

NON-TECHNICAL SUMMARY

TITLE: The Long and Short of It: Why are Stocks with Shorter Runs Preferred?

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We investigated whether there are systematic biases in how individuals read graphical information to judge financial risk. We show that investors systematically perceive that stocks with longer run-lengths (the consecutive number of upward or downward movements in the series) are riskier. Stocks with shorter runs are perceived to be less risky and are preferred even when they are statistically identical to stocks with longer run-lengths. This is termed the “run-length” effect. Importantly, the run-length effect increases with greater education and frequency, length, and diversity of trading experience.

These results have implications for how financial information is communicated to investors. The visual display of stock information has increased and the number of commercial purveyors of stock analysis information has mushroomed. Many online sites (e.g., Yahoo! and Vanguard) allow investors to customize graphs, enabling richer visual analysis. Given that traders make split second decisions using common data that is presented graphically or as strings of numerical data, systematic biases in risk perceptions may permeate the market uniformly, resulting in persistent biases in prices.

Understanding systematic biases in how investors read graphs to make financial investment decisions is also an issue of relevance to consumer welfare groups and public policy makers. Individual biases in financial decision-making could aggregate to major market movements, given the large and growing individual investor base that

contributes to a substantial level of market activity. The Investment Company Institute estimates that 45% of all U.S. households (92M individuals) invest in mutual funds with a median portfolio of \$100K, accounting for \$10.35 trillion (year-end 2008). Thus, an understanding of the psychology behind individual investing is possibly also of interest to government regulators who would like to control volatility in financial markets.

What is the mechanism by which run-length affects investor decision-making?

We argue that given the large amount of data presented on a graph, investors simplify their task by sampling points from a financial instrument's price history to estimate trend and noise. This sampling strategy leads to perceptual biases when the sample points are chosen as a function of their salience and are not representative of the price series.

To examine this question, we displayed various series of daily returns for one year that were identical in terms of mean, variance, skewness and kurtosis, but were different in the consecutive number of upward or downward movements in the series, so that their average run-length differed. We then showed that stocks with higher run-lengths have more extreme local maxima and minima. The local maximum is the largest value and the local minimum is the smallest value that a price sequence takes within a given neighborhood. The difference in the extremity of local maxima and minima leads to investors perceiving greater risk for stocks with higher run-lengths.

The run-length effect is particularly interesting as, historically, run-lengths are not positively correlated with the variance of returns in the US financial markets, and an overwhelming majority of stocks on the NYSE, AMEX and NASDAQ from January 1962 to

December 2005 have run-lengths between 2 and 3 (74%), with as many as 14% having run-lengths >3. (A run-length of 2 is associated with a random walk.)

We tested this prediction in three experiments. In Study 1, we recruited 71 PTA members in an affluent Californian suburb. These adults were highly educated (96% graduates), affluent (74.3% reported annual household income > \$100K), and had finance-related experience (32.4% had worked in a finance-related job, 22.5% had worked in the financial sector). They were also heavy investors: 83% invested >25% of their assets in financial securities (one-third invested >75%), 78.8% owned 5+ stocks, and over half traded multiple times a year. Results show the run-length effect: 90% of the sample believed that the stock with an average run-length of 10 was riskier than the equivalent stock with an average run-length of 3.

In Study 2, we recruited 150 undergraduate students and tested their risk perceptions of stocks with run lengths 2, 3, 4 and 8. Results show that stocks with shorter run lengths are perceived as less risky than stocks with longer run lengths. In Study 3, we surveyed a random sample of 217 individual investors. Over two-fifths of the sample reported financial assets of over \$50K (8% reported \$500K+), and stated that they relied on stock charts more than any other resource in making their stock picks. If education and experience reduce the run-length effect, then consumer welfare and public policy officials may have little to worry. However, if biases are greater among those who invest more frequently and across a wide range of instruments, then investors are clearly unable to learn from their past behavior and the biases are more

likely to aggregate to market effects. We found that that run-length effects are greater for investors who:

1. Are more educated (college graduates = 133) versus those who have not completed a college degree (79).
2. Trade quarterly (n = 69), semi-annually or annually (n = 31) versus those who trade less than once a year (n = 112).
3. Had actively traded in the stock market for 5+ years (n = 98) versus those who had traded for less than 5 years (n = 115).
4. Invested in one (n = 64), or two or more (n = 87) of six different investment vehicles (mutual funds, stocks, bonds, commodities, foreign exchange, and other) versus those who invested in none (n = 66).

These results have potentially wide-ranging implications for investors as well as for technical analysis carried out by chartists who trade on graph patterns. From a consumer welfare perspective, individual investors should be made aware of their biases in appraising and comparing stocks using charts. People may be less biased if they are provided risk and return statistics numerically rather than graphically. From a public policy perspective, regulators should consider imposing guidelines about how financial information is presented to individuals akin to mandatory labeling by the FDA.