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Triple Crown Teachings

Three Takeaways from the Quest for the Elusive Feat

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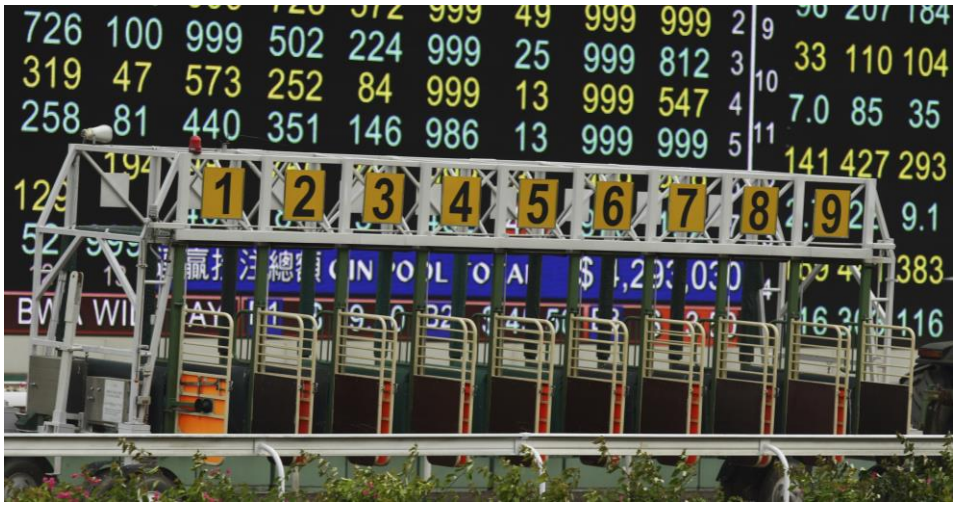


"When American Pharoah seeks to complete a sweep of the Triple Crown at Belmont Park on Saturday, racing fans will hope to see a great race and perhaps a definitive confirmation that the winner has earned a lofty place in the sport's history. Based on recent history, it won't happen."

Andrew Beyer[1]

- The quest for the Triple Crown of horse racing offers three lessons for an investment organization:
  - Pay attention to the results of the past
  - Recognize the value of diversity
  - Value = Probability x Price
- The first lesson is to consider base rates in assessing future outcomes.
- The second lesson is to promote cognitive diversity and thereby avoid the equivalent of inbreeding in your organization.
- The final lesson is to focus on mispricing in investing.

Introduction

To be part of the pantheon of horse racing in the United States requires winning the Triple Crown—the Kentucky Derby, the Preakness Stakes, and the Belmont Stakes. The three races cover different distances and occur over a span of just five weeks. It is an extraordinarily hard task for a horse. Indeed, only eleven have achieved it in the past century.

On Saturday, June 6th, 2015, American Pharoah will be the 32nd horse to attempt to complete the feat.[2] Up to that point, the three-year-old bay colt had won five of the six races he had entered including victories by a margin of one length at the Kentucky Derby and a more impressive seven lengths at the Preakness.

Whether American Pharoah wins or losses, the path to the Triple Crown offers three lessons for investors and organizations. Some of the teachings may be familiar but are a useful reminder.

Lesson 1: Pay attention to the results of the past. Andrew Beyer, a horse racing expert, said of American Pharoah's chances of winning: "Based on recent history, it won't happen." Why the downbeat message? The answer lies in the base rate of success over time.

In the last 100 years, 31 horses have been in a position to capture the Triple Crown and, as noted, 11 of them succeeded. That places the success rate at about 35 percent. But those numbers belie a marked distinction before and after 1950. Before 1950, eight of the nine horses that tried won, or close to 90 percent. Since 1950, only 3 of 22 have succeeded, and none since 1978. In the past sixty-five years, more than 85 percent of the horses failed to capture glory.

Further, American Pharoah's speed is not particularly distinguished. Beyer developed the Beyer Speed Figure, which measures the results of a horse adjusted for the track conditions. Higher speed figures are better. When you compare American Pharoah's figures for the Kentucky Derby and Preakness to those of the last eight Triple Crown aspirants—reliable speed figures have only been available since 1990—he falls near the bottom of the heap. The sole horse with worse speed figures was last year's failed Triple Crown contender, California Chrome, who finished the Belmont tied for fourth place.

In 2014, California Chrome had to deal with 10 challengers, whereas American Pharoah will run against just 7. That brightens American Pharoah's prospects. But winning the Belmont has eluded all comers in the last 36 years.

The lesson is to consider base rates in assessing future outcomes. While finding an appropriate reference class and the relevant data can be tricky, psychologists have shown that we tend to rely too much on our own point of view and fail to consider sufficiently the experiences of others.

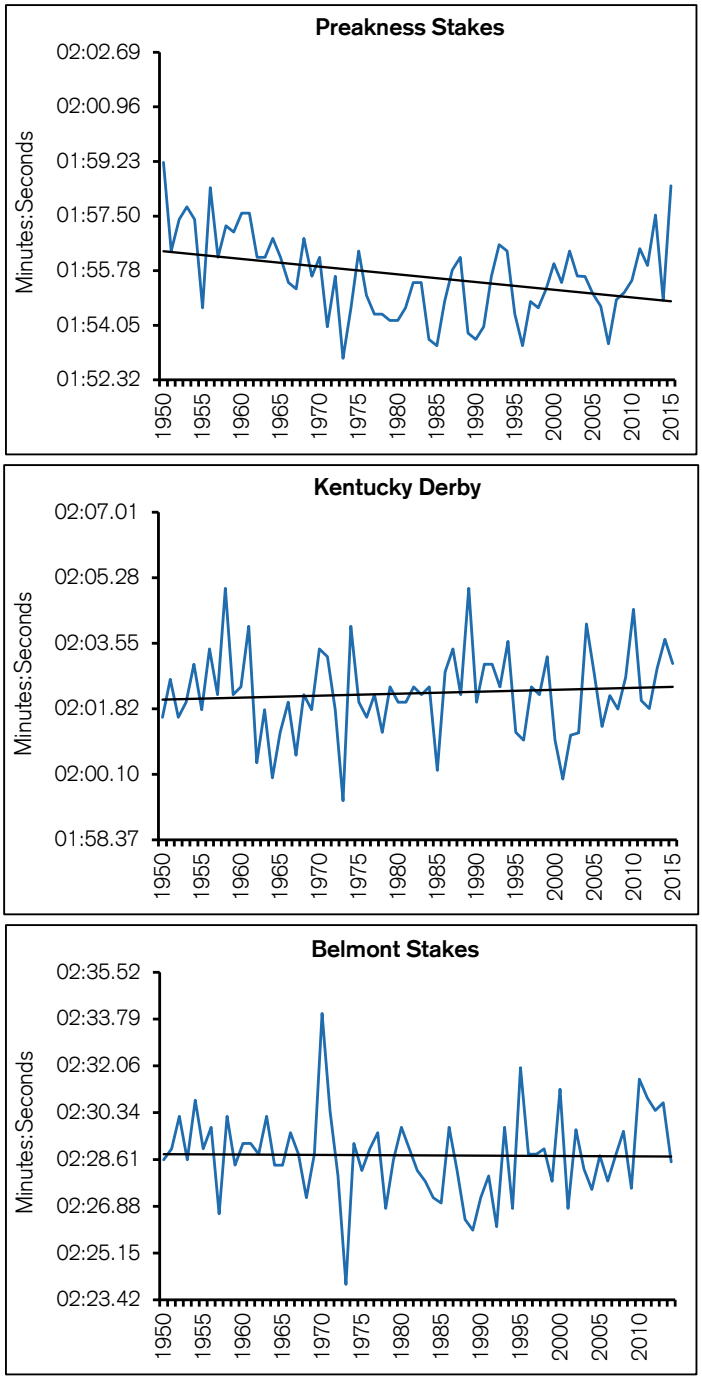
Lesson 2: Recognize the value of diversity. In the discussion of success rates, the year 1950 pops off the page. Why would the horses have succeeded at such a high rate prior to 1950 and at such a low rate after it?

The answer has many facets, but exhibit 1 is a good place to start. It shows the winning times for the three events from 1950 to 2015 (of course, it is without the Belmont result). Rather than listing the races in chronological order, they are ranked by distance. The Preakness is the shortest race (1 $^{3}/_{16}$ miles), the Kentucky Derby in the middle (1 $^{1}/_{4}$), and the Belmont the longest (1 $^{1}/_{2}$).

While the Preakness shows a modest decline in finishing times since 1950, you can see that the trend in times for the Kentucky Derby and the Belmont are essentially flat. For example, the winner of the 1950 Kentucky Derby, Middleground, had a raw time of 2:01:60, faster than American Pharoah's 2:03:02 in 2015.

One academic studying the topic wrote, "Despite intensive programs to breed faster thoroughbreds . . . race speeds . . . have not increased in the last 40-60 years."[3] Can you think of any other athletic endeavor where the results have not improved since the middle of the last century?

Exhibit 1: Winning Times for Triple Crown Races, 1950-2015



Source: www.preakness-stakes.info; www.kentuckyderby.ag; www.belmontstakes.com.

Take humans as an example. Researchers estimate that winning times for elite humans running races from sprints to marathons have improved 12 to 13 percent over the same time period.[4] You can explain this gain through a larger population, better nutrition, refined training methods, psychological incentives, and an improvement in technology. (This leaves aside other potential sources of performance enhancement that are relevant for animals and humans.)

One plausible explanation is that thoroughbred horses reached their physiological peak of performance in the mid-1900s.[5] Breeding is a key part of this argument. In 1791, James Weatherby established a record of thoroughbred horse breeding, effectively creating a closed population. Analysis shows that about one-third of the genes in the current population of one-half million thoroughbreds come from four stallions born between 1688 and 1725. The top ten contributors are responsible for about half of the genes, and 31 horses account for 80 percent of the genetic makeup of today's stock.[6] Thoroughbreds have among the highest ratio of inbreeding of any horse breed.[7]

Early horse races tended to be over longer distances than today and owners ran horses that were older. In the last two centuries, the distances have gotten shorter and the horses younger. As a result, thoroughbreds were bred for speed and precocity. This allowed for a steady improvement in race performance from the early 1800s through the mid-1900s.[8] But horses have simply not gotten faster, save for some improvement at short distances. Since 1950, normal variance explains most of the ups and downs in times.[9]

Indeed, it appears that inbreeding has taken a turn for the worse in recent decades. Whereas the goal for years had been to breed for speed, the emphasis today is more on producing yearlings that fetch as much money as possible at auction. As a result, inbreeding has increased sharply since the mid-1990s.[10]

The lesson is to avoid the equivalent of inbreeding in your organization. Research shows that diverse teams tend to outperform more homogenous ones when faced with complex problems. Many organizations, including investment banks, consulting firms, and investment managers, tend to recruit from a select number of universities and place substantial weight on personal fit. This practice can limit diversity.[11]

The goal is to build a workforce with high cognitive diversity and good cultural fit.[12] You can think of the value of cognitive diversity as similar to that of genetic diversity. Matt Ridley, a journalist, makes the link even more vivid when he suggests that the key to innovation is "ideas having sex."[13] The point is that you want diverse ideas to engage in reproduction so as to increase the fitness of your organization.

Lesson 3: Value = Probability x Price. Notwithstanding the dismal record of horses trying to win the Triple Crown, bettors appear unfailingly optimistic about each horse's chances. Exhibit 2 shows that the last eight contenders had probabilities of winning the Belmont in the range of 40 to 80 percent as implied by the odds.

Exhibit 2: Implied Probability of Winning the Belmont for the Last Eight Triple Crown Aspirants

	Probability
Silver Charm	49%
Real Quiet	56
Charismatic	39
War Emblem	44
Funny Cide	50
Smarty Jones	74
Big Brown	77
California Chrome	63

Source: Equibase Company.

American Pharoah is in the same range. The recent odds of 3-5 suggest a probability of winning of 63 percent. That figure is very high, representing a lofty expectation of performance. Odds are set through a pari-mutuel system, where the bettors express their expectations by how they allocate their dollars. More money bet on a horse drives up its probability of winning.

Steven Crist, a handicapper and author, emphasizes that the attractiveness of an opportunity is a function of both the probability of the event occurring and the payoff.[14] Before any bettors are rewarded, there is a takeout to pay the race purses, track, and state. This means that the win pool is reduced by 15-20 percent. Assume the takeout is 20 percent. That means a $4 bet on a horse with a 50 percent chance to win pays, on average, $3.20.[15]

Crist's point is that the intelligent handicapper requires a combination of probability and price to yield a positive expected value. Knowing which horse is likely to win doesn't make you money; you need to know which horse is mispriced. It takes little effort to translate this to the world of business and investing. Knowing which company is best isn't the path to riches; knowing which company is mispriced makes you money.

Triple Crown contenders attract a lot of unsophisticated bettors. On a typical Saturday in the U.S., wagers on horses are about $50 million. For last year's Belmont Stakes, the bets were three times that amount. You can safely assume that most of the incremental $100 million was from people caught up in the excitement of the Triple Crown.[16] As a result, Triple Crown contenders are almost always mispriced. Probability times price yields a poor value. Perhaps for some, betting on a potential winner has excitement value that exceeds the cost of the ticket. But that doesn't make it a good bet in monetary terms.

The final lesson is that you need to focus on mispricing in investing. Triple Crown contenders are a little like dot-com darlings from the late 1990s: Their past success draws the attention of individuals who invest without sufficient regard to the relationship between price and value.

American Pharoah may win the Triple Crown, and if he does it will be an extraordinary feat that will bring deserved excitement to the sport. But no matter the outcome, we can say that his current probability appears too high.

Endnotes

[1] Andrew Beyer, "What Happened to the Belmont Stakes? Breeders De-Emphasized Stamina," *Washington Post*, June 1, 2015.
[2] The horse's name is "Pharoah" instead of "Pharaoh" because of an apparent error. The owners of the horse, Zayat Stables, ran a contest to name the horse. A woman named Marsha Baumgartner submitted the winner. Zayat Stables turned around and submitted the name to the Jockey Club, the organization that registers thoroughbreds. It is not clear whether Baumgartner misspelled the name or whether Zayat Stables made the error when submitting it. But since the name met all of the criteria for approval, it was granted as submitted. Melissa Hoppert, "So, Who Misspelled American Pharoah?" *New York Times*, May 22, 2015.
[3] Mark W. Denny, "Limits to Running Speed in Dogs, Horses, and Humans," *Journal of Experimental Biology*, Vol. 211, No. 24, December 2008, 3836-3849.
[4] David S. Gardner, "Historical Progression of Racing Performance in Thoroughbreds and Man," *Equine Veterinary Journal*, Vol. 38, No. 6, November 2006, 581-583.
[5] Roger Pielke Jr., "Thoroughbreds Are Running as Fast as They Can," *FiveThirtyEight*, May 3, 2014.
[6] Patrick Cunningham, "The Genetics of Thoroughbred Horses," *Scientific American*, May 1991, 92-98.
[7] Jessica L. Petersen, James R. Mickelson, E. Gus Cothran, Lisa S. Andersson, Jeanette Axelsson, Ernie Bailey, Danika Bannasch, Matthew M. Binns, Alexandre S. Borges, Pieter Brama, Artur da Câmara Machado, Ottmar Distl, Michela Felicetti, Laura Fox-Clipsham, Kathryn T. Graves, Gérard Guérin, Bianca Haase, Telhisa Hasegawa, Karin Hemmann, Emmeline W. Hill, Tosso Leeb, Gabriella Lindgren, Hannes Lohi, Maria Susana Lopes, Beatrice A. McGivney, Sofia Mikko, Nicholas Orr, M. Cecilia T Penedo, Richard J. Piercy, Marja Raekallio, Stefan Rieder, Knut H. Røed, Maurizio Silvestrelli, June Swinburne, Teruaki Tozaki, Mark Vaudin, Claire M. Wade, Molly E. McCue, "Genetic Diversity in the Modern Horse Illustrated from Genome-Wide SNP Data," *Plos One*, January 30, 2013.
[8] Mim Bower, Beatrice A. McGivney, Michael G. Campana, Jingjing Gu, Lisa S. Andersson, Elizabeth Barrett, Catherine R. Davis, Sofia Mikko, Frauke Stock, Valery Voronkova, Daniel G. Bradley, Alan G. Fahey, Gabriella Lindgren, David E. MacHugh, Galina Sulimova, and Emmeline W. Hill, "The Genetic Origins and History of Speed in the Thoroughbred Racehorse," *Nature Communications*, Vol. 3, No. 643, January 24, 2012.
[9] Secretariat, the greatest racehorse of all time, appears to be an anomaly. That horse's heart was estimated to weigh 22 pounds, more than 2.5 times the size of the average heart for a thoroughbred. Researchers believe that a mutuation for heart size is passed through the mare line. See "Bruce Lowe Figure System Coming Back Into Vogue," *Journal of Equine Veterinary Science*, Vol. 14, No. 4, April 1994, 200.
[10] M.M. Binns, D.A. Boehler, E. Bailey, T.L. Lear, J.M. Cardwell, and D.H. Lambert, "Inbreeding in the Thoroughbred Horse," *Animal Genetics*, Vol. 43, No. 3, June 2012, 340-342.
[11] Lauren A. Rivera, "Guess Who Doesn't Fit In at Work," *New York Times*, May 30, 2015.
[12] Elizabeth Mannix and Margaret A. Neale, "What Differences Make a Difference? The Promise and Reality of Diverse Teams in Organizations," *Psychological Science in the Public Interest*, Vol. 6, No. 2, October 2005, 31-55.
[13] Matt Ridley, "Ideas Having Sex," *Reason.com*, July 2010.
[14] Steven Crist, "Crist on Value," in Beyer, et al., *Bet with the Best* (New York: Daily Racing Form Press, 2001), 61-75.
[15] Here's the math, based on Crist's essay. Assume a win pool of $1,000 is reduced to $800 because of takeout and breakage (rounding down payoffs). A horse with a 50 percent probability of winning would have had 125, $4 bets placed on him ($125 x $4 = $500, or 50 percent of the total $1,000 bet). So if the horse wins, the payoff is $6.40 ($800/125) and zero if he loses. So the expected payoff is (0.5 x $6.40) + (0.5 x $0) = $3.20.
[16] Eric Chemi, "If You Bet on the Preakness, Don't Make These Rookie Blunders," *NBCNews.com*, May 15, 2015.

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