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Bob Weir, CFA
Director of Research

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Does Mean Reversion Always Hold True?

March 6, 2018

Summary

- Only select sectors have historically reverted to the mean when at extreme levels
- There are times when mean reversion is inconsistent
- The frequency of outperformance differs across sectors
- There is a unique relationship between relative performance and time horizon

Introduction

The S&P 500 took to the sky in 2017 gaining almost 22%, extending this current bull market further and approaching what could become the second longest in history, according to Chris Puplava's most recent quarterly newsletter **Records Were Made to Be Broken**.

Although returns in 2017 made the record books, history has shown us that good things do not last forever. In fact, there is the old adage that excess in one direction leads to an opposite excess in the other. For a long time, contrarians, value investors, and technicians have developed trading strategies based on mean reversion—purchasing (or shorting) securities that have out-performed (or under-performed) the broader market. But how reliable is this strategy?

Financial Sense Wealth Management conducted a study looking at the returns of different sectors that under-performed the S&P 500 by at least 2 standard deviations or greater. Finding real value in "cheap" under-performing sectors is an often-used investment strategy, but does not apply equally well to each of the 9 major sectors of the market.

The following is a break-down of our study and results, which we apply towards the active management of our client portfolios.

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Methods

Going back to 1989, we looked at the 12-month relative performance of 9 of the S&P sectors versus the S&P 500 including:

1. **Industrials**
2. **Financials**
3. **Energy**
4. **Information Technology**
5. **Consumer Discretionary**
6. **Materials**
7. **Consumer Staples**
8. **Health Care**
9. **Utilities**

We then used the relative performance of each sector to find the z-score (**definition**) or the number of deviations of each sector's relative performance from its historical average. After we grouped occurrences where there was a -2 standard deviation under-performance or greater of the sector relative to the S&P500, we found the corresponding 1-month, 3-month, 6-month, and 12-month forward relative performance to determine whether mean reversion occurred and resulted in out-performance.

Results

1. Only select sectors have historically reverted to the mean when at statistical extremes

One of our main objectives throughout this study was to determine what sectors historically have performed the best relative to the S&P on a risk-adjusted basis when they have significantly under-performed the broader market.

Shown on the next page in Figure 1 (click any image to enlarge) are the best-performing sectors ranked top to bottom when relative performance vs. the S&P 500 was at a -2 standard deviation or more event.

Based on the data, sectors like Industrials, Consumer Discretionary, and Health Care have historically offered the greatest risk-adjusted return, on a relative basis, in the forward months when that sector has under-performed the S&P 500 by at least 2 standard deviations.

Risk Adjusted Forward Returns When at a -2 Std Deviation

1 Month		3 Months		6 Months		12 Months	
Sector	Risk Adj Return	Sector	Risk Adj Return	Sector	Risk Adj Return	Sector	Risk Adj Return
Con. Dis	0.183	Industrials	0.568	Industrials	0.255	Industrials	0.471
Healthcare	0.092	Con. Dis	0.257	Con. Dis	0.200	Con. Dis	0.359
Utilities	0.064	Healthcare	0.178	Materials	0.107	Financials	0.014
Materials	0.046	Con. Stap	0.143	Healthcare	0.081	Healthcare	0.010
Financials	0.046	Materials	0.117	Con. Stap	0.010	Materials	-0.082
Industrials	0.046	Financials	0.012	Energy	0.000	Utilities	-0.140
Con. Stap	-0.014	Utilities	-0.024	Financials	-0.024	Con. Stap	-0.164
Info Tech	-0.035	Energy	-0.031	Utilities	-0.098	Info Tech	-0.174
Energy	-0.209	Info Tech	-0.238	Info Tech	-0.353	Energy	-0.367

Figure 1 - Sources: Financial Sense® Wealth Management, Bloomberg. *Past performance is no guarantee of future results.*

Shown in Figure 2 below are the best-performing sectors on a risk-adjusted basis when even further statistical extremes have occurred (-3 standard deviation or more). During occurrences of poor relative performance beyond 3 standard deviations, sectors like Information Technology, Consumer Discretionary, and Utilities have historically yielded the greatest risk-adjusted return in the months ahead.

Risk Adjusted Forward Returns When at a -3 Std Deviation

1 Month		3 Months		6 Months		12 Months	
Sector	Risk Adj Return	Sector	Risk Adj Return	Sector	Risk Adj Return	Sector	Risk Adj Return
Con. Dis	1.369	Utilities	42.908	Utilities	8.786	Utilities	10.893
Info Tech	0.863	Con. Dis	1.254	Info Tech	1.036	Info Tech	1.656
Con. Stap	0.832	Info Tech	0.526	Materials	0.549	Con. Dis	1.123
Materials	0.578	Healthcare	0.518	Industrials	0.396	Industrials	0.588
Industrials	0.298	Industrials	0.402	Healthcare	0.352	Healthcare	0.159
Financials	0.176	Materials	0.319	Con. Stap	-0.225	Con. Stap	-0.060
Healthcare	-0.032	Con. Stap	0.177	Financials	-0.368	Materials	-0.144
Energy	-0.056	Financials	-0.008	Energy	-0.499	Financials	-0.167
Utilities	-0.236	Energy	-0.574	Con. Dis	-0.866	Energy	-1.086

Figure 2 - Sources: Financial Sense® Wealth Management, Bloomberg. *Past performance is no guarantee of future results.*

What does this mean for investors? Well, for those that accept the concept of mean reversion, these sectors historically have offered the best return with the lowest volatility when already at extreme levels of under-performance.

Solely on an absolute relative-return basis under extreme conditions (-3 standard deviations or more), we found that Information Technology, Utilities, and Industrials out-performed the S&P by the greatest percentage in almost all the proceeding months within a year's time.

2. There are times when mean reversion is inconsistent

Another objective of ours was to determine if there have been occurrences when mean reversion does not take shape. From our data, we found that there were a few sectors that, on average, showed little to no attempt in returning to their mean no matter how extreme their oversold condition in the market—for example, Financials, Consumer Staples, and Energy.

However, it is important to note a few points:

- The data obtained for our financial sector is largely skewed to the left in terms of concentrated distribution. This is possibly due to the 2008 financial crisis—a period when many financial institutions experienced a slow recovery from extremely oversold levels.
- Looking at Consumer Staples, the sector's forward returns seem to have little to do with their over- or under-performance to the market. This could likely be explained given the fact that this sector generally offers steady dividends, strong financials, and are less volatile relative to the rest of the market.
- As shown in Figure 3 below, Energy showed a weak correlation between oversold conditions and positive forward relative performance. In fact, the more the sector under-performed the S&P 500, the forward relative performance worsened. For this reason, our data suggest that mean reversion is rather inconsistent when analyzing the energy sector.

Z - Score	Average 1M FWR of Energy	Average 3M FWR of Energy	Average 6M FWR of Energy	Average 12M FWR of Energy
-2 - 2.5	-0.38%	1.33%	2.01%	-2.14%
-2.5 - 3	-1.98%	-2.73%	-3.18%	-8.71%
-3+	-0.13%	-3.14%	-3.75%	-13.82%

Figure 3 - Sources: Financial Sense® Wealth Management, Bloomberg. *Past performance is no guarantee of future results.*

3. The frequency of outperformance differs across sectors

The frequency of positive relative performance over time is also a significant factor that we wanted to look at. Based on the data, the same sectors that typically provided the best risk-adjusted returns once oversold, did so with the highest probability of over-performance relative to the S&P as shown in Figure 4 below.

Frequency of outperforming the S&P when oversold

The percentage of times the sector outperformed the S&P when at or below a -2 St Deviation

Industrials	**1 Month**	**3 Months**	**6 Months**	**1 Year**
Outperform the S&P	0.17%	2.07%	3.67%	8.65%
Standard Deviation	3.64%	9.67%	14.39%	18.36%
What % of the time	50.28%	56.44%	60.19%	66.10%

Consumer Discretionary	**1 Month**	**3 Months**	**6 Months**	**1 Year**
Outperform the S&P	0.57%	1.39%	1.42%	3.43%
Standard Deviation	3.09%	5.41%	7.10%	9.57%
What % of the time	56.53%	58.16%	43.82%	55.96%

Health Care	**1 Month**	**3 Months**	**6 Months**	**1 Year**
Outperform the S&P	0.40%	1.08%	0.70%	0.13%
Standard Deviation	4.40%	6.07%	8.57%	13.23%
What % of the time	53.79%	61.37%	52.81%	44.01%

Figure 4 - Sources: Financial Sense® Wealth Management, Bloomberg.

These three sectors were shown to out-perform the S&P 500 often when they under-performed the S&P by at least a -2 standard deviation event.

Based on these results, another observation is that each sector has its own characteristics when it comes to their mean reversion life cycle. For example, the cyclical nature of the Industrial sector shows that once mean reversion begins to take place, the longer you hold it from an oversold level, the higher the chance you have of out-performing the S&P 500.

Consumer Discretionary had a dip in its 6-month likelihood (or frequency of returns) of over-performance relative to the S&P 500 which, we believe, is most likely due to seasonal factors that align with many retailers and their annual business cycles.

Health-Care showed a near opposite mean reversion cycle than the Industrials sector. Based on our data, Health-Care had a relatively short-lived bounce in relative performance, between one to six months, after being a statistical under-performer of the market. Our data for the Health-Care sector also suggests that when considering the six- to the twelve-month time frame, mean reversion has already exhausted itself as investors have moved on to more attractive sectors.

4. There is a unique relationship between relative performance and time horizon

The last and final point to be made is regarding the relationship between forward relative performance and time horizon. Based on a regression analysis, we found that only a select few sectors had a positive correlation between higher returns and a longer time horizon:

- **Industrials – 96% correlation**
- **Consumer Discretionary – 94% correlation**

Of the sectors that under-performed the S&P 500 by at least a -2 standard deviation, Industrials and Consumer Discretionary had the strongest positive correlations between increasing relative performance and forward months.

Looking at sectors that have under-performed at further extremes (-3 standard deviations or more), we discovered an even stronger correlation between higher relative performance and forward-looking months. Technology and Industrials were among the sectors with the highest correlation at these oversold levels. On the opposite side of the spectrum, Energy was a sector that historically has under-performed the S&P and continued that downward trend in forward months when negative relative performance is at an extreme.

Conclusion

Based on the study, our findings suggest that mean reversion is a likely contributor to forward returns in most sectors. However, the extent to which mean reversion plays a role and how strong the reversion is depends on the sector itself. While mean reversion is a powerful trend, it is important to note that not all sectors are created equal, nor do they behave in the same manner. Some sectors exhibit longer periods of outperformance, while others historically tend to have shorter lifecycles from their current statistical under-performance.

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Co-Authors: Ryan Preiss and Josh Nunn

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About FS Staff

Financial Sense: **Primary Tel:** 858.487.3939

fswebmaster@financialsense.com
https://www.financialsense.com/

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