing jackpot of \$1 billion within a year seems to be about 17 percent. This might lead to a spectacular increase in sales compared to 2015, or only a moderate increase. A billion-dollar jackpot late in the year would tend toward the spectacular, while a billion-dollar jackpot early in the year might dampen the response to more modest jackpots through many ensuing months.

The happy middle range bounded by “same as last year” at the bottom, and “\$1 billion game changer” at the top has about 78 percent probability. When pressed to give a best estimate for Powerball sales for 2016, I try to make clear the limits of my understanding, and then say “most likely about \$5.8 billion nationwide.” That’s about 20 percent higher than I would have estimated, had the matrix

change of October 2015 not happened.

This sales increase corresponds to an increase in the median run length from 8 to 11 draws, and in the median jackpot won from about \$180 to \$240 million.

Sometimes, especially when dealing with stakeholders, it is good to under-promise and over-deliver. I am pretty comfortable saying “there is about a 2/3 chance that nationwide Powerball sales will exceed \$4.6 billion in 2016.” In practical terms, this is not much different from leaving the Powerball sales projection the same as

it was in 2015, with increased confidence in being able to meet or exceed it. This may make more sense to your non-gambling stakeholders, than projecting higher sales with increased uncertainty.

So to summarize: players continued to play both Mega Millions and Powerball in 2015 much as they had in 2014. The games were somewhat differentiated in 2015 by the frequency of jackpots over \$300 million. With the matrix change that took effect in Powerball in October 2015, that game will more surely deliver multiple jackpots over \$300 million in 2016. There is also an increased probability of a jackpot exceeding \$1 billion, which may reset expectations and decrease the predictability of results in periods that follow. The most likely scenario is that we will arrive at the end of 2016 with bigger sales in both games than we saw in 2015, but with the same risks on the horizon. ■

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Notes:

My estimates were developed without knowledge of new jackpot management practices for Powerball that will go into effect early in 2016. These changes will slightly reduce the likelihood of a \$1 billion jackpot in any year.

I am happy to share the specifications of these math models, but that is not my purpose in this article. Please contact me at: lmcbusinessintel@hotmail.com

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