# Evidence of Morocco Industry Long-Term Return Contrarian

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## Abstract

In a landmark paper, Bornholt, Gharaibeh, and Malin (2015) show strong evidence of contrarian in the long-term returns of U.S. industries over formation periods (up to 132 months), this paper investigates whether there is evidence of contrarian in the long-term returns of 17 Morocco industries using monthly data covering the period from January 1995 to April 2014. This study finds strong evidence of long-term return contrarian in industry returns from strategy with long formation period lengths of 108, 120 and 132 months and this finding confirms the Bornholt et al. (2015) finding. The finding of this paper suggests that industry-level return contrarian is not simply a reflection of the stock-level contrarian. These contrarians are difficult to reconcile with overreaction.

**Keywords:** Morocco Stock Exchange (MSE), long-term return contrarian, Fama-French three-factor model

## 1. Introduction

Research into stock returns can be performed at the level of individual stocks, industries, or national markets. As a result, perhaps, of the lack of a role for industries in popular asset pricing models, the dynamics of industry returns have received relatively little academic attention in finance.

In an important paper, Bornholt et al. (2015) investigates whether U.S. industry returns exhibit long-term return contrarian. Their study uses contrarian strategy and employs extra-long strategy formation periods (up to 132 months) to allow enough time for structural changes to begin. Bornholt et al. (2015) document strong evidence of reversal in the long-term returns of industries. Following the Bornholt et al. (2015) methodology, this study is motivated by the need to test whether the long-term contrarian is existence at Morocco industry returns.

This study contributes to the literature as follows. It examines the long- term contrarian strategy at the industry level employing a sample of 17 Morocco industries. This paper finds that there is strong evidence of industry-level long-term return contrarian. This evidence is generated by contrarian strategies with long formation periods (108, 120 and 132 months) rather than the formation periods typically used in stock-level studies (36, 48 and 60 months). This is consistent with the findings of Bornholt et al. (2015) that are based on industry returns.

The remainder of the paper is organized as follows. The next section reviews the literature.   Section 3 describes the data. Section 4 outlines the methodology used to construct and investigate the long-term contrarian strategy. Section 5 presents the main empirical results, and Section 6 draws conclusions from the results of the study.

## 2. Related Literatures

In an influential article, DeBondt and Thaler (1985) document strong evidence of the reversal of long-term returns that challenges the notion of market efficiency. Their contrarian strategies buy portfolios of stocks that have low long-term past returns (losers) and sell portfolios of stocks that have high long-term past returns (winners). The long-term returns used to classify stocks are the returns over the past three to five years. For U.S. stocks, DeBondt and Thaler (1985) show that losers outperform winners over the following three to five years. DeBondt and Thaler (1985; 1987) and others, such as Arnold and Baker (2007), attribute this long-term return reversal to investor overreaction. Fama and French (1996) show that their three-factor model can explain long-term return reversal in stocks.

The evidence of stock-level return reversal has been mirrored in market-level studies. Evidence that international equity market indices also exhibit long-term return reversal has been reported in a number of studies, including Richards (1997), Balvers, Wu and Gilliland (2000), and Malin and Bornholt (2013). An important difference between the results from market-level studies and those from stock-level studies is that popular asset-pricing

models such as the Fama-French three-factor model are unable to explain the long-term reversal in international market indices. However, to the best of the author's knowledge, the literature does not contain the results of any empirical research investigating whether or not Morocco industry returns exhibit long-term return reversal. This study aims to fill this gap in understanding of the dynamics of Morocco industry returns. This paper uses the traditional long-term return contrarian strategy to investigate evidence for long-term return reversal at the industry level.

## 3. Data and Methodology

The industries data used in this study are the value-weighted monthly returns, average firm size (ME), and the value-weighted average firm book-to-market ratio (BM) for 17 Morocco industries. For the market index, the study uses the monthly returns of the Centre for Research in Securities Prices' (CRSP) value-weighted Morocco market index of all Morocco stocks while the one-month Treasury bill rate reported at the beginning of each month is the risk-free rate. All data is downloaded from data stream. His data has itself been compiled from the well-regarded CRSP database of all Morocco stocks listed on the Casablanca exchanges. The sample period is from December 1994 to April 2014. The study commences from December 1994 because the CRSP database has a less comprehensive coverage of Morocco stocks prior to December 1994.

Table 1 reports industry summary statistics over the period December 1994 to April 2014 for the 17 Morocco industries, showing the monthly average return, standard deviation, last two columns reports Skewness and Kurtosis for each industry. There is a large difference in the mean and standard deviation of average returns. Distributors, investment companies and other finance, beverage and banks have the largest monthly average (over 1% per month), while Constructing and Building Materials have the lowest average at -5.76. The 17 Morocco industries have an average monthly return of 0.33% and an average standard deviation of 9.51%.

Table 1. Descriptive statistics

| Morocco Industry Names | Av. returns | S.D. | Skew | Kurt |
|---|---|---|---|---|
| Distributors | 1.53 | 10.79 | 3.71 | 34.50 |
| Investment Companies & Other Finance | 1.31 | 7.89 | 2.46 | 14.19 |
| Beverages | 1.27 | 8.03 | 0.70 | 1.47 |
| Banks | 1.05 | 4.81 | 1.48 | 7.14 |
| Food producers & Processors | 0.94 | 5.36 | 0.35 | 2.14 |
| Mining | 0.86 | 11.83 | -2.76 | 21.02 |
| Real Estate | 0.83 | 10.98 | -0.57 | 25.26 |
| Utilities | 0.36 | 7.10 | 0.49 | -0.40 |
| Electrical & Electronic Equipment | 0.12 | 10.31 | 0.29 | 7.94 |
| Insurance | 0.10 | 11.59 | -3.32 | 33.07 |
| Leisures and Hotels | 0.08 | 9.86 | 2.73 | 11.98 |
| Oil & Gas | -0.10) | 10.14 | -3.18 | 50.57 |
| Pharmaceutical Industry | -0.35 | 12.28 | -5.45 | 41.58 |
| Chemicals | -1.51 | 15.69 | -1.97 | 15.98 |
| Materials, Software & Computer Services | -1.99 | 15.73 | -2.29 | 17.25 |
| Engineering & Equipment Industrial Goods | -2.65 | 15.95 | -3.92 | 21.76 |
| Construction & Building Materials | -5.76 | 15.23 | -1.50 | 1.70 |
| **Average** | **-0.24** | **10.80** | | |

This table details the descriptive statistics for 17 Morocco industries utilized in this research. The first column is the abbreviated name of the industry. 'Av. returns' is the average monthly returns, 'S.D.' is the standard deviation of monthly returns, 'Skew is the Skewness, 'Kurt' is the kurtosis for each industry is estimated over the period December 1994 to April 2014.

This paper examines the evidence for industry-level long-term return reversal by employing contrarian strategy. Contrarian strategy has been employed in many stock-level and market-level studies as a way of uncovering any evidence of long-term return reversal (for example, DeBondt & Thaler, 1985; 1987; Richards, 1997; Malin & Bornholt, 2013).

The study examines the long-term contrarian strategy applied to Morocco industries. As discussed above, if an

industry experiences a period of extreme performance (either good or bad) over a sufficiently long period of time then such an event may trigger long-term structural changes in the industry that may begin to reverse the industry's fortunes. Consequently, extreme long-term past returns may be predictive of such reversals. However, given the uncertainty over what would constitute a 'sufficiently long period of time', this paper employs a wider range of formation period lengths than the usual 36-60 months that is commonly employed in stock-level contrarian strategies. The next sections detail the long-term contrarian strategy used in this paper.

*3.1 Long-Term Return Contrarian Strategies*

The long-term contrarian portfolios are constructed as follows. At the beginning of each month $t$, the 17 Morocco industries in Table 1 are ranked based on their past $J$-month returns ($J = 36, 48, 60, 72, 84, 96, 108, 120$ or $132$ months). For a given $J$, the long-term loser (LL) portfolio comprises the 20% of industries that have the lowest past $J$-month returns whereas the long-term winner (LW) portfolio comprises the 20% of industries that have the highest past $J$-month returns. The long-term contrarian strategy (LL-LW) buys the long-term loser portfolio and sells the long-term winner portfolio. Portfolios are held for $K$-month holding periods, where $K = 3, 6, 9$ and $12$ months.

For this long-term contrarian strategy, this study maintains a 12-month gap between the end of the $J$-month formation period and the beginning of the $K$-month holding period. A gap of 12 months is consistent with previous studies such as those of Fama and French (1996), Figelman (2007), Grinblatt and Moskowitz (2004) and Malin and Bornholt (2013). Fama and French (1996) found that skipping the first 12 months after the end of the formation period improves the performance of the long-term return contrarian strategy and generates stronger findings because this procedure helps avoid any long-term reversals being offset by the short-term continuation of returns. Indeed, in results not shown in this paper, long-term contrarian contrarian strategies do not produce statistically significant profits if there is no gap between the formation period and the holding period. A twelve-month gap is also consistent with DeBondt and Thaler's (1985) finding that the first year after the end of the formation period in their study did not provide significant contrarian profits.

## 4. Results

This section analyses the empirical results for the Long-term contrarian strategies in terms of raw and risk-adjusted results. It includes raw and risk-adjusted results.

*4.1 Long-Term Contrarian Results*

Tables 2 and 3 report results for the short (LW), long (LL), and long-short (LL-LW) long-term return contrarian portfolios for several ($J, K$) combinations. Table 2 contains the results for formation period lengths of $J = 36, 48, 60, 72$, and $84$ months, while Table 3 contains the results for the extra-long formation period lengths of $J = 96, 108, 120$, and $132$ months. Each table provides the equal-weighted average monthly portfolio returns in percentages for $K$-month holding periods ($K = 3, 6, 9$ and $12$ months) in columns 3 through 6, and the Year 1 to Year 5 annual event-time returns in columns 7 through 11.

The long-term return contrarian results in Table 2 indicate that the strategy profits (LL-LW) are statistically insignificant over all $K$-month holding periods if $J = 36, 48, 60, 72$, or $84$ months. For example, for the five-year (60-month) formation period and 6-month holding period ($K=6$) case, the difference between the average monthly returns of the LL portfolio and the LW portfolio is only -0.65% per month (*t*-stat 1.00), which is statistically insignificant. In short, the holding period returns in Table 2 give no indication of a long-term return reversal effect at the industry level. Therefore, next consider the results for the longer formation periods in the Table 3 where $J = 96, 108, 120$, and $132$ months.

The results in Table 3 reveal substantial differences from the results in Table 2. Except for the $J = 96$ case, Table 3 shows economically significant long-term return contrarian LL-LW profits for all $J = 108$ to $132$ months and all $K$, while they are statistically significant long-term return contrarian LL-LW profits for $J = 144$ months. For the 120-month formation period case with a six-month holding period ($K= 6$), for example, past long-term losers generate an average of 1.15% per month whereas past long-term winners produce an average of only 0.03 % per month over the same period. The resulting LL-LW difference of 1.12% per month is economically significant (*t*-stat 0.76).

In summary, there are big and economically significant contrarian profits produced for extra-long formation periods of 108, 132 to 144 months, but not for the shorter three-year to five-year formation periods conventionally employed in previous stock-level and market-level studies. (Note 1)

Table 2. Profitability of the long-term return contrarian strategy (j= 36 to 84 months)

| | | Holding Period Returns | | | | Annual Event-Time Returns | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| J | Portfolio | K=3 | K=6 | K=9 | K=12 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| 36 | LL | 0.07 | 0.11 | 0.06 | 0.02 | 0.03 | 0.10 | 0.07 | 0.12 | 0.11 |
| | | (0.12) | (0.21) | (0.11) | (0.03) | (0.04) | (0.19) | (0.12) | (0.22) | (0.2) |
| | LW | 0.49 | 0.56 | 0.54 | 0.55 | 0.42 | 0.54 | 0.49 | 0.56 | 0.55 |
| | | (1.24) | (1.49) | (1.46) | (1.46) | (1.01) | (1.34) | (1.24) | (1.47) | (1.48) |
| | LL-LW | -0.42 | -0.45 | -0.48 | -0.54 | -0.39 | -0.44 | -0.42 | -0.44 | -0.45 |
| | | (-0.74) | (-0.85) | (-0.92) | (-1.02) | (-0.63) | (-0.76) | (-0.74) | (-0.8) | (-0.83) |
| 48 | LL | -0.23 | -0.04 | 0.03 | 0.06 | -2.15 | 1.98 | 7.33 | 6.93 | 15.60 |
| | | (-0.39) | (-0.06) | (0.06) | (0.1) | (-0.28) | (0.25) | (0.78) | (0.69) | (1.46) |
| | LW | 0.73 | 0.70 | 0.61 | 0.54 | 9.63 | 6.21 | 6.00 | 4.37 | 5.32 |
| | | (1.67) | (1.65) | (1.43) | (1.25) | (1.83) | (1.17) | (1.61) | (1.21) | (0.86) |
| | LL-LW | -0.96 | -0.74 | -0.57 | -0.49 | -11.78 | -4.23 | 1.33 | 2.56 | 10.28 |
| | | (-1.58) | (-1.19) | (-0.95) | (-0.83) | (-2.07) | (-0.67) | (0.17) | (0.32) | (0.9) |
| 60 | LL | 0.29 | 0.36 | 0.39 | 0.43 | -0.79 | 4.88 | 6.10 | 6.30 | 11.66 |
| | | (0.48) | (0.61) | (0.64) | (0.69) | (-0.1) | (0.52) | (0.55) | (0.63) | (1.19) |
| | LW | 0.93 | 1.01 | 0.79 | 0.90 | 12.46 | 9.00 | 4.10 | 0.15 | -2.53 |
| | | (2.06) | (2.29) | (1.77) | (1.96) | (2.28) | (2) | (0.98) | (0.03) | (-0.47) |
| | LL-LW | -0.64 | -0.65 | -0.41 | -0.47 | -13.25 | -4.12 | 1.99 | 6.16 | 14.19 |
| | | (-0.95) | (-1) | (-0.62) | (-0.7) | (-1.92) | (-0.55) | (0.21) | (0.57) | (1.26) |
| 72 | LL | 0.34 | 0.54 | 0.54 | 0.45 | 3.69 | 6.55 | 4.84 | 5.07 | 14.07 |
| | | (0.49) | (0.76) | (0.82) | (0.69) | (0.37) | (0.61) | (0.47) | (0.54) | (1.39) |
| | LW | 0.61 | 0.74 | 0.76 | 0.73 | 12.98 | 6.39 | -0.68 | -5.36 | -6.41 |
| | | (1.19) | (1.39) | (1.36) | (1.24) | (2.38) | (1.51) | (-0.13) | (-0.97) | (-1.21) |
| | LL-LW | -0.27 | -0.19 | -0.22 | -0.27 | -9.28 | 0.17 | 5.52 | 10.43 | 20.48 |
| | | (-0.36) | (-0.25) | (-0.29) | (-0.36) | (-1.16) | (0.02) | (0.5) | (0.95) | (1.75) |
| 84 | LL | 0.40 | 0.48 | 0.42 | 0.28 | 9.22 | 6.83 | 4.66 | 12.32 | 20.47 |
| | | (0.66) | (0.75) | (0.66) | (0.44) | (0.83) | (0.65) | (0.5) | (1.16) | (1.95) |
| | LW | 0.71 | 0.76 | 0.53 | 0.49 | 4.65 | -0.84 | -4.51 | -8.14 | -6.62 |
| | | (0.91) | (0.87) | (0.59) | (0.52) | (0.99) | (-0.16) | (-0.82) | (-1.57) | (-1.41) |
| | LL-LW | -0.31 | -0.28 | -0.11 | -0.20 | 4.57 | 7.67 | 9.17 | 20.46 | 27.09 |
| | | (-0.35) | (-0.29) | (-0.11) | (-0.2) | (0.5) | (0.67) | (0.82) | (1.77) | (2.59) |

This table reports the average monthly holding period returns in percentages of the short, long and long-short portfolios of the long-term return contrarian strategy. Portfolios are constructed as follows: At the beginning of each month *t*, the 17 industries are ranked based on their past *J*-month formation period returns for *J* = 36, 48, 60, 72 and 84 months. The long-term loser equal-weighted portfolio (LL) contains the 20% of portfolios with the lowest *J*-month returns, and the long-term winner equal-weighted portfolio (LW) contains the 20% of portfolios with the largest *J*-month returns. The long-term return contrarian strategy (LL-LW) portfolios are held for *K* = 3, 6, 9 or 12 months. Annual event-time returns (Year 1, Year 2, Year 3, Year 4 and Year 5) are the average annual returns in percentages for the first five years following the portfolio formation date. The *t*-statistics are based on the Newey-West (1987) correction for autocorrelation up to lag 11.

4.2 *Post-Holding Period Returns of Contrarian Strategies.*

Table 3 provides evidence of the reversal of long-term returns for 17 Morocco industries. Since these reversals may continue for longer than the holding periods used in the various contrarian strategies, it is of interest to know how long the reversals last. This section uses annual event-time returns to examine how long such reversal of past performances continues. The last five columns of Table 3 reports event-time returns (the average annual returns for each portfolio for the five 12-month periods following the formation date), together with the associated *t*-statistics based on the Newey-West (1987) autocorrelation correction up to lag 11.

For the long-term return contrarian strategies in Table 3, all five years have positive LL-LW returns. While some are statistically significant at the 10% level, most of the Years 2 and 3 are statistically significant at the 5% level and most Year 5 profits are significant at the 5% level. Overall, the universally positive long-term return contrarian event-time returns suggest that reversal continues throughout the first five years post-formation.

The post-formation behaviors of the long-term return contrarian strategies' profits are also illustrated in Figure 1. Figure 1 depicts the post-formation cumulative returns of the long-term return contrarian strategy (LL-LW) with $J = 120$ for the 60 months following the end of the formation period. The long-term contrarian strategy graph shows no any signs that the reversal of past performances is slowing down by the end of the first 60 months post-formation.

Table 3. Profitability of the long-term return contrarian strategy (J= 96 to 132 months)

| J | Portfolio | Holding Period Returns | | | | Annual Event-Time Returns | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | K=3 | K=6 | K=9 | K=12 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| 96 | LL | 0.40 | 0.37 | 0.42 | 0.51 | 8.67 | 6.01 | 14.33 | 19.66 | 19.71 |
| | | (0.62) | (0.55) | (0.62) | (0.75) | (0.75) | (0.67) | (1.42) | (1.87) | (1.59) |
| | LW | 0.51 | 0.43 | 0.41 | 0.23 | -2.86 | -5.38 | -6.95 | -8.41 | -8.47 |
| | | (0.48) | (0.39) | (0.36) | (0.19) | (-0.54) | (-1.02) | (-1.27) | (-1.83) | (-2.26) |
| | LL-LW | -0.11 | -0.06 | 0.01 | 0.29 | 11.53 | 11.39 | 21.28 | 28.07 | 28.18 |
| | | (-0.09) | (-0.05) | (0.01) | (0.23) | (0.94) | (1.06) | (1.91) | (2.6) | (2.3) |
| 108 | LL | 0.65 | 0.79 | 0.80 | 0.96 | 4.48 | 12.65 | 19.16 | 19.52 | 13.03 |
| | | (0.9) | (1.08) | (1.1) | (1.29) | (0.49) | (1.21) | (1.84) | (1.59) | (1.36) |
| | LW | 0.13 | 0.16 | 0.11 | 0.31 | -2.24 | -8.28 | -5.89 | -7.15 | -6.81 |
| | | (0.11) | (0.13) | (0.09) | (0.24) | (-0.37) | (-1.43) | (-1.2) | (-1.6) | (-2.15) |
| | LL-LW | 0.52 | 0.63 | 0.69 | 0.65 | 6.72 | 20.93 | 25.06 | 26.68 | 19.83 |
| | | (0.39) | (0.46) | (0.49) | (0.45) | (0.57) | (1.84) | (2.63) | (2.49) | (2.15) |
| 120 | LL | 1.41 | 1.15 | 1.17 | 1.32 | 12.03 | 19.66 | 20.79 | 14.72 | 8.74 |
| | | (1.75) | (1.56) | (1.67) | (1.88) | (1.13) | (1.89) | (1.58) | (1.43) | (1.36) |
| | LW | 0.20 | 0.03 | 0.23 | 0.70 | -4.08 | -6.79 | -7.10 | -2.34 | -4.02 |
| | | (0.15) | (0.02) | (0.16) | (0.7) | (-0.64) | (-1.31) | (-1.66) | (-0.53) | (-1.56) |
| | LL-LW | 1.21 | 1.12 | 0.94 | 0.62 | 16.11 | 26.45 | 27.89 | 17.07 | 12.76 |
| | | (0.83) | (0.76) | (0.63) | (0.51) | (1.31) | (2.72) | (2.59) | (2.17) | (1.67) |
| 132 | LL | 1.89 | 1.27 | 1.41 | 1.49 | 15.09 | 22.10 | 20.33 | 8.91 | -4.83 |
| | | (2.35) | (1.81) | (2.03) | (2.09) | (1.39) | (1.48) | (1.56) | (1.4) | (-1.06) |
| | LW | -0.21 | -0.48 | -0.66 | -0.54 | 1.35 | -6.00 | -0.73 | 3.95 | 2.62 |
| | | (-0.36) | (-0.9) | (-1.38) | (-1.16) | (0.25) | (-1.42) | (-0.19) | (0.99) | (0.79) |
| | LL-LW | 2.09 | 1.76 | 2.07 | 2.03 | 13.74 | 28.11 | 21.06 | 4.96 | -7.44 |
| | | (2.65) | (2.49) | (2.95) | (2.9) | (1.51) | (2.2) | (1.81) | (0.89) | (-1.85) |

This table reports the average monthly holding period returns in percentages of the short, long and long-short portfolios of the long-term return contrarian strategy. Portfolios are constructed as follows: At the beginning of each month $t$, portfolios are ranked based on their past $J$-month formation period returns for $J = 96, 108, 120$ and 132 months. The long-term loser equal-weighted portfolio (LL) contains the 20% of portfolios with the lowest returns, and the long-term winner equal-weighted portfolio (LW) contains the 20% of portfolios with the largest returns. The strategy LL-LW longs the long-term loser portfolio and shorts the long-term winner portfolio to be held for $K = 3, 6, 9$ or 12 months. Annual event-time returns (Year 1, Year 2, Year 3, Year 4 and Year 5) are the average annual returns in percentages for the first five years following the portfolio formation date. The $t$-statistics are based on the Newey-West (1987) correction for autocorrelation up to lag 11.
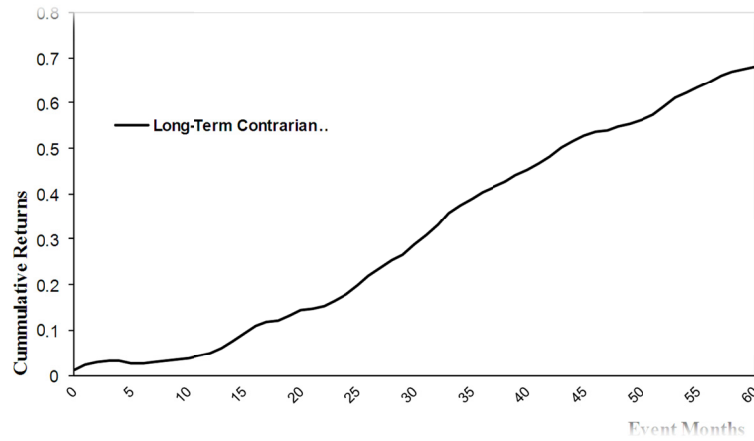
Figure 1. Cummulative returns of long-term 120 month strategy

This graph presents the cumulative returns of the long-term return contrarian portfolio LL-LW (with $J = 120$ months) using non-overlapping portfolios ($K = 1$) for the 60 months following the end of the formation period.

*4.3 Risk Adjustments*

To determine whether the profits of these strategies could be considered a reward for bearing risk, the profits of the long-term contrarian strategy is risk-adjusted using the Fama-French three-factor model. The three-factor regression model includes the market factor, a small minus big factor, and a value minus growth factor:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + s_p SMB_t + h_p HML_t + \varepsilon_{pt} \tag{1}$$

Where the dependent variable $R_{pt} - R_{ft}$ is the monthly excess return of the strategy portfolio $p$, $R_{pt}$ is the monthly return of portfolio $p$ at time $t$, and $R_{ft}$ represents the monthly risk-free rate at time $t$, represented by the one-month Morocco T-Bill return. The independent variables or factors are as follows: $R_{mt} - R_{ft}$ is the CRSP value-weighted index's monthly excess market return for month $t$, while $SMB_t$ and $HML_t$ are the monthly Fama-French size and book-to-market factors at time $t$, respectively.

The monthly return values for the Fama-French factors and one-month T-Bill risk-free rate covering the full sample period from December 1994 to April 2014 are downloaded from data stream. The three-factor model covers the period from the period from December 1994 to April 2014. The coefficients $\beta_p$, $s_p$ and $h_p$ are the regression loadings corresponding to the factors of the models, while the intercept $\alpha_p$ (or simply alpha) represents the risk-adjusted abnormal returns of the portfolios over the estimation period. If alpha is statistically significantly different from zero, then this is evidence of abnormal profits. The *t*-values corresponding to the regression coefficients are corrected for heteroskedasticity using White's (1980) test.

Table 4 reports the estimated regression coefficients of the three-factor model and the corresponding White-corrected *t*-values for the long, short and long-short portfolios for the long-term contrarian ($J = 120$ strategy with six-month holding periods ($K = 6$). Column 2 of Table 4 reports the monthly alphas of the three-factor model, while the last column lists the adjusted $R^2$.

The alpha of the long-term contrarian long-short LL-LW portfolio is small (0.011% per month) and insignificant

(*t*-stat 0.76. Interestingly, neither the long nor the short portfolios in any of the long-term contrarian have significant alphas at the 10% level. This gives an indication that there are no abnormal long-term profits.

Table 4. Risk-adjusted long-tem contrarian profits

| | Three-factor model | | | | |
|---|---|---|---|---|---|
| | $\alpha$ | $b_{Rm-Rf}$ | $b_{smb}$ | $b_{hml}$ | **Adj** $R^2$ |
| LW | -0.004 | -0.004 | 0.003 | 0.006 | 0.49% |
| | (-0.26) | (-0.9) | (0.33) | (0.79) | |
| LL | 0.007 | 0.001 | 0.000 | 0.004 | 1.31% |
| | (0.93) | (0.96) | (-0.07) | (1.81) | |
| LL-LW | 0.011 | 0.005 | -0.003 | -0.002 | 1.51% |
| | (0.67) | (1.26) | (-0.31) | (-0.19) | |

This table presents the three-factor regression results for the monthly returns of the long-term return contrarian portfolios for $J = 120$ and $K = 6$ in Panel A. These portfolios are described in Tables 2 and 3. The three-factor regression model is as follows:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p (R_{mt} - R_{ft}) + s_p \text{SMB}_t + h_p \text{HML}_t + \varepsilon_{pt}$$

Where $R_{pt}$ - $R_{ft}$ is the portfolio's excess return, $R_{mt}$ -$R_{ft}$ is the excess return on the market, $\text{SMB}_t$ is the Fama-French size factor, and $\text{HML}_t$ is the Fama-French book-to-market factor. The *t*-statistics presented in parentheses are corrected for heteroskedasticity using White's (1980) test.

In summary, the long-term contrarian results in Table 4 reveal that there is long-term return reversal in industry returns that can be explained by the Fama-French three-factor model. It is not surprising that the long-term contrarian risk-adjusted results are weak since the long-term contrarian raw profits are considerably small. The insignificant long-term contrarian strategy's alpha is consistent with Fama and French's (1996) finding that the three-factor model can explain the reversal of long-term returns of individual U.S. stocks reported by DeBondt and Thaler (1985). The results in this paper raise the possibility that the Fama-French three-factor model may have easily explaining the results of such a study.

## 5. Conclusion

Most previous studies have reported evidence of long-term return reversal at the level of individual firms and at the level of international market indices. This paper attempts to investigate if there is an evidence for the long-term return reversal at the level of industry returns. The methodology has been employed in this paper is similar to Bornholt's, et al. (2015) methodology by using a broad range of formation period lengths in order to cover the possibility that if reversal in industry returns exists then it may need longer formation periods than those used in stock-level studies.

The study documents strong evidence of long-term return reversal of industry returns using contrarian strategies with long formation period lengths (108, 120, 132 and 144 months) but not when using contrarian strategies with the 36-month, 48-month, and 60-month formation periods commonly used in stock-level studies and this finding is consistent with Bornholm's et al. (2015) results. The Fama-French three-factor model alpha for the long-term contrarian three-factor alpha is not significant. The return reversal effects in Morocco industry portfolios are relatively small. For example, the 120 long-term contrarian strategy with a six-month holding period produces an insignificant risk-adjusted return of 0.011% per month on average over the full sample.

This paper is trying to understand the complexities of industry behavior. The analysis presented in the current study has attempted to shed light on the long-term return contrarian that exist in the Morocco industry returns, and it has opened possible new research avenues arising from the results provided as examine in more detail why industry returns behave differently to the firm returns. From the analysis in this paper it has been shown that the contrarian strategies use long formation period lengths (108, 120, 132 and 144 months) to provide significant profits while contrarian strategies in stock-level studies commonly use formation period lengths (36, 48, and 60 months) to generate significant profits. More comprehensive studies into the behavior of industry returns should provide a better understanding why such differences occur.

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**Note**

Note 1. Recent examples of contrarian studies applied to individual stocks that find strong contrarian results for 60-month formation periods are Figelman (2007) and Grinblatt and Moskowitz (2004).