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## Return to Higgledy-Piggledy Growth Again and Again

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**NORTHERN ILLINOIS UNIVERSITY**

**Return to Higgledy-Piggledy Growth Again and Again**

**A Thesis Submitted to the**

**University Honors Program**

**In Partial Fulfillment of the**

**Requirements of the Baccalaureate Degree**

**With University Honors**

**Department of Finance**

**by**

**Wade Steinberg**

**DeKalb, Illinois**

**May 9, 1998**

## HONORS THESIS ABSTRACT

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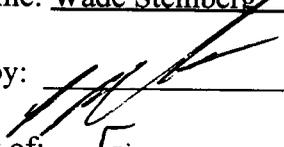
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ABSTRACT:

This study, based upon recently published research on the subject, investigates mean reversion in large portfolios of stocks. Portfolios were formed based upon E/P ratios and industry diversification using firms listed on the New York Stock Exchange from 1977 to 1996. Analysis of the data confirms the presence of mean reversion but disagrees with other published works on the timing of the reversion. This study attempts to address unanswered questions concerning mean reversion. Particularly, the study discusses how investors can practically apply knowledge of mean reversion through contrarian investment strategies.

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Academic research into investing has revealed many phenomenon concerning rates of return. The most well known include the “weekend effect” and the “January effect.” One current phenomenon currently being researched is mean reversion. Mean reversion is the tendency of stock returns to revert to average levels following periods of above or below average returns. This research examines mean reversion for predictability in portfolio performance.

This study is organized into three main sections. The first section is an examination of current published studies on mean reversion. The second section analyzes data gleaned from E/P portfolios. The third and final section examines the practical application of knowledge of mean reversion by investors.

### **Literature Review**

Over the years, numerous studies have been published discussing mean reversion in stock returns. De Bondt and Thaler pioneered this work in 1985.<sup>1</sup> Nearly every study on the subject examine the mean reversion in terms of the price earnings ratio (P/E), a commonly used investor criterion. The numerous studies suggest that short-term returns are characterized by positive autocorrelation and long-term returns are characterized by negative autocorrelation.<sup>2</sup>

An interesting side note to these studies is the debate they have caused over defining short-term versus long-term. Certain researchers find that the traditional definition of short-term being time periods under one year still holds true. Other suggest that short-term should be

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<sup>1</sup>Debondt and Thaler. “Does the Stock Market React.” P. 793.

<sup>2</sup>Kim, Nelson, Startz. “Mean Reversion in Stock Prices?” P. 515.

expanded to include time periods under two years.<sup>3</sup>

The original study by De Bondt and Thaler builds off of the "January effect," concluding that mean reversion is a real phenomenon. In their study, the authors investigate whether investors overreact to surprise information on stocks. They conclude that mean reversion is evidence of substantial weak form market inefficiencies.<sup>4</sup>

Evidence of mean reversion outside of American markets was confirmed in a 1988 study by Poterba and Summers. In their study, the two examined data from the United States and 17 foreign markets for evidence of mean reversion. Their research revealed returns had significant levels of positive autocorrelation over short horizons and negative autocorrelation over longer horizons in all markets.<sup>5</sup>

Researchers have developed two generally accepted explanations for mean reversion. These reasons are explored in a study by Gangopadhyay and Reinganum (1996). One explanation is that mean reversion is caused by mispricing in irrational markets. Alternatively, mean reversion could be explained by predictable time variation in stock returns.<sup>6</sup> In either case, the fact that mean reversion occurs leaves room for the investor to profitably use this information.

A 1995 study by Dreman and Berry focuses on the misprices justification for mean

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<sup>3</sup>Gangopadhyay and Reinganum. "Interpreting Mean Reversion in Stock Returns." P. 377.

<sup>4</sup>De Bondt and Thaler. "Does the Stock Market Overreact?" P. 793.

<sup>5</sup>Poterba and Summers. "Mean Reversion in Stock Prices." P. 27.

<sup>6</sup>Gangopadhyay and Reinganum. "Interpreting Mean Reversion in Stock Returns." P. 378.

reversion. In their study, positive and negative earnings surprises affect high and low P/E stocks in an asymmetrical manner.<sup>7</sup> Their study suggests that mean reversion occurs after 19 quarters. The authors argue that the mispricing-correction hypothesis explains the superior returns of contrarian strategies.

The phenomenon of mean reversion has not gone unchallenged. A 1991 study by Kim, Nelson, and Startz suggests that mean reversion is not a current phenomenon. Their research suggests that mean reversion can only be found in markets before World War II. The authors conclude that if randomization methods are used to calculate significance levels, mean reversion cannot be found in current markets.<sup>8</sup>

The basis for this study can be found in a combination of two published works. Haugen's recently published work points out that if investors can practically apply knowledge of mean reversion, significant returns await them.<sup>9</sup> In his work, Haugen suggests that the best available research on mean reversion comes from Fuller, Huberts, and Levinson. It is their study that forms the basis of the current research. The Fuller, Huberts, and Levinson study examines mean reversion using portfolios rather than individual stocks. Furthermore, their research focuses on the relationship between the structure of current market prices and future growth.

### **Examining Mean Reversion**

The goal of this study is to assess if there is predictability in portfolio performance via

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<sup>7</sup>Dreman and Berry, "Overreaction, Underreaction, and the Low P/E Effect." P. 21.

<sup>8</sup>Kim, Nelson, and Startz. "Mean Reversion in Stock Prices?" P. 515.

<sup>9</sup>Haugen. The New Finance. P. 52.

mean reversion. As noted earlier, many studies have examined the actual phenomenon of mean reversion. While some research suggests that mean reversion was more prevalent prior to World War II, nearly every researcher would agree that mean reversion still occurs to some degree in present times.<sup>10</sup>

Thus, how can investors use this information? The answer still remains a mystery without a further examination of the data. Investors can either create or choose portfolios that characterize the P/E or E/P ratios that researchers have used. The Fuller, Huberts, and Levinson study suggests that mean reversion can be seen within eight years. This study will reexamine their findings and determine whether there is any further predictability in mean reversion. For instance, is it possible to determine how long the portfolio will remain at the mean following reversion?

### **Methodology**

To determine whether there is predictability in portfolio performance surrounding mean reversion, five portfolios were created using firms listed on the New York Stock Exchange (NYSE). This study attempted to emulate the research conducted by Fuller, Huberts, and Levinson.<sup>11</sup> Using firm listed on both CRSP and COMPSTAT, the five portfolios were followed from 1977 to 1996. After culling the data for missing values, 632 firms survived. This culling process could result in the study suffering from look-ahead and survivorship biases.

Rather than using the P/E ratio of the firm to form portfolios, earnings-to price (E/P)

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<sup>10</sup>Kim, Nelson, and Startz. "Mean Reversion in Stock Prices?" P. 515.

<sup>11</sup>Fuller, Levinson, and Huberts. "Return to E/P Strategies, Higgledy-Piggledy Growth, Analyst' Forecast Errors, and Omitted Risk Factors." P. 14

ratios were used. E/P ratios allows for firms with zero earnings to be included. For the 632 firms, the E/P ratio was calculated by dividing the EPS by the year-end stock price. Only firms that were NYSE listed were used for two reasons. First, NYSE firms tend to have more complete financial data available. Second, NYSE firms are usually more representative of firms selected by both institutional and individual investors. These portfolios allows this study to be highly relevant to individual investors because of their tendency to invest in mutual funds.

For each year, the stocks were ranked by E/P ratio and assigned to quintiles. The first quintile (Q1) contains the 20% of the firms with the highest E/P ratios and the fifty quintile (Q5) contains the 20% of the firms with the lowest E/P ratios. To ensure that quintiles were not dominated by particular industries, the quintiles were constructed to be industry diversified. Before assigning firms to particular quintiles, the firm were split into their respective Standard Industrial Classification (SIC) Divisions. Only firms with a SIC code under 5999 were included in the study. This resulted in seven divisions including: Agriculture, Forestry, and Fishing; Mining; Construction; Manufacturing; Transportation, Communications, Electric, Gas, and Sanitary Services; Wholesale Trade; and Retail Trade.

## **Results**

TABLE 1, on the next page, displays the actual differences between the quintile's annual returns and the market return. An analysis of the data using a standard t-test showed that the all quintiles were significantly different from each other except when Q5 was compared to Q4 and Q1 compared to Q2. TABLE 2, on the next page, lists the computed t-statistics for each of the comparisons. With 22 degrees of freedom and an alpha of 0.05, the relevant t-statistic was 2.074. The null hypothesis in this study suggests that the calculated returns were not different to

a statistically significant degree. Therefore, any calculated t-statistic less than 2.074 reveals that the two quintiles compared were different for reasons other than sampling error.

**TABLE 1**

<u>Time</u>	<u>Q5 (Low E-P)</u>	<u>Q4</u>	<u>Q2</u>	<u>Q1 (High E-P)</u>
0	-4.70%	2.48%	0.11%	-1.87%
1	-1.67%	-3.55%	1.44%	8.16%
2	-0.87%	-1.95%	4.16%	5.49%
3	-1.76%	-3.37%	1.84%	4.43%
4	-1.17%	-0.30%	1.85%	3.59%
5	-2.24%	-1.86%	1.43%	3.12%
6	-2.02%	-1.93%	0.22%	3.37%
7	-2.85%	-1.38%	0.98%	1.06%
8	0.38%	0.02%	2.36%	4.48%
9	0.40%	0.70%	0.48%	0.59%
10	1.82%	2.10%	-1.57%	0.00%
11	2.99%	0.22%	-0.55%	-0.74%

**TABLE 2**

<u>Relationship</u>	<u>T-Statistic</u>
Q5 v. Q4	-0.290625989
Q5 v. Q2	-2.743901943
Q5 v. Q1	-3.499669167
Q4 v. Q2	-2.544875125
Q4 v. Q1	-3.350797556
Q2 v. Q1	-1.677769782

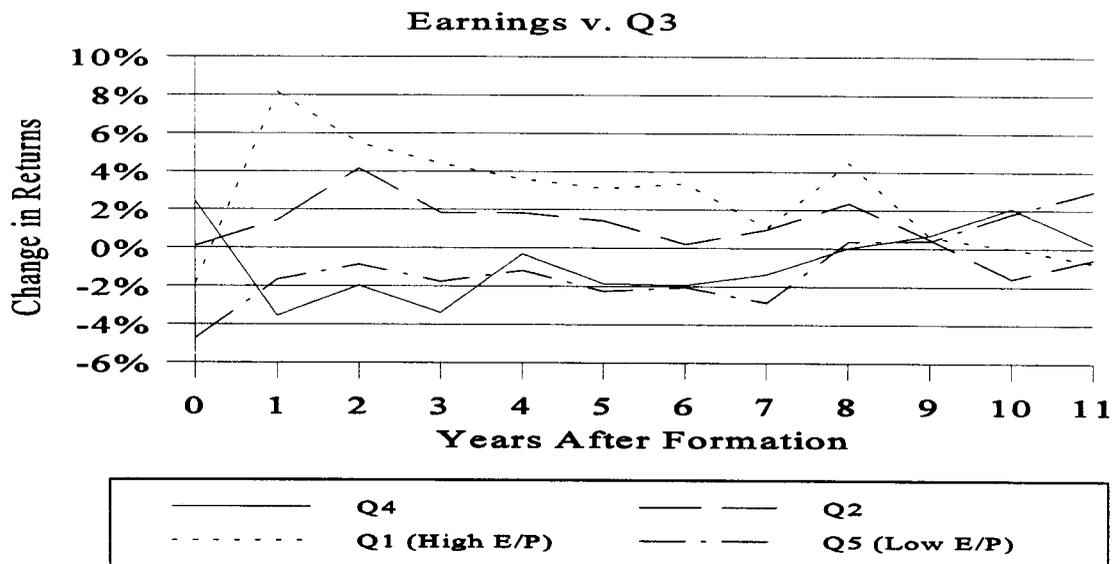
TABLE 3 lists relevant information about the quintile portfolios. The table shows a calculated average E/P ratio and return for each of the quintiles over the twelve year period. The table also lists the average change in the E/P ratio and the calculated return from year to year. The average change illustrates the average increase or decrease that a particular portfolio experienced during the time of the study.

**TABLE 3**

		<u>E/P Avg.</u>	<u>Return Avg.</u>
Q5 (Low E/P)	Average	-0.035602823	17.25%
	Change	0.341044779	1.38%
Q4	Average	0.039186943	17.49%
	Change	0.315275674	-2.61%
Q3	Average	0.053992844	18.23%
	Change	-0.062523102	-2.34%
Q2	Average	0.048908411	19.29%
	Change	0.017861200	-2.33%
Q1 (High E/P)	Average	0.037197541	20.87%
	Change	-0.152355731	-0.77%

A simple overview of the findings confirms the presence of mean reversion. As illustrated in GRAPH 1, mean reversion in the study occurs after approximately 10 years. GRAPH 1 presents the difference in earnings growth of the portfolios versus the market growth (represented by Q3) in years subsequent to portfolio formation. Somewhat interesting to note, is the fact that all the portfolios show mean reversion at nearly identical rates.

**GRAPH 1**



## Practical Investment Applications

The usual criticism of academic financial research is that the studies show little practical application. For instance, the “weekend” effect where stock prices tend to be lower on Friday afternoons through Monday afternoons generally lacks practical application because of trading fees.<sup>12</sup> However, mean reversion shows some practical possibilities to investors.

Mean reversion suggests that contrarian investment strategies might offer investors better opportunities to earn above average returns. A contrarian investment strategy is where an investor purchases firms that had relatively poor recent performance. In the case of mean reversion via E/P ratios, could allow an investor to obtain earnings growth above the market rate for approximately ten years if he/she invested in Q5 firms. The catch to this strategy is to make certain that the firm comprising Q5 are merely suffering from short-term, correctable problems and do not have terminal problems. Investors should still make certain that the stocks still fit the classic Benjamin Graham definition of value. Graham’s philosophy of value investing holds that an investor buys shares in a firm as though he/she were buying the whole company, paying little attention to exterior conditions.<sup>13</sup>

In his book, A Random Walk Down Wall Street, Burton Malkiel discusses how investors often pursue “Castles-in-the-Air” which unfortunately narrows their investing horizon. Rather than pursuing these fashionable stocks, often characterized by low E/P ratios, investors should

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<sup>12</sup>Malkiel. A Random Walk Down Wall Street. P. 203.

<sup>13</sup>Lowe. Value Investing. P. 2.

purchase stocks not currently in favor.<sup>14</sup>

### A FINAL NOTE

Mean reversion in stocks clearly illustrates the investing maxim that past performance is not indicative of future performance. However, this does not mean that knowledge of the past cannot assist in investing decisions today. The phenomenon of mean reversion illustrates how downturns in an investors portfolio will correct themselves over the long-term investing horizon.

Finally, without the assistance of Dr. William Chittenden, this project would not have been possible. His assistance in retrieving the data was invaluable. Also, he was a wonderful sounding board for ideas in the development of this study.

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<sup>14</sup>Malkiel. A Random Walk Down Wall Street. P. 199.

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