Does The Market Go To 1?

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ABSTRACT

In periods of market turmoil, it can often be heard that the "market goes to 1," usually implying that all investment choices are moving in the same direction (down). This paper looks to test whether or not this is actually the case. From firsthand experience, anyone who has an interest in the topic will undoubtedly say it feels like that is happening, so this paper looks to put some evidence behind what is thought. After relaxing many characteristics that would be present in a market going to 1, this paper employed two tests. The results of the tests indicate that it is possible, however unlikely, that the market actually goes to 1.

Keywords: Correlation, market to 1, investing, portfolio management, diversification

INTRODUCTION

For anyone involved in the financial industry, whether by direct job function or by tangential relationship, these are interesting times. And when an academic (or medical professional) uses the term "interesting", it seldom means something good. Interesting usually means something anomalous, out of the ordinary, or strange. What was a bull market of historic length is now a pile of devastation – all returns refunded, as well as principal (and principle), receding to levels not seen in many years (and careers). All investment classes were gutted, with nowhere to hide. With less tongue-in-cheek than one would expect, I was thinking about writing a book titled "How Liquid Is Your Cash?" Unfortunately, many will understand the reference.

Professionals heard the "market went to 1" comment often during this most recent financial meltdown. However, since the comment was accompanied by "except for US Government securities", I could end this paper now and say the market did not go to 1. It mostly went to 1, but since there was an uncorrelated investment class, it is a "close but no cigar" on the "market to 1" thing. Chances are that the paper would not get published if I stopped here, so I venture into the realm of the hypothetical and ask "could the market go to 1?"

The purpose of this paper is to explore a widely held investment axiom – that in the most terrible of times, the "market goes to 1." What this refers to is the metric of correlation, the relationship of two streams of data. In an investment context, correlation is applied to the returns of two investments (or asset classes). Correlation runs from -1 to +1, with -1 representing perfect negative correlation (as the return of one investment changes the return of the other moves in the opposite direction) and +1 representing perfect positive correlation (as the return of one investment changes, the return of the other moves in the same direction). Zero (0) represents non-correlation, meaning that the movement of one investment's return provides no predictive ability as to the other. The actual calculation is a little more complicated, but easily handled by Excel and most handheld calculators.

When it is said that the market goes to 1, what is really meant is that all investment choices are moving in the same direction – downward. Not surprisingly, two years or so ago, it could have been said that the market went to 1, but in a positive direction. Everything was going up and there were virtually no bad investments. For sure, some did better than others, but all seemed to do well. Investment professionals do not focus on this because that would remove their acumen from their returns – when everything is going up, it is their skill; when everything is going down, it is because the market went to 1.

So, I got curious – what does it really mean for the market to go to 1? Does the market really go to 1, or is this just a shoddy, self-serving rationalization made to make people feel better about the losses ruining their

portfolios (and their bonus)? When investment managers quote return data, they are required to provide a variety of time frames for the returns (one month, three months, one year, three years, five years, etc). Not so for correlation data – it is all too typical to be given a single correlation statistic, usually for an extended period, often for as long as data is available. For this paper, I use 15 years (180 months) to represent the standard correlation time period.

I do not have an answer for the next question, but I ask that you provide an answer that you feel works in your situation. What level of correlation is significant? At what level of correlation are you comfortable saying investments are correlated? The corollary is at what level are investments non-correlated? For intellectual integrity, I ask that you write you answer below before continuing.

Correlation shows a significant relationship starting at +/- _____

THE FIRST TEST

Since correlation typically uses a 15-year time frame, I wondered what effect a recent phenomena (market crash) would have on the correlation. Does three months of high correlation have any effect on 180 months of low correlation? In the context of this paper, would a recent total market collapse provide a correlation over the last 15 years (including the collapse) that approaches a significant relationship?

To test this, I utilized two streams of 180 random numbers, representing the returns of two investments over 15 years. I then set the last 12 returns to be equal, representing perfect correlation of the last 12 observations and took the correlation over the 15 years (where the first 168 observations were random and the last 12 set equal). I repeated this 100 times.

I then went back and set the last 18 observations equal (changing an additional six from the paragraph above) and repeated the process 100 times. I then changed the last 24 observations (again, an additional six) to be equal and repeated 100 times.

The results obtained are presented in Table 1, which shows the distribution of observations by range of correlation. There are three columns, for when the last 12, 18 and 24 observations are set equal. There were 100 trials for each of the three (12, 18, 24). For each range of correlation the distribution represents the number of times the correlation of the trial fell within that range (since it is based on a total of 100 trials, the number of times also represents the percentage of times this occurred). For example, when the last 12 observations are set equal, 28 times (28% of the time) the trial had a correlation within the range of .0000 to .0499.

Table 1: Distribution of Correlations when the Last N Observations are Set Equal"

Range of Correlation		**N Number of Last Observations Set Equal**		
From	**To**	**12**	**18**	**24**
.0000	.0499	28	23	10
.0500	.0999	37	28	26
.1000	.1499	24	28	23
.1500	.1999	10	12	21
.2000	.2499	1	6	14
.2500	.2999	0	2	5
.3000	.3499	0	1	0
.3500	.3999	0	0	0
.4000	.4499	0	0	1
	Total	100	100	100

Here comes the intellectual honesty. Look back at the threshold you set for the minimum needed to be considered correlated. Now look at the table. When the last 12 observations were set equally (representing a year of perfect correlation), a correlation of greater than .2000 (but less than .2500) happened 1% of the time (once). A correlation of between .1500 and .1999 happened 10% of the time (10 times), and a correlation between .1000 and .1499 happened 24% of the time (24 times). Would you consider any of these correlations significant?

When the last 18 observations are set equally (representing a year and a half), a correlation of between .3000 and .3499 was observed 1% of the time (once). A correlation of between .2500 and .2999 was observed 2% of the time (twice) and between .2000 and .2499, 6% of the time (6 times). Would you consider any of these to be significantly correlated?

Now, when the last 24 observations are set equally (representing two years), a correlation of between .4000 and .4499 occurred 1% of the time (once). No correlations between .3500 and .3999 were observed, nor were any between .3000 and .3499. Did your chosen threshold of significant correlation start below .45?

Conclusion – Test 1

It is for each reader to decide at what level correlation (and non-correlation) starts to exist. To me, non-correlation exists certainly at and below .3000, and a very slight relationship begins from .3000 to .3999. A stronger, but not strong, relationship goes from .4000 to .5999 and the streams start to get correlated above .6000. Nothing presented in the first test approaches that.

Living through a period of correlation might give rise to the feeling that everything is correlated, and it is, for that snippet of time. However, in terms on which correlation is discussed, meaning over an extended period, shorter periods of perfect correlation probably do not change the overall correlation enough to move what are historically uncorrelated investments into the realm of the correlated.

THE SECOND TEST

The first test concerned two streams of data, whereas a true "market going to 1" includes more than two streams of data. For the second test, I utilized six streams of data (each stream was 180 observations, representing 15 years of monthly returns), which assumes there are six broad asset classes. The random monthly returns used parameters that allowed them to go from -50 to +50, simulating high monthly return volatility. Taking them two at a time, you wind up with 15 simultaneous correlation calculations. In a true "market to 1" scenario, all 15 have to be highly correlated simultaneously.

In this test, I also looked at rolling three-month periods so that during the 15 years (180 months), I was looking for any consecutive three-month period where all six streams were highly correlated. For each run, there were 178 chances for the six streams to be highly correlated. I ran this 100 times.

Whether it is possible for the market to go to 1 depends a lot on what you consider "highly correlated." Without being nit-picky and saying "unless the correlation was 1.0, the market did not to go 1", would a correlation of .90 be close enough? How about .80? Does .70 make the grade? The results for all three levels of correlation (greater than .70, .80 and .90) are presented in Table 2, which shows the number of times that level of correlation was observed and the percentage it represents of the total observations. For instance, there were 119 observations of a correlation .70 or more (absolute value) on a rolling three-month basis. Since there were a total number of 17,800 observations (100 trials and 178 rolling three-month periods in each), this represents one-third of one percent (.67%).

Table 2: Number of Observed 3-Month Rolling Periods with a Correlation of at Least .70, .80 and .90

Absolute value of correlation		
>.70	**>.80**	**>.90**
119	34	6
0.67%	0.19%	0.03%

There were 17,800 chances for all 15 correlations to be above a certain threshold (100 runs x 178 rolling three-month periods). At the .90 level, this happened six times at the .80 level 34 times and at the .70 level, 119 times. The test was somewhat unrealistic in a number of senses. First, the recent market turmoil happened during the last three months. While this test looks at any three months, it looks at the absolute value of correlations, which could mean that some high correlations were negative and some were positive, which would tend to dispute the idea that the market goes to 1. The parameters were constant throughout the 180 observations, whereas it is more likely that the range narrowed during periods of turmoil. Perhaps limiting the range from -40 to +10 would have been more realistic. This test was also less restrictive in only using a rolling three-month period. Sustained periods of financial distress are usually longer than three months.

Conclusion – Test 2

The test relaxed certain characteristics of a true "market to 1." Instead of being the last three months (the most recent period), the test included any three months (which increased the possibility of once per run to 178 per run). The test also looked at the absolute value of returns instead of only the positively correlated ones. The test used (perhaps) too wide a range of monthly returns (-50 to +50), whereas the range could have been narrowed and perhaps asymmetric (say -50 to +10). Lastly, the test used a rolling period of three months instead of a more reasonable six to nine-month period.

Given the parameters used to conduct the test, the conclusion is that the market can go to 1. Though certainly a rare occurrence, the test indicates it can happen (albeit in only .0003 of the observations). It can happen, but most likely doesn't. For discussions of six-sigma events and whether they are good bets, I refer the reader to google "Long Term Capital Management."

OVERALL CONCLUSION

The question about whether the "market went to 1" recently is answered succinctly – no, it did not. US Government securities were uncorrelated with the rest of the market, so the question has a ready answer. The bigger question is "can the market go to 1"?

This paper conducted two tests to see if the market can go to 1. Using certain assumptions, the answer is, "yes, in rare occasions it can go to 1. However unlikely, it is possible."

If the assumptions were altered to be somewhat more realistic (i.e. instead of any rolling period, use only the most recent; instead of absolute value of correlations, use only positive; instead of rolling three-month periods, use six to nine months), the likelihood decreases even further. How many runs would it take to produce an event that satisfies the criteria? That is an interesting question.

AUTHOR INFORMATION

Jeffry Haber is Associate Professor at Iona College, teaching graduate and undergraduate course in a variety of accounting subjects. He is a frequent speaker on accounting, nonprofit and investing topics and publishes in a variety of areas. He has a PhD from Rensselaer Polytechnic Institute, MS and BS degrees from Syracuse University and is a CPA. He is Vice-Chair of the New York State Society of CPA's Nonprofit Accounting Committee and Co-Chair of their annual conference.