

The Financial Crisis: Did the Market Go To 1? and Implications for Asset Allocation

Jeffry Haber

Iona College

Andrew Braunstein (contact author)

Iona College

Abstract: Investment professionals continually mention that “the market went to 1” during the recent financial crisis. This refers to the calculation of correlations between asset classes, fundamental to modern portfolio theory and asset allocation. If the market did indeed go to 1, then no matter what investment choices were made, the results would be similar – returns on all investments would be going in the same direction (up or down). A previous paper (Haber 2010 b) discussed whether the market *could in theory* go to 1. That paper suggested that although such an outcome is possible, it would be an extremely unlikely event. The current paper makes use of empirical data to test whether the market *did in fact* go to 1.

There are three main considerations that could affect the conclusion one draws about the recent crisis: (1) What is the threshold for labeling a correlation as “1”? Is it .90, .80 .70 or some other amount?; (2) How many asset classes are used to parse the market?(that is, which specific asset classes are selected to calculate the correlations?); and (3) What is the time period over which the correlations are calculated? This paper calculates the correlations over the entire duration of the financial crisis – from December 2007 through March 2009. We utilize .70 as the cutoff for a “strong” correlation, defining .70 or greater as “going to 1.” Using a variety of domestic equity returns, global and emerging markets equity returns, commodity returns, aggregate bond returns, government bond returns and corporate bond returns, it is found that the market did not go to 1. The equity markets went to 1, but the bond markets and commodity markets were not strongly correlated with the equity markets.

Based on the cutoff point used in our analysis (.70), the emerging markets fell just a bit shy of being strongly correlated with the equity markets.

If the purpose of asset allocation is to group investments into “buckets” based on correlations, then domestic and international equity investments should be treated as a single asset class, given the very high level of correlation between them during the financial crisis. Emerging markets, fixed income (debt), and commodities remain as asset classes that did not correlate during the period of extreme financial distress.

Introduction

The financial crisis that began in December of 2007 wreaked havoc throughout the world. Equity markets took a nosedive and credit markets came to a standstill. It was not unusual to see emerging market funds losing twenty percent or more on a monthly basis (in fact, some lost 50% in a single month). In the aftermath of this calamity, investment professionals frequently proclaimed that “the market went to 1.” The implication was that no matter what investment choices they made, they would have lost money. Some analysts expanded the statement, saying that the market went to 1, “with the exception of US Government Securities”. Those who prefer the abridged statement might argue that US Government Securities are not a separate asset class.

Previous research (Haber 2010 a, 2010 b) considered the question of whether the market theoretically *could* go to 1, and found that such an event would be possible, but highly unlikely. Haber used streams of random numbers to simulate monthly returns. This paper uses streams of actual returns for various asset classes to ascertain whether the market *did indeed* go to 1.

Theory/Background

An important step in asset allocation is to group investments into “buckets”, such that the items within a bucket have similar return characteristics. The idea is that when certain market events happen, the investments within a bucket can be expected to have returns that behave in a similar manner. For instance, a bucket might consist of investments that are sensitive to interest rate movement – if interest rates go up, the items grouped in this bucket will behave in similar ways. In other words, the investments within such a bucket have returns that are highly positively correlated.

Having investments within a bucket whose returns are highly positively correlated also allows the investor to diversify and select investments whose returns are negatively correlated with the items in that bucket. Negative correlation refers to an inverse relationship between two streams of data. So while a positive correlation indicates movement in the same direction (if one stream is going up, the other is expected to rise as well), negative correlation suggests streams moving in opposite directions (for example, as one stream goes up, the other is expected to go down, and vice versa).

Despite the claims by many that the market “went to 1” (i.e., that the returns on all investments were highly positively correlated) during the financial crisis, to our knowledge

there is no published research providing hard empirical evidence for that assertion. The issue is important for two reasons in particular: (1) there should be integrity among investment professionals. For such individuals to claim that the market “went to 1” during the financial crisis essentially implies that they should not be held responsible for the significant losses in the portfolios under their watch – there were no investments to choose from whose returns weren’t negative. It seems unlikely that these same investment professionals would claim that the market is at 1 when the market is going up, because that would imply there currently are no bad investments, and more importantly, that little investment skill is needed at the time; (2) if the market did not indeed go to 1 during the financial crisis, then there likely are lessons to be learned about what kinds of steps should be taken regarding asset allocation during future periods of extreme financial stress.

Important Factors to Consider

There are three major decisions that need to be made that can profoundly impact the conclusion of our study. The first is what is meant by a strong correlation. Correlation is a calculation between two streams of data. The stronger the relationship between the streams, the higher the correlation will be. A correlation of 1 means that knowledge of the behavior of one stream of data will give perfect insight into the behavior of the second stream. The first stream allows prediction of the second. A correlation of 0 means that there is no relationship between the changes in the two streams – knowing one stream will not allow inference as to what is occurring in the second stream.

Correlation is calculated on a continuum from -1 to +1. The sign indicates direction (“+” means a direct relationship – as one stream goes up, the other stream will go up as well, whereas “-” means an inverse relationship – as one stream goes up the other stream will go down). The sign does not indicate the strength of the relationship, merely the direction. Correlations of -.32 and +.32 are exactly the same in terms of the strength of the relationship.

Testing the statement that “the market went to 1” by examining if all correlations were exactly 1.0 is too extreme of a condition. The statement really is suggesting that the market was strongly correlated. If the correlations actually turned out to be .90, for instance, the statement could still be considered accurate. However, one needs to determine at what point a correlation coefficient is high enough to signify a strong correlation, a proxy for “1.” This study uses .70 as the lower limit for what is considered to be a strong correlation. Though this admittedly is an arbitrary cutoff point, it appears to be a reasonable one in the context of comparing returns on investments. Undoubtedly, however, there are others who would consider correlation values either lower than .70 or higher than .70 as the point at which one would start considering a relationship to be a strong one.

A second important factor is the choice as to which group of asset classes is said to constitute the market. At a basic level, there are the equity and debt markets. However, within the equity and debt markets, there are sub-classes of domestic and international markets, along with developed and emerging markets. Within the domestic equity markets, there are large cap, mid cap, small cap, and, within these, growth and value subsets. Within the domestic debt markets, there are corporate and government pieces. There are many ways to further sub-divide any of those markets. In addition to the myriad choices as to how to divide the

equity and debt markets, there are also commodities, hard assets, and real estate and alternative assets to consider. We chose a limited, but representative number of asset classes to constitute the market. While it certainly is not all encompassing, if the market did not go to 1 with the limited set of choices used here, then there is no benefit to expanding the number of asset classes – the market will still not have gone to 1.

The third question is what period to use when calculating the correlations. Correlations of investment returns are often calculated over extremely long periods (for instance, fifteen years). In ordinary circumstances, adding the number of months that represents the duration of the financial crisis (sixteen) to the tail end of a fifteen year correlation calculation would not be expected to change the historical calculation by a significant amount. We know that some asset classes exist because they are historically uncorrelated with others over time. It is certainly possible that adding sixteen months of data (pertaining to the period of financial crisis) to the end of a fifteen year period could cause otherwise uncorrelated streams to become highly correlated. That is, of course, an empirical issue. However, if the correlation results for those sixteen months are that extreme, it will be even more evident if they are treated as a standalone period. This study calculates the correlations specifically over the sixteen month duration of the financial crisis – from December 2007 through March 2009.

Equity Market Correlations

At a top level, the equity markets can be broken down into developed and emerging markets, and within developed markets, into domestic and international ones. This provides three basic, broad equity markets – US, developed international, and emerging. To define returns we used indices, and for expediency, the ETFs (exchange-traded funds) built on specific indices. Choosing ETFs and indices that have high tracking error would have confounded our results. We believe that the choices we made are reasonable surrogates for the “true” market returns. In some cases, we chose more than one index for an asset class.

The equity indices used for developed markets are as follows:
 for domestic equity - S&P 500 and the US Market Index
 for developed international - a global index (SPDR DJ Global Titans) and an all-world index not including the US (Vanguard FTSE All World ex-US)
 The correlation matrix is shown in Figure 1.

Figure 1
 Equity Market Correlation Matrix

| | <u>S&P 500</u> | <u>US Market Index</u> | <u>SPDR DJ Global Titans</u> | <u>Vanguard FTSE All World ex-US</u> |
|-------------------------------|--------------------|------------------------|------------------------------|--------------------------------------|
| S&P 500 | 1.000 | 0.997 | 0.969 | 0.930 |
| US Market Index | | 1.000 | 0.968 | 0.940 |
| SPDR DJ Global Titans | | | 1.000 | 0.955 |
| Vanguard FTSE All World ex-US | | | | 1.000 |

The correlations are extremely high. At an overall market level, it is a reasonable conclusion that the domestic (US) and international developed equity markets were very strongly correlated.

Emerging Market Correlations

Adding a broad emerging market equity index (Vanguard Emerging Markets Stock Index) as an additional asset class yields the correlation matrix shown in Figure 2.

Figure 2
Equity Market and Emerging Market Correlation Matrix

| | <u>S&P 500</u> | <u>US Market Index</u> | <u>SPDR DJ Global Titans</u> | <u>Vanguard FTSE All World ex-US</u> | <u>Vanguard Emerging Markets Stock</u> |
|---------------------------------|--------------------|------------------------|------------------------------|--------------------------------------|--|
| S&P 500 | 1.000 | 0.997 | 0.969 | 0.930 | 0.657 |
| US Market Index | | 1.000 | 0.968 | 0.940 | 0.655 |
| SPDR DJ Global Titans | | | 1.000 | 0.955 | 0.701 |
| Vanguard FTSE All World ex-US | | | | 1.000 | 0.660 |
| Vanguard Emerging Markets Stock | | | | | 1.000 |

Given our established cutoff value of .70 as representing strong correlation, one would be led to conclude that emerging equity markets overall were not highly correlated with developed equity markets. Certainly, one who chooses a somewhat lower value as the cutoff would draw a different conclusion.

Commodity Index Correlations

Adding commodities as an asset class (iShares S&P GSCI Commodity Index) provides the correlation matrix shown in Figure 3.

Figure 3
Equity Market, Emerging Market and Commodity Correlation Matrix

| | <u>S&P 500</u> | <u>US Market Index</u> | <u>SPDR DJ Global Titans</u> | <u>Vanguard FTSE All World ex-US</u> | <u>Vanguard Emerging Markets Stock</u> | <u>iShares S&P GSCI Commodity Index</u> |
|----------------------------------|--------------------|------------------------|------------------------------|--------------------------------------|--|---|
| S&P 500 | 1.000 | 0.997 | 0.969 | 0.930 | 0.657 | 0.552 |
| US Market Index | | 1.000 | 0.968 | 0.940 | 0.655 | 0.568 |
| SPDR DJ Global Titans | | | 1.000 | 0.955 | 0.701 | 0.483 |
| Vanguard FTSE All World ex-US | | | | 1.000 | 0.660 | 0.596 |
| Vanguard Emerging Markets Stock | | | | | 1.000 | 0.199 |
| iShares S&P GSCI Commodity Index | | | | | | 1.000 |

The commodity index value is under .60 in every case – leading to the conclusion that commodities were not highly correlated with developed equity markets and had little correlation with emerging equity markets (since that particular correlation coefficient is below .20).

Debt Market Correlations

Adding a broad debt market index (Barclays Aggregate) provides the correlations shown in Figure 4.

Figure 4
Equity Market, Emerging Market, Commodity and Debt Market Correlation Matrix

| | <u>S&P 500</u> | <u>US Market Index</u> | <u>SPDR DJ Global Titans</u> | <u>Vanguard FTSE All World ex-US</u> | <u>Vanguard Emerging Markets Stock</u> | <u>iShares S&P GSCI Commodity Index</u> | <u>Barclays Aggregate</u> |
|----------------------------------|--------------------|------------------------|------------------------------|--------------------------------------|--|---|---------------------------|
| S&P 500 | 1.000 | 0.997 | 0.969 | 0.930 | 0.657 | 0.552 | 0.305 |
| US Market Index | | 1.000 | 0.968 | 0.940 | 0.655 | 0.568 | 0.314 |
| SPDR DJ Global Titans | | | 1.000 | 0.955 | 0.701 | 0.483 | 0.321 |
| Vanguard FTSE All World ex-US | | | | 1.000 | 0.660 | 0.596 | 0.432 |
| Vanguard Emerging Markets Stock | | | | | 1.000 | 0.199 | 0.238 |
| iShares S&P GSCI Commodity Index | | | | | | 1.000 | -0.023 |
| Barclays Aggregate | | | | | | | 1.000 |

We see that the correlations are all below .50 (and mostly in the low .30s or below), indicating a low correlation between all pairs of asset classes. Thus, the overall debt market was not correlated with developed equity markets (domestic or international), emerging equity markets, or commodity markets.

Earlier, we mentioned that some proponents of the “market to 1” theory believe that government bonds are not an asset class. They consider government bonds to be an alternative to cash (and perhaps even a substitute for cash, depending on maturity), making them strategic, not investment, holdings. In that case, it is possible that correlations for the broad debt market index would be distorted by the inclusion of government bonds. To investigate further, two other debt indices were added to the matrix – a pure 10-20 year government bond index (iShares Barclays 10-20 Year Government Bond) and a corporate bond index (iShares Barclays Credit Fund). The correlations are shown in Figure 5

Both the government bond index and the credit index were highly correlated with the aggregate index (Barclays Aggregate), but neither was highly correlated with the equity (developed or emerging) or commodity indices. As expected, the government bond index had the lowest correlations with the other indices. The credit index had higher, but not strong correlations with the other indices.

Figure 5
Equity market, Emerging Market, Commodity, Broad Debt, Government Debt and Corporate Debt Market Correlation Matrix

| | <u>S&P 500</u> | <u>US Market Index</u> | <u>SPDR DJ Global Titans</u> | <u>Vanguard FSTE All World ex-US</u> | <u>Vanguard Emerging Markets Stock</u> | <u>iShares S&P GSCI Commodity Index</u> | <u>Barclays Aggregate</u> | <u>iShares Barclays 10-20 Year Govt Bond</u> | <u>iShares Barclays Credit Fund</u> |
|---------------------------------------|--------------------|------------------------|------------------------------|--------------------------------------|--|---|---------------------------|--|-------------------------------------|
| S&P 500 | 1.000 | | | | | | | | |
| US Market Index | | 0.997 | 0.969 | 0.930 | 0.657 | 0.552 | 0.305 | 0.249 | 0.423 |
| SPDR DJ Global Titans | | 1.000 | 0.968 | 0.940 | 0.655 | 0.568 | 0.314 | 0.244 | 0.447 |
| Vanguard FSTE All World ex-US | | | 1.000 | 0.955 | 0.701 | 0.483 | 0.321 | 0.306 | 0.406 |
| Vanguard Emerging Markets Stock | | | | 1.000 | 0.660 | 0.596 | 0.432 | 0.381 | 0.541 |
| iShares S&P GSCI Commodity Index | | | | | 1.000 | 0.199 | 0.238 | 0.121 | 0.302 |
| Barclays Aggregate | | | | | | 1.000 | -0.023 | -0.120 | 0.151 |
| iShares Barclays 10-20 Year Govt Bond | | | | | | | 1.000 | 0.898 | 0.865 |
| iShares Barclays Credit Fund | | | | | | | | 1.000 | 0.615 |
| | | | | | | | | | 1.000 |

Conclusions Based on the Strength of the Correlations

Our analysis indicates that it is not accurate to say that the “market went to 1” during the financial crisis. Even though many likely felt that such was the case at the time, our examination of the correlations throughout the duration of the crisis indicates that the market was not at 1. The developed equity markets (domestic and international) went to 1, but the commodities market and debt market (even separating out the corporate market) certainly did not. Based on our criterion, the emerging equities market did not go to 1, although a small lowering of the cutoff point for what constitutes a strong correlation would alter that conclusion.

Some Possible Implications for Asset Allocation

That the world is getting smaller is borne out by the strong correlations between equity funds during the financial crisis – developed country equity markets fared very much the same, whether domestic or international. The implication is that there is only one developed country equity market for the purpose of correlation, and that country borders mean little.

Emerging equity markets are less correlated with developed equity markets, falling slightly below what would be considered strongly correlated, based on the standard of .70 used in this study. For the purposes of asset allocation, however, an investor may still consider a correlation greater than .60 to be valuable, even if it does not constitute “going to 1.”

During the financial crisis, fixed income (debt) was not correlated with the equity markets (either government or corporate). Fixed income was a diversifier during the sixteen months that the crisis lasted.

Commodities offered returns which were not highly correlated with the returns of equities, and were even less so with those of bonds (whether corporate or government). When compared to any other return stream used in this study, commodities could be expected to provide uncorrelated returns during periods of financial duress.

References

Haber, Jeffry (2010 a). Does the market go to 1? *Proceedings of the 10th Hawaii International Conference on Business.*

Haber, Jeffry (2010 b). Does the market go to 1? *Journal of Business and Economics Research*, pp.99-102, Vol. 8, No. 3.

Haber, Jeffry and Braunstein, Andrew (2011). Did the Market go to 1? *Proceedings of the 10th International Business and Economy Conference*.

Contact Information:

Andrew Braunstein (**contact author**)

Iona College

715 North Avenue

New Rochelle, NY 10801

abraunstein@iona.edu

914-633-2081