Extensions: probabilities of success runs in general settings

$$s_n = f_1 + f_2 + \cdots + f_n$$

$$f_n = u_n - f_1 u_{n-1} - f_2 u_{n-2} - \cdots - f_j u_{n-j} - \cdots - f_{n-1} u_1$$

$$u_n = 2^{-5} - u_{n-1} 2^{-1} - u_{n-2} 2^{-2} - u_{n-3} 2^{-3} - u_{n-4} 2^{-4}$$

Extensions: probabilities of success runs in general settings

- Success runs of length r
- Biased coins with success probability p

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Extensions: probabilities of success runs in general settings

- Success runs of length r
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$$s_n = f_1 + f_2 + \cdots + f_n$$

$$f_n = u_n - f_1 u_{n-1} - f_2 u_{n-2} - \cdots - f_j u_{n-j} - \cdots - f_{n-1} u_1$$

$$u_n = p^r - u_{n-1} p - u_{n-2} p^2 - \cdots - u_{n-(r-1)} p^{r-1}$$

The basis of a statistical test

- The test: Compare the observed sequence of basket attempts with a string of coin tosses.
- The slogan: *The more likely it is that a success run (of the observed length) occurs somewhere in a string of coin tosses the less the evidence for a hot hand.*
- The conclusion? "The hot hand theory is a widespread cognitive illusion affecting all beholders, players, coaches, and fans."

- References: The quote is from D. Kahneman's very readable account summarising the work of T. Gilovich, R. Vallone, and A. Tversky.

- The original paper: T. Gilovich, R. Vallone, and A. Tversky, "The hot hand in basketball: On the misperception of random sequences", *Cognitive Psychology*, volume 17, pages 295-314, 1985.
- The quote: D. Kahneman, *Thinking, Fast and Slow*, page 117. New York: Farrar, Straus, and Giroux, 2011.