

# MEGA MILLIONS AND POWERBALL JACKPOTS IN 2015: PROJECTIONS FROM MATH MODELS

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The January 2014 issue of *Insights* carried an article titled: "Mega Millions: What is the new normal?" In that article I discussed how I have used simulation models to project the likely future development of jackpots in Mega Millions, and projected the likelihood of seeing 1, 2, 3, or more jackpots of over \$300 million in an "average" year. A main message of that article was that a year with more than two such jackpots was not very likely. In fact, a year with three or more such jackpots would be about as likely as a year with no single jackpot over \$300 million.

This sort of projection may be useful to lotteries in the process of setting sales and profit goals for the next year or two. The big jackpot games are highly profitable, but also highly volatile on a year-to-year basis. While it may be perfectly reasonable to expect instant sales to grow consistently from one year to the next, this is not true of Mega Millions or Powerball.

Simulation models, such as I build, are driven by a description of how players' spending increases with the amount of the jackpot. In that January 2014 work, I started with a math description of how players spent in the "base period" defined as the interval between when Powerball raised its price to \$2 (February 2012) and when California joined the Powerball game (April 2013). Anticipating that these might already by January 2014 be the "good old days," I scaled expected sales for future periods down to 85 percent of that base period level.

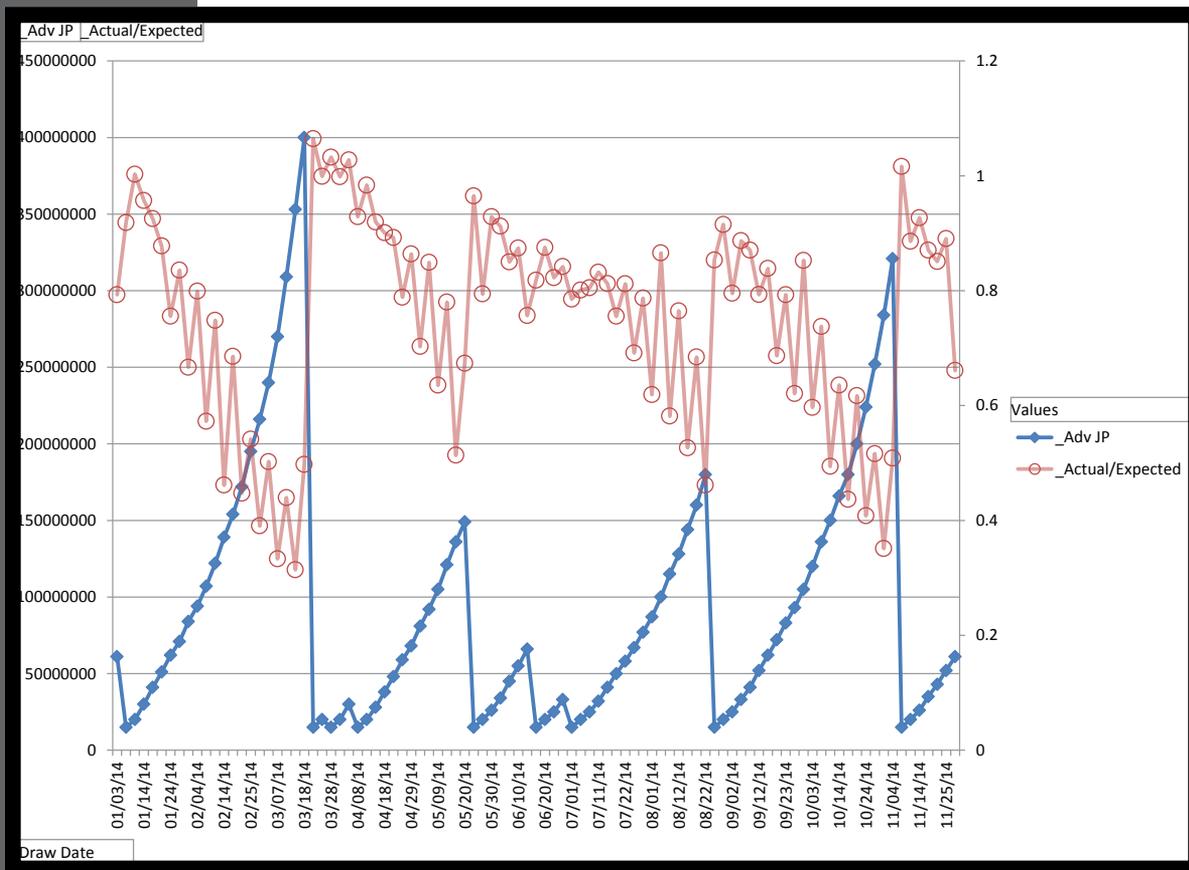
In early December of 2014, we have 11 months of actual

results to compare to that prediction. There have been two Mega Millions jackpots that built to over \$300 million. If we compare players' actual spending to the predictions of the "base period" model, we see that actual spending was only about 60 percent of baseline, not 85 percent as I had assumed. Further, if we plot the history of jackpots along with the percentage of "base period" sales achieved, we see that actual sales were 80 to 100 percent of base period sales when the jackpot was below \$100 million. As the jackpot rose toward \$300 million, actual sales dropped to less than 50 percent of what was seen in the base period. Chart A illustrates this.

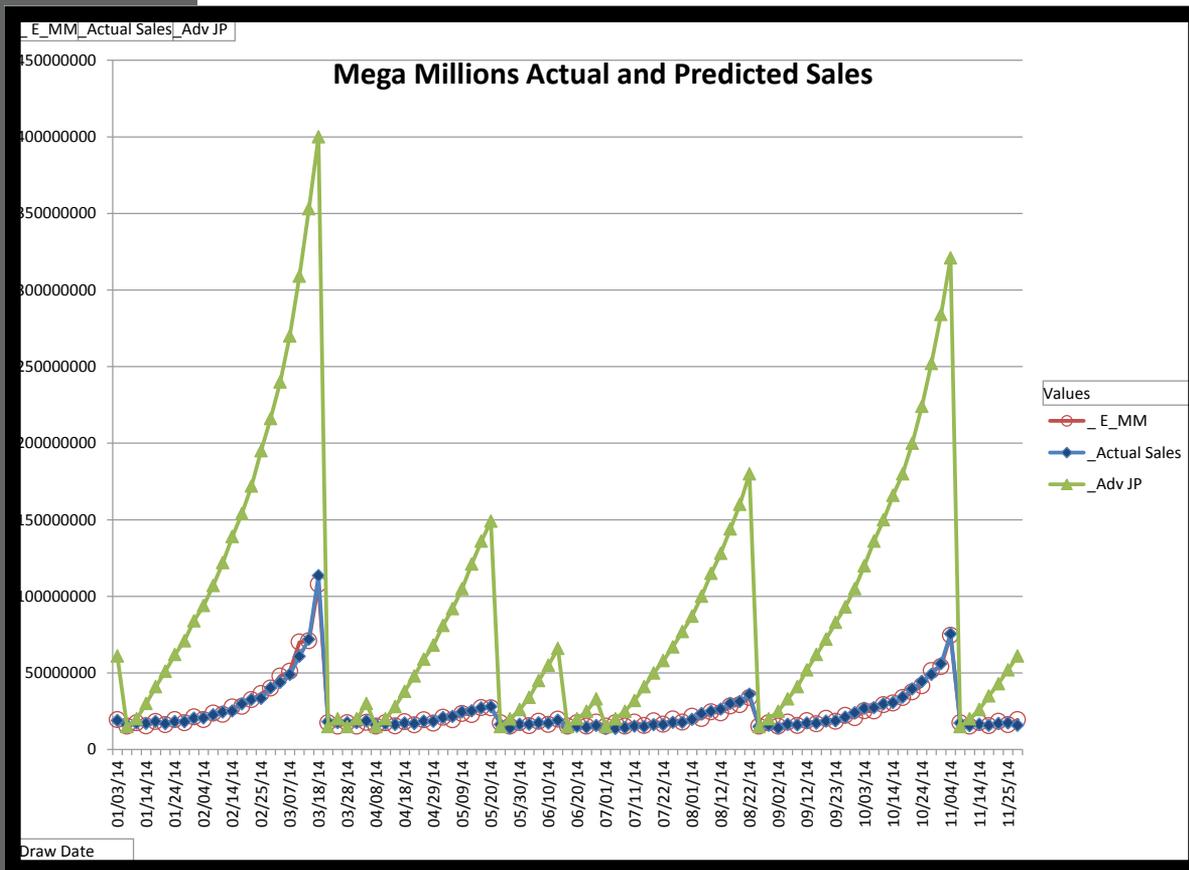
There is both good news and bad news in this observation. The good news, clearly, is that at jackpots between \$15 and \$100 million, spending is much as it was in the base period. I don't think it is a big leap to say that loyal regular players of Mega Millions are still with the game in late 2014. The bad news is about what to expect from building huge jackpots. I don't think it is a huge leap to say that new players are not being drawn into the game by rising jackpots as they once were.

What does this mean for the immediate future of Mega Millions? One perspective on this question comes from building new models that reflect how players have behaved in the past several months, and using these to project future sales and jackpot development. Chart B shows the correspondence between the model and actual sales during 2014, through November.

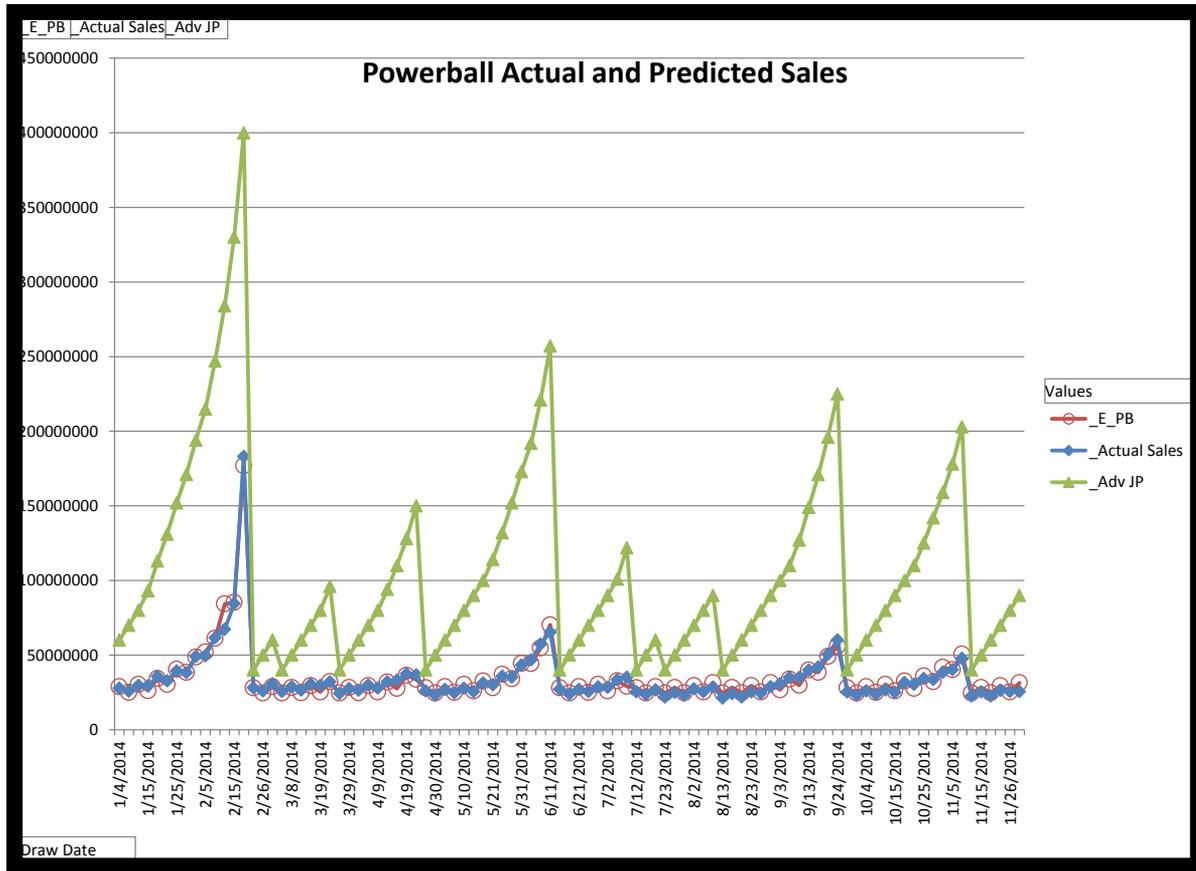
A



B



C



I used the same base period to build a new model for Powerball in Chart C above.

What if players continue to behave in 2015 as they have in 2014? What should we expect of jackpot and sales development in the bloc games, for the near term?

Given an adequate model of how players respond to jackpots (as described above), we can get an idea of what to

expect in the future by running “thousand year” simulation models. I have done this for both Mega Millions and Powerball, using player behavior in 2014 as the basis. I have used an annuity factor (which converts cash to advertised jackpot) of 1.8, which most would say is optimistic. The results are as tabulated here:

Number of Jackpots >\$300 million in a year	Mega Millions Probability	Powerball Probability
0	23%	1%
1	42%	7%
2	27%	21%
3	7%	32%
More than 3	1%	39%

Clearly, the future sales expectation for Mega Millions must be lower now than it was at the beginning of 2014. My modeling suggests that sales in an “average” year might now amount to about \$2.7 billion, down from my previous estimate of \$2.9 billion. Again, there is good news and bad news in this. The bad news is that expected sales are lower now. The good news is that expected sales are less than 10 percent lower, despite a big drop in expectations around super-high jackpots. Further good news is that year-to-year variation in expected sales and profits from the game is lower: about two-thirds of years would produce between \$2.2 and \$3.1 billion in sales. Lower variation reduces the uncertainty of planning.

In Powerball, the corresponding sales expectation is about \$4.9 billion for an “average” year. Year-to-year variability remains high: about two-thirds of years would be expected to finish somewhere between \$3.9 and \$5.9 billion. The probability of a Powerball jackpot reaching \$1 billion in the next year appears to be no more than 3 percent.

In summary, for the games as currently structured and played in 2014, Mega Millions is positioned to be much less about high jackpots than Powerball.

Individual lotteries historically account for a certain percentage of the nationwide sales total of each game. For purposes of goal-setting, these percentages can be applied to the national

expectations for the range of outcomes.

Of course, in the lottery world things change regularly. Changes to Powerball are on tap for the first part of 2015. The model described here may be useful in assessing the impact of these changes on player behavior, once enough time has passed. Let’s remember, in December 2015, to look both backward for the effects of these changes, and forward into the unknown of 2016! ■

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