# Behavioral Biases and Investor Behavior: Predicting the Next Step of a Random Walk (Revisited and Extended)

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## From Barberis and Thaler (2002):

Since behavioral theories claim to be grounded in realistic assumptions about behavior, we hope behavioral finance researchers will continue to give their assumptions empirical scrutiny.

If a theorist wants to claim that fact X can be explained by behavior Y, it seems prudent to check whether people actually do Y.

**Barberis, Shleifer, and Vishny (1998)**

- Earnings follow a **random walk** but investors falsely believe they are drawn from a **regime-shifting** process.

  – Reversal regime

  – Trending regime

**Barberis, Shleifer, and Vishny (1998)**

- Investor's only task: Which regime is governing?

- When + followed by +, raises likelihood of trending

- When + followed by -, raises likelihood of reversal

- Testable implication: Investor more likely to believe the next earning realization is a continuation after observing a streak of like outcomes, and more likely to believe that it is a reversal the higher the rate of past reversals.

## Rabin (2002)

- Investor has a strong prior that firms are "average" (generating equal numbers of good and bad outcomes), but also allows for the possibility of "good" and "bad" firms.

- After short streaks of like outcomes, due to the strong "average-firm" prior, the investor believes that a reversal is due. After a long streak, the investor expects continuation as he believes he is facing an "extreme" firm.

- Testable implication: Investor more likely to believe the next earning realization is a reversal after short streaks and continuation after long streaks.

# Bloomfield and Hales (2002): Predicting the Next Step of a Random Walk

- Subjects are shown 8-outcome binary sequences (up or down) and **informed** that sequences are from a random walk.
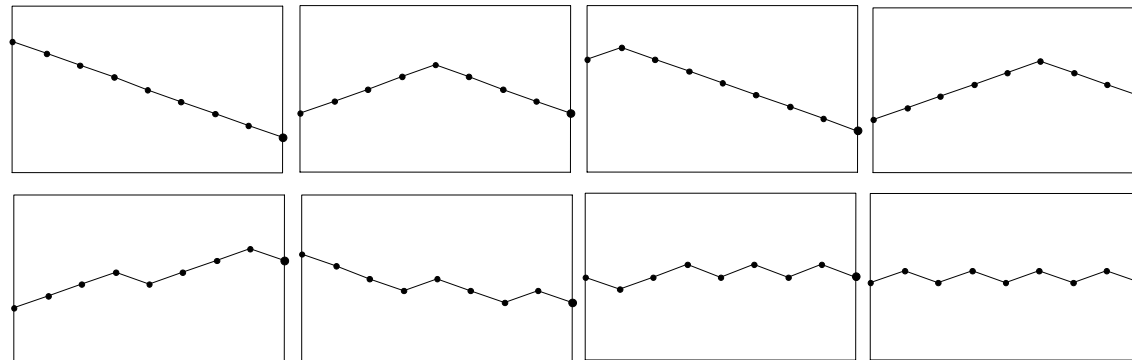


- Ask subjects to predict whether the next move will be up or down (Use incentive compatible mechanism that elicits subjective probabilities of an UP movement).

- **Result:** Subjects show "a strong tendency to predict reversion after seeing many reversals and to predict trending after seeing few recent reversals."

## Histograms
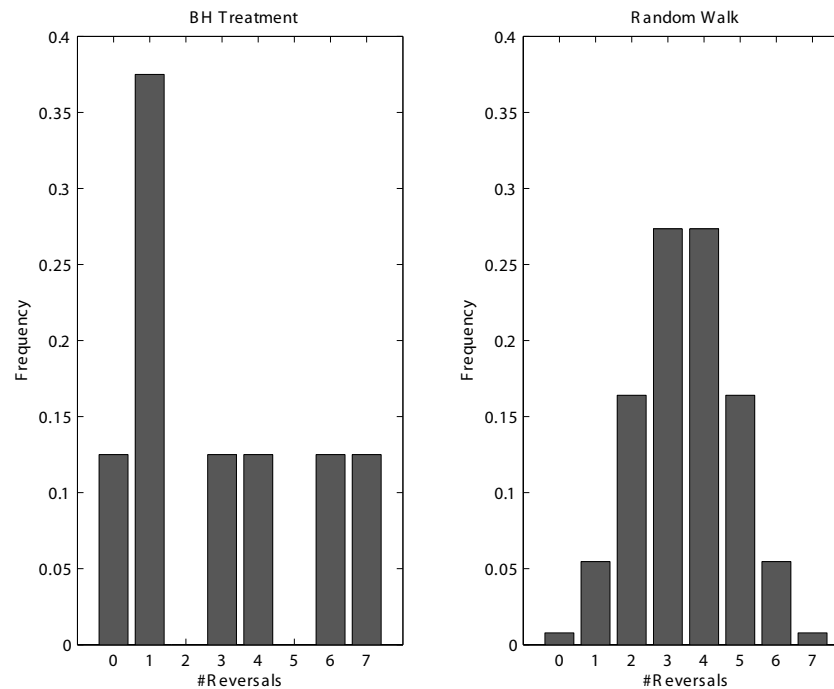
# Bloomfield and Hales (2002) Revisited

- Use BH experimental design BUT present subjects with sequences that are generated from a random walk process.
- Result: In our experiment subjects are more likely to bet on reversal the **fewer** the number of past reversals (Gambler's fallacy).

| #Reversals | Mean Reaction for category | |
|---|---|---|
| | Bloomfield and Hales | BHR |
| Low | **11.2**$^*$ $(p < 0.01)$ | **-5.8370**$^*$ (-2.4821) |
| Moderate | **0.9** $(p > 0.8)$ | **-0.8210** (-0.8401) |
| High | **-6.9**$^*$ $(p < 0.01)$ | **-1.2450** (-0.5233) |

# BH tests of BSV, Summary

- In situations where people do know the data-generating process in advance, the law of small numbers leads to a gamblers fallacy effect.

  Barberis and Thaler (2002)

- Based on above we conjecture that BH results might be driven by the non-random sequences shown to subjects.

- BH experiment cannot rule out the possibility that subjects rationally conclude that the data is from a regime-shifting process.

# Testing BSV and Rabin models

- In addition to using random sequences we:

  - modify laboratory setting by not telling subjects about the underlying process.

  - expand testing methodology to include an analysis of streaks.

# Hypothesis, BSV

- Through a simulation experiment we verify that when both number of past reversals and streak length are considered

  - the relation between reaction and reversals is negative

  - the relation between reaction and streak is positive

- **H0:**

  - When reaction measure is regressed on number of past reversals and current streak length, the coefficient of reversals is negative, while the coefficient of streak is positive.

# AHL: Effect of Reversals and Streaks on the Reaction Measure

## Coefficient Estimates

| Intercept | REVERSAL | STREAK |
|-----------|----------|--------|
| 3.090 | −0.714* | |
| (2.348) | (-2.173) | |
| 1.700 | | -0.538 |
| (1.864) | | (-1.708) |
| 0.6 | −1.413* | −1.258* |
| (0.921) | (-3.648) | (-3.391) |

- While the reaction to reversals is in the right direction, the reaction to streaks is not. We therefore reject that investors act in accordance to the regime-shifting beliefs proposed by BSV in our simple experimental setting.

# Hypothesis, Rabin

- Through a simulation experiment we verify that

  - the relation between reaction and reversals is negative

  - the relation between reaction and streak is negative for short streaks and positive for longer ones.

- **H0:**

  - When reaction measure is regressed on number of past reversals and current streak length, the coefficient of reversals is negative, the coefficient of short streaks is negative, and the coefficient of long streaks is positive.

# Effect of Reversals and Streaks on the Reaction Measure: Further Analysis

| | Coefficient Estimates | | | |
|---|---|---|---|---|
| | Intercept | REVERSALS | SHORT STREAK | LONG STREAK |
| K=4 | 9.143 (4.483) | -1.401 (-3.619) | -1.949 (-3.895) | 0.607 (0.620) |
| K=5 | 8.934 (4.452) | -1.400 (-3.619) | -1.797 (-4.107) | 2.194 (1.430) |

- Based on the statistical analysis we cannot reject that investors act in accordance to Rabin's model in our experimental setting.

We have two predictions about the outcome of the exercise of the direct tests of the assumptions of economic models. First, we will find out that most of our current theories, both rational and behavioral, are wrong. Second, substantially better theories will emerge.

Barberis and Thaler (2002)