

RISKY BUSINESS

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Risk is a word of warning. It can arouse anxiety and fear of loss. This emotional freight tends to make us back off from anything called risky.

Risk also has a sense that conveys an upside. I feel that the way risk is used in formal financial theory, tracing back to the 1950s, recognizes a profound truth: risk enables both the fear of losing and the thrill of winning. Risk is defined statistically in financial theory. This definition has nothing to say about emotions. Rather, it says something like, "the less predictable the yield from your investment, the riskier it is." Sometimes a risky asset disappoints; sometimes it yields more than we had any reason to expect.

In the lottery business, we manage assets (games) that have different degrees of risk. At one end we have the extremely risky multi-state games, Powerball and Mega Millions. Risky is not pejorative here, it is merely honestly descriptive. Yields can vary a lot from one year to the next. We never experience the long-term yield of these games, because every few years we change their rules. The long-term yield is in fact a difficult concept, because even if the games do not change, there is no assurance the

players will remain the same.

Near the other end of the risk spectrum, we have the small draw games that produce much the same sales and profit year after year. Most jurisdictions have a few of these. Some lottery jurisdictions earn most of their yield here.

Somewhere toward the low-risk end are the instant games. Here, risk arises because a particular game may fail to reach its sales goal, while still paying its top prizes. Alternatively, it may sell through while the big prizes go unclaimed. The risk associated with any single instant game is generally not all that important, because there are so many instant games in the market in most places.

The instant portfolio illustrates a key insight from economic theory: the important thing is the risk of the portfolio, not the risk of any particular asset. To the degree that the lottery's yield comes from small draw games and instants, it is less risky. But along with lower risk comes lower potential for big gains.

Economic theory talks about the risk tolerance of the investor - that is, the ability to accept variations in yield over time. Lottery managers tend to welcome the upside risk of Powerball

and Mega Millions, because these games have the potential to produce 'bonus' years; we count on less volatile assets to make the downside risk of the big games tolerable.

Unfortunately for lottery managers, it is not only their own risk tolerance but also that of their beneficiaries that matters. The beneficiaries are generally risk-averse, and at the same time hungry. They want whatever we can produce now, and there may not be any sort of 'buffer' to absorb one year's bonus in order to protect against another year's shortfall.

In the absence of an actual buffer, and with pressure to increase the yield to beneficiaries, what tactics are potentially available to protect beneficiaries from risk? One approach might be to focus more attention on developing games that are not inherently risky - draw games offering smaller top prizes, for instance. Another might be to work for better profitability of the instant games.

However, since the appeal of really big prizes has been demonstrated many times, it is worth asking whether there is any way to make offering really big top prizes less risky. Remembering the insight that it is the risk of the portfolio that matters, I

suggest that we consider the effects of diversifying our holdings.

Lotteries saw some benefit when, in 2010, they agreed that both Powerball and Mega Millions, rather than one game or the other, could be sold in each U.S. jurisdiction. Sales from both games together have been less variable year-to-year (and also larger) than from one alone. Statistical theory teaches that having the same volume of sales running through a greater number of games lowers year-to-year variability. As a rule, this works roughly according to the square root of the number of games: having four games would give half the variability of having only one. Each additional game added has a smaller beneficial effect.

Another approach to diversification has been shown by an unlikely teacher: the 'synthetic' lottery, of which Lottoland is the best-known example. Lottoland diversifies its risk portfolio by going right outside the lottery realm and working with commercial insurers.

Lottoland is a name that carries negative emotional freight in the lottery world, where it is known, first of all, for appropriating the best-known games of state-sponsored lotteries for its own profit. But if the Lottoland incursion teaches state lotteries something new about risk management, it may be doing us a favor.

The basic lesson from synthetic lotteries is that having a huge playing population and correspondingly large cash flow is not the only way to provide for paying multi-million-dollar prizes in a lottery game. We can address the possibility of paying a big prize at a financial loss in the same way we address the possibility of a house burning down: we pay a premium to an insurer in exchange for a guarantee to cover the cost of the adverse event. It is the insurer's business to assemble a diversified portfolio of risks, and to charge an appropriate premium for each little part.

Why would an insurer want to take on the risk of a big lottery game? Perhaps mostly because the risks



**Fast
Cheap
Delicious**
(Choose Any Two)



**Big Prize
Predictable Yield
Small/Medium
Population**
(Choose Any Two)

in our honest games of chance can be perfectly understood in principle, simply from the way the games are defined. There is no perfect math governing the risk of fire, and yet insurers work from empirical evidence to address the likelihood of your particular building burning. Lottery business may also appeal to an insurer, because no one insurer needs to be asked to take the whole risk of a game – rather, each may have a certain appetite for this kind of thing as a part of its diversified portfolio.

Why would a lottery want to consider paying another party to help it address the possibility of being “caught short” when paying a big prize? Because this frees the lottery from the Tyranny of Scale.

I must admit I am indebted to my friend M., the lottery-enthusiast economist, for that expression Tyranny of Scale. It happened like this: We were sitting in a bistro in Seattle, catching up on what we each had been working on. I was telling him about this very article that I was writing, and how I was hoping to wind it up.

“You see, the problem is I may have started out sort of pedantic, with the definition of risk and all, and people don’t have a lot of patience with that sort of thing. I want to get to why you don’t have to be a big monopoly in order to pay big prizes, if you go the insurance route. It’s really profound in a way. I’m tempted to get all historical and talk about how, back in the day, it looked like the only way to make a big game work was to set up a state

monopoly to run it. But that would be a digression. I just want to emphasize what it may be worth now.”

“You need something like that sign over there,” said M. He nodded to a placard on a side wall. The placard was placed over framed awards and notices won by this eatery, a popular leader in the Seattle “slow food” movement.

“Well, that’s the slow-food attitude for sure,” I acknowledged. “But actually, this place delivers pretty well on all three points, doesn’t it?”

“Yes, I’m happy with it too,” he said. “But my point is that the sign shows the constraints they work within. And they have managed to make tradeoffs within that box that produce something we like.” While I considered how slow would be too slow, M. pulled out a pen and wrote on his napkin:

“Here’s the box lotteries have been in. If you want predictability, you have to keep the prize relatively small. But ‘small’ does not mean the same amount of money when you have one million players as when you have 10 million, or 100 million. So, with a bigger population, you may feel safe offering very long top prize odds on a big prize. If you risk a big prize, even with a small population, you may lose money some years. The yield becomes unpredictable over any reasonable amount of time. And a start-up is just a crap shoot. That’s what I would call the Tyranny of Scale. But, if you choose to make your yield predictable by going to the insurance model – that is, you give up some of the upside

by paying premiums, in exchange for protection from the downside – then you don’t have to worry about the size of the playing population. You escape the Tyranny of Scale.”

“But doesn’t that add a cost of operation?”

“Sure. And wouldn’t the benefit be worth something? You would probably have to do a competitive procurement for the insurance. Might get enough competition going to get a good price.”

“Do you mind if I use your Tyranny of Scale in the article?”

“Don’t you think that’s a little florid?”

“Yeah, but I can put that on you, so no harm done. And I’ll keep that napkin too, if you don’t mind.”

So it was that M. provided me with the ending of this article, for which I am again indebted. To make the implication completely clear: With insurance-backed prizing, the size of the player population can become irrelevant. This is especially important when considering a new game which, although it may grow in popularity, is initially unknown. The player population must grow from a small start. With the conventional approach that M. sketched on the napkin, the early development of a new game can easily produce a financial loss. If the lottery is not provisioned to cover the loss, the random occurrence of an early top prize award may lead to the accidental death of the game. Why not pay a little for relief from that risk? This is the value proposition of insurance in the lottery industry. ■



Andrew Davis at NASPL!

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