OUTLOOK FOR THE BIG GAMES IN 2017

Mega Millions is likely to do a little more in 2017 than it did in 2016; Powerball is likely to do a lot less.

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One year ago, in the November/December 2015 issue of *Insights*, I reviewed the relation between jackpots and sales (aside from multipliers) in Mega Millions and Powerball in the year just past, and projected performance for 2016. The main points of those projections were: 1) in Mega Millions, with no structural changes planned, sales were likely to be higher than in 2015, with the likeliest total around $2.7 billion; 2) in Powerball, the October 2015 matrix change made the likelihood of a jackpot of $1 billion or more in the next year about 17 percent, with the likeliest total of sales about $5.8 billion.

Actual developments in 2016 have fallen very close to these projections. Between January 1 and the end of October, Mega Millions sold $2.04 billion, compared to $2.22 billion for all 12 months of 2015. With 17 percent of the year remaining, the game is likely to produce nearly $2.4 billion in 2016.

In Powerball, of course, the one-in-six event came through, with a jackpot over $1 billion in January. Sales for the first ten months of the year were $5.91 billion.

My goal in this article, as in the past couple of years, is to assess what we learned from the past year, and to make some projections about the next. To jump right to the projections: Mega Millions is likely to do a little more in 2017 than it did in 2016; Powerball is likely to do a lot less. My observations and reasoning follow.

Much has been written, and more could be written, about that exciting time in January 2016. More people bought lottery tickets than ever before. However, it also became clear that only a little over half of the population will spend $2 on a ticket that might be worth more than $1 billion. And practically all of them had also played for a $600 million jackpot in the past[1]. That is, by doubling the size of the jackpot, we got a very small increase in participation.

Further, as most of us expected, seeing a jackpot over $1 billion has raised the bar for excitement. The effects are not as severe as I privately feared, but are clear in the following charts. In the first (Powerball) chart, the blue points (representing actual sales for the draw) fall squarely on the values predicted from the 2014 model, right up until the record jackpot. The scale of the chart is truncated to make what happened later more visible. The starting jackpot immediately after the record win produced higher-than expected sales for a few draws, but as the jackpot approached $200 million, sales that had happened in the past did not appear. The jackpot passed $300 million with little notice. Finally, when the jackpot exceeded $400 million, sales jumped to levels similar to what we would have expected in 2014. *(See Chart 1)*

This effect was not confined to Powerball. The second (Mega Millions) chart shows a small positive halo in Mega Millions around the Powerball record draws, but in May and June, as the jackpot crept up from $150 million to $400 million, sales consistently lagged the model projection. As in Powerball, $400 million got attention and sales like in old days. *(See Chart 2 on page 46)*

Compared to how people played in 2014, we saw a shortfall in nine months of 2016 (from the record jackpot up to the end of October as I write this) amounting to about $0.9 billion between the two games, due to lack of response to jackpots between $100 and $400 million. We were fortunate that both games produced jackpots greater than $400 million after February.

Now, in order to make projections for 2017, I have put the older history aside and built models for national sales of Powerball and Mega Millions solely on the basis of what happened since late January 2016. This short time base is not optimal, but pretty clearly we are in a different frame of reference now.

As usual, my procedure was to build a mathematical description for sales as a function of jackpot on each draw day. These descriptions embody the idea that there is a "core" population of players in each game, who play over a wide

Chart 1

Powerball Actual and Predicted Sales

Legend:
- _E_PB
- _Actual Sales
- _Adv JP

Values
Draw Date
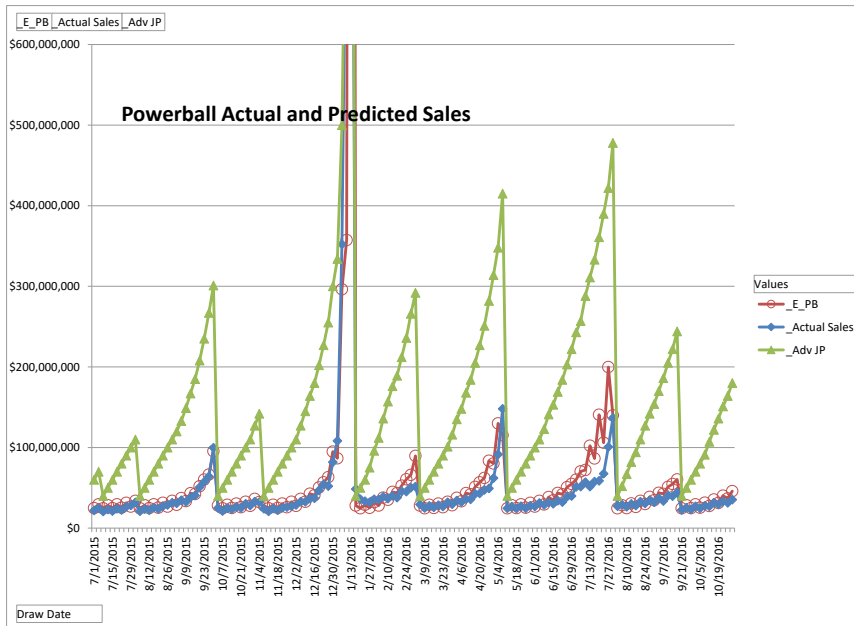
range of jackpots, and also a "jackpot chaser" population who join only when the top prize reaches a certain size. These models recapitulate what actually happened with high precision, and project future sales consistent with this behavior.

I then used these descriptions to drive "thousand year models" of each game, in order to get projections of likely jackpot and sales development during 2017. Given recent player behavior, we are especially interested in jackpots of $400 million and more.

In Mega Millions, reaching a jackpot over $400 million is likely to take 32 draws. The

Mega Millions Actual and Predicted Sales
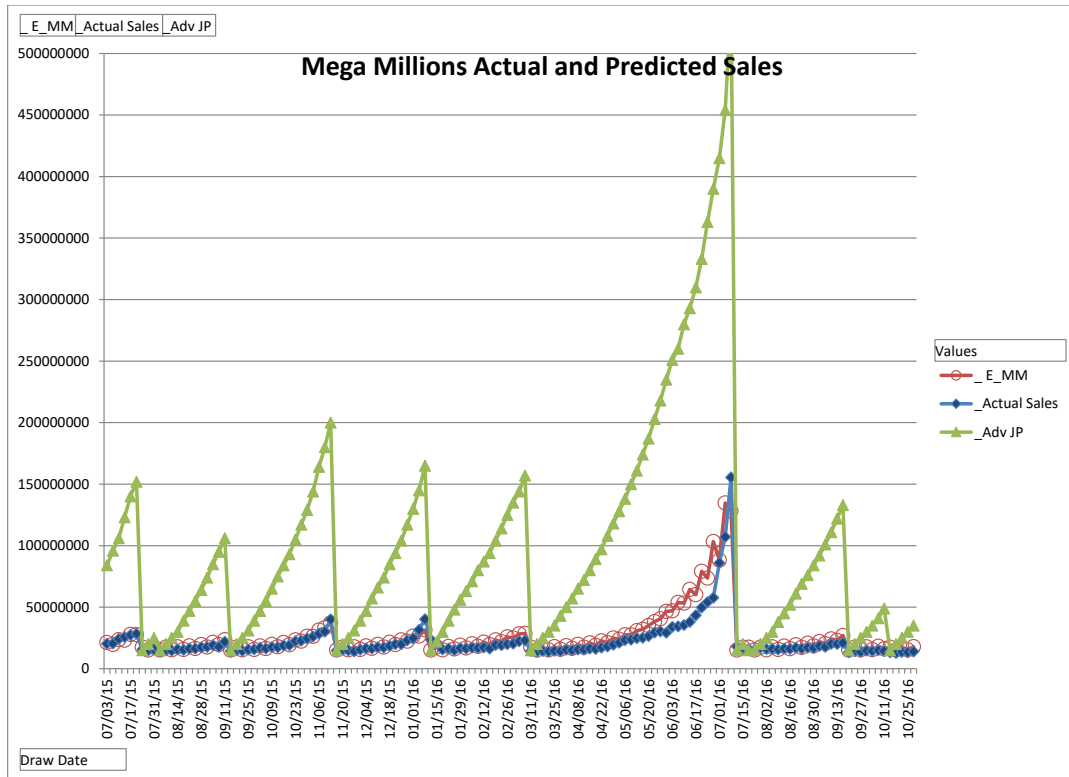
likelihood of this happening in one year is reassuringly high: over 70 percent. Reaching a jackpot over $1 billion is likely to need 38 draws. In my simulations, this happens about 40 times in 1000 years, so I estimate the likelihood in one year at about 4 percent. The degree of variability from one year to the next in these simulations is high. There is about a one in six chance of a year with less than $2 billion in sales. The likeliest value is around $2.9 billion.

The median length of a run in Mega Millions may be about 18 draws, reaching a jackpot of about $175 million. The jackpot will probably be paid about five times per year.

In Powerball, in contrast, the median length of a run is 13 draws, for a jackpot just over $200 million. There will probably be about seven or eight jackpot wins in a year. Twenty-one draws should produce a jackpot over $400 million; at least one such jackpot happens in more than 93 percent of simulated years.

The likeliest sales result for Powerball is about $4.9 billion, with a one in six chance of a year with as little as $3 billion.

On the basis of these projections, I find that the likelihood of seeing another jackpot of $1 billion or more in 2017 is about 10 percent. This is substantially lower than the 17 percent I estimated last year.

Practically speaking, what is the difference between a 10 percent likelihood and a 17 percent likelihood? Maybe not so much, in the sense that a conservative manager probably would not bet the farm in either case. However, our

beneficiaries and outside stakeholders are less likely to have a gambling orientation, and may be just as likely to think "you did it the first time, shouldn't it be easier to do it again?" Educating these outside stakeholders is tricky, because we don't want to give the impression that our past success was entirely due to luck- after all, we dealt with unprecedented volumes of transactions, and got good publicity because we did a great job of cultivating it. Still, it is important for them to understand that although we may be even better prepared for the next billion-dollar jackpot, we do not know whether it will happen in this year. Or the next. Or during the current term of any elected official.

All this just reminds us to look further than bigger jackpot games for the future development of our business. Fortunately, there are other ideas out there; some may appear in this publication. ■

[1] Studies documenting these points can be accessed on the NASPL Matrix.

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