Efficiency Stuff
Econ 452

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"A market in which prices always ‘fully reflect’ available information is called ’efficient.’" - Fama (1970)
What does this mean? Suppose there is some news at time $t_1$. How does the price respond? Consider two pictures.
Kendall in 1953 noted:

*It may be that the motion of [stock prices] is genuinely random and that what looks like a purposive movement over a long period is merely a kind of economic Brownian motion. But economists – and I cannot help sympathizing with them – will doubtless resist any such conclusion.*

As Kendall put it, in discussing over 2,000 weekly price changes in Chicago spot wheat recorded for years between 1883 and 1914:

*The series looks like a "wandering" one, almost as if once a week the Demon of Chance drew a random number from a symmetrical population of fixed dispersion and added it to the current price to determine next week’s price.*
Samuelson on his result:

It does not prove that actual competitive markets work well. It does not say that speculation is a good thing or that randomness of price changes would be a good thing. It does not prove that anyone who makes money in speculation is ipso facto deserving of the gain or even that he has accomplished something good for society or for anyone but himself. All or none of these may be true, but that would require a different investigation [1965a, III, Chap. 198, p. 789].
Figure: Information Sets and Efficiency
Figure 4.3
Percent of equity mutual funds outperformed by Wilshire 5000 Index, 1972–2001

Source: The Vanguard Group.
Persistence

![Graph showing average monthly excess return over different years for Decile 1 and Decile 10.](image)
Volatility: Shiller Diagram

Fig. 1.—Standard and Poor’s (real) annual composite stock price index 1926–79 augmented with Cowles Commission common stock index 1871–1925 (solid line) and corresponding perfect-foresight series, including terminal condition $p^*_T = p_T$. 
Fig. 2.—Nonstationary (geometric random walk) price series (solid line) and corresponding perfect-foresight series, including terminal condition $p^*_T = p_T$. 
Dividends Paid and Dividend Paying Companies (TTM Basis) – 10 Years

Source: FactSet Fundamentals via FactSet Alpha Testing