

A Behavioristic Study on Overreaction and Underreaction: When and Why Does it Occur?

Jørgen Foss and Ane Warholm – 01/09/2016

❖ Objectives and motivations of the study

Overreaction and underreaction = possible explanations to asset mispricing

The study could serve as a prelude to assessing “the missing link” between fair asset prices and actual asset prices.

Motivation: help researchers “understand why the market appears to overreact in some circumstances and underreact in others” (*Michaely, Thaler and Womack, 1995: 606*)

Objective: integrate the theory and provide feasible explanations as to why and when overreaction and underreaction might occur in the market.

- ➔ First, by investigating overreaction and underreaction, find **evidence for their occurrence**
- ➔ Secondly – if we find such evidence – to provide answers to **when and why they occur**

Overreaction Hypothesis: both non-adjusted and risk-adjusted abnormal returns on Norwegian data seem to be too extreme to accord with market efficiency

❖ Data used

Collecting total returns and market capitalization from all non-financial firms listed on Oslo Stock Exchange (OSE) from the period of 1999-2014 (giving 16 years of data for 498 companies) → to assess whether overreaction and underreaction does in fact occur on Norwegian data (using Bloomberg database)

To avoid the survivorship bias, we chose to include all stocks traded from 1999-2014 instead of only considering those who are still trading at the end of our sample period. A requirement for a stock to be included in the portfolio is that it must have been traded during the observation period, and at a minimum once during the test period. We use monthly returns, and the market returns are computed as the equally weighted index of all the included stocks.

❖ Indicators, Methods, Models used

Many previous studies have used:

- ➔ **negative autocorrelation in stock returns** in the long run (two years or more) as **evidence of overreaction**
- ➔ **positive autocorrelation in stock returns** (= Momentum Effect) in the short run (one month to one year) has been used to **reflect underreaction**

Conclusions:

- ➔ losing portfolio (value stocks) strongly outperformed the winning portfolio (growth stocks), which necessarily had to imply that investors were overreacting = validated the Overreaction Hypothesis (*Thaler 2015*)
- ➔ investors first overreact by excessively favoring stocks, and then underreact to this asset mispricing (*Dreman and Lufkin 2000*)
- ➔ When? overreaction occurred prior to portfolio information (*Dreman and Lufkin, 2000: 73*)

Critiques:

- ➔ the abnormal return obtained by buying a “loser” portfolio is simply a compensation for adding risk, in congruence with the Efficient Market Hypothesis (*Chan 1988*)
- ➔ losers do not outperform winners after firm size and the January effect on returns is coped with (*Zarowin 1990*)
- ➔ the “winner” and “loser” portfolio returns is solely due to the January effect, and after it has been accrued for, there is no evidence for market overreaction (*Conrad and Kaul 1993*)

Our conjecture:

- ➔ general evidence on overreaction and underreaction are robust
- ➔ the two phenomena need to be recognized as possible explanations to asset mispricing
- ➔ assessing when and why these phenomena occur is something that might add additional credibility both to behavioral finance in general, and to the Overreaction Hypothesis in particular

Test for overreaction and underreaction separately to possibly get evidence for each of them

First ➔ make use of different models in order to prove their presence in the Norwegian Stock Market

Second ➔ explore whether there are negative serial autocorrelation (over-) in the long run (24 months) and positive autocorrelation (under-) in returns in the short run (6 months)

Third ➔ the findings are risk-adjusted and tested for robustness in order to assess whether these findings are in fact due to overreaction and underreaction by investors

Finally ➔ compare and review the existing literature on the two phenomena's occurrence in the market: to qualitatively assess **when** and **why** they might occur

Testing for Overreaction

#1 First test might give us results on the negative serial correlation in the medium- to long-term, where we can determine its significance

- ➔ If we find any mean reversion tendency in stock returns that is robust to the control of the factors mentioned above, it indicates that overreaction has occurred.

#2 Second test is performed to retrieve/develop data on the profitability of contrarian strategies (= Buying low-price value stocks and selling high-price growth stocks)

#1 and #2 tests will be performed on sub-periods within the data sample. In every sub-period there is an observation period and a test period.

Regression: the stocks will be sorted on the basis of how they performed in the observation period, and then assigned into winner (the best performing stocks), loser (worst performing stocks) and arbitrage (return gap between winners and losers) portfolios. At formation, the three different portfolios will be equally weighted, and the included stocks in these portfolios will be held through the test period.

Sample period will include the full 16 years of data, based on monthly observations from 1999 to 2014 where we test 24 month/24 month strategies. This gives us seven non-overlapping observation- and test periods. Using the methodology offered by *DBT(1985)*, we compute the **cumulative market-adjusted returns** (CAR) for the observation period for every period and for each stock. The CAR is given by:

$$CAR_{i,t} = \sum_{t=24}^{t-1} \mu_{i,t}$$

$\mu_{i,t}$ is the market-adjusted return for stock i in month t, and is computed as:

$$\mu_{i,t} = R_{i,t} - R_{m,t}$$

Where $R_{i,t}$ is the return for stock i in month t, defined as:

$$\frac{(P_{i,t}) - (P_{i,0})}{(P_{i,0})}$$

$R_{m,t}$ is the market (average) return in month t, and is computed as the weighted average of all the stock returns. Then, portfolios definition:

- Quintile (Q1) = winners = portfolio includes the 20 % best performing stocks
- Q5 = loser = portfolio includes the 20% worst performing stocks
- Q2, Q3 and Q4 = portfolios in between (i.e. medium performing stocks)

To test these portfolios performance → compute the average CAR of the stocks 24 months forward. The average CAR is computed as:

$$CAR_{p,z,T} = \sum_{t=1}^T \left(\frac{1}{N} \sum_{i=1}^N \mu_{i,t} \right)$$

p = type of portfolio we refer to (W for winner; L for loser; A for arbitrage); z = the period (1, 2,..., 7); T = how many months we hold onto the portfolio (i.e. 24 for our strategy of choice). The next step is to calculate the grand mean (ACAR) for the seven periods' CAR:

$$ACAR_{p,T} = \frac{\sum_{z=1}^Z CAR_{p,z,T}}{7}$$

$ACAR_p$ = an indication to whether there are negative autocorrelations in the returns

- ➔ Yes = there is mean reversion in the returns
 - “losers” earn positive average test period excess returns (i.e. $ACAR_L > 0$)
 - “winners” earn negative excess returns (i.e. $ACAR_W < 0$)
 - A non-zero arbitrage portfolio return (i.e. $ACAR_A \neq 0$)

Testing for Underreaction

Opposite of what were done when testing for overreaction: **to look at the positive serial correlation in returns for short-term periods**

Chose to run a 6 month/6month strategy, as before: to test the performance six months forward based on the past six months. This gave us a total of 31 observation and test periods. The observation period is the basis of the five quintiles to be tested in the test period (as before)

Then apply $ACAR_p$ = an indication to whether there are positive autocorrelations in the returns:

- imply momentum
- $ACAR_L < 0$ and $ACAR_W > 0$
- an arbitrage portfolio consisting of buying winners and selling losers would earn an abnormal return (i.e. $ACAR_A \neq 0$)

❖ Robustness

Overreaction Control for other risk and non-risk factors to assess the robustness of our results (= negative serial correlation in returns), the following considerations should be taken into account:

1. Size Effect
 - high portfolios (big firms) = firms having a size above the median market capitalization within that quintile
 - low portfolios (small firms) = have a size below
 - Same result = $ACAR_L > 0$ and $ACAR_W < 0$ = firm size doesn't matter
2. January Effect
 - neglecting the month of January
 - Same result = overreaction occurs in non-January months

❖ Results

Findings support Overreaction Hypothesis: they find a robust mean-reversion tendency in stock returns for our sample of non-financial Norwegian firms.

For overreaction: $ACAR_L > 0$ and $ACAR_W < 0$

- ➔ clear evidence of overreaction occurring on Norwegian stocks within our data sample

For underreaction, they did not find evidence of positive serial autocorrelation in the short term on their specific sample

- ➔ no evidence of a Momentum Effect being present on this sample

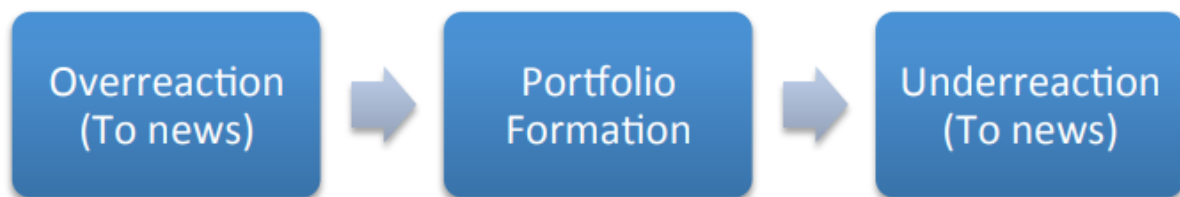
Underreaction: we find no clear pattern of positive autocorrelation of stock returns over 6 months for our data sample. For the winner portfolio, we see that there are positive autocorrelations in only 7 out of the 31 test periods. Oppositely, for the worst performing stocks there are a continued decline in performance in only 8 out of 31 test periods. Hence, utilizing a 6-month momentum strategy does not seem to generate any abnormal returns on OSE for the period 1999-2014.

- We conclude that we do not find any evidence of underreaction occurring on stocks listed on OSE in the period 1999-2014 in the short term.

When they occur?

By comparing their results and literature: Overreaction occurs prior to portfolio formation, while underreaction occurs after.

- Investors overreact to future news announcements and thus drive the price of growth stocks too high and the price of value stocks too low. (réagissent de manière excessive aux annonces de nouvelles à venir et font ainsi monter le prix des actions de croissance à trop haut et le prix des actions de valeur trop bas)
- Investors underreact to news that contradicts their prior and embedded beliefs (ne réagissent pas aux informations qui vont à l'encontre de leurs convictions antérieures et intégrées)



Why they occur?

- we hypothesize that **overreaction** is best explained by the **Representativeness Heuristic**, which means that investors perceive past performance to be representative for the future, ignoring some of the fundamental aspects. *(Both the Herding Effect and the Overconfidence Bias does not seem to explain why overreaction was found on our sample of Norwegian firms)*
- we believe that **underreaction** is a result of a cognitive bias known as the **Conservatism Bias**. Underreaction is also a result of investors' slow diffusion of contradictory, new information

Our study shows that once an investment portfolio is made, and although how wrong it may be at the time, humans (and investors) probably have an inherent disability to "admit defeat" and correct its inaccurate estimates.