High-Correlation Episodes not Associated with Known Financial Crises

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Introduction

Financial contagion in world equity markets is generally understood to be a two-step process: first, prices fall sharply in one country or in one market sector, usually in response to an identifiable trigger-event, such as the Russian bond-default of 1998; second, prices also fall in other countries and sectors, suggesting that the influence of the initially-localized crisis is spreading.

One view of financial contagion is that it represents a period of weeks or months during which pair-wise correlations of returns between certain countries and market sectors rises to much higher than average levels. Of course, the number of ways pair-wise correlation of price movements can be measured is almost unlimited, and so, not surprisingly, the contrary view is also widely represented in the literature.

Objectives and hypothesis

Our first objective is to **identify and measure contagion between emerging financial markets in the time period of 1996 to 2009** by using different definitions.

In a second time, our study aimed to compare the known crisis with the episods of high-correlation found in our analysis and discuss their characteristics.

The data used are extracted from the Russell database, encompassing 51 countries, 9 sectors, accounting for a total of more than 5.8 million stock quotes. Missing data is addressed by creating clusters to regroup countries that exhibit missing data.

Acknowledgement

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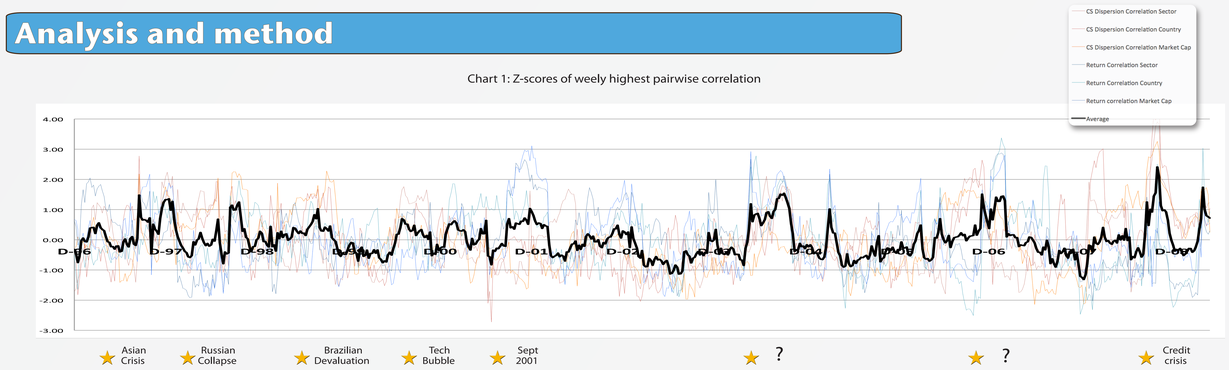
Literacy used:

[1] Antonios Garas, Panos Argyrakis, Celine Rowenblat, Marco Tomassino, Shlomo Havlin. "Worldwide spreading of economic crisis".
[2] Thomas C. Chiang, Bang Nam Jeon, Huimin Li. "Dynamic correlation analysis of financial contagion: Evidence from Asian markets." 26(2007), Journal of International Money and Finance
[3] Bruno Solnik and Jacques Roulet. "Dispersion as Cross-Sectional Correlation." Vol. 56, Jan. - Feb., 2000, Financial Analysts Journal
[4] Ernest M. Ankrim and Zhuanxin Ding. "Cross- Sectional Volatility and Return Dispersion." Vol. 58, Sep. - Oct., 2002, Financial Analysts Journal.
We also used Circo software to plot the circular graph.

Analysis and method

Chart 1: Z-scores of weely highest pairwise correlation



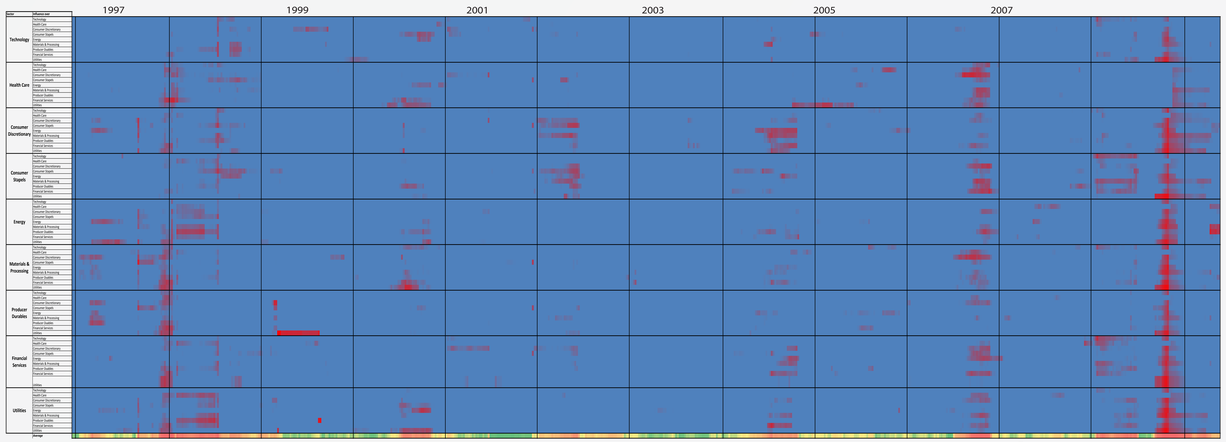


Chart 2: Heatmap of the weekly sector Cross sectional dispersion correlation

Graph description

Chart 1 shows the six time series of highest of pair-wise correlations (outlier excluded), along with the combined mean of all six. Note that peaks in the combined mean appear to have a high degree of overlap with known financial crises – as well as contain a number of peaks that are not generally associated with any crises event.

Chart 2 above is an example of one of the six sets of time series of pair-wise correlations used to generate the z-scores above. The chart for cross-sectional dispersion against cross-sectional dispersion, at a one week lag, for the 81 pairs of market sectors is shown. The Chart is color-coded to show the 30% highest-correlation pairs of market sectors each week in various shades of red.

Chart 3 shows the highest 30% of the 81 pairwise correlations between sectors, for the very high-correlation week of October 29 – November 5, 2008. Each sector is assigned its own color. The width of each bank corresponds to the level of correlation, arbitrarily displayed so that the ratio of widths between the highest and lowest correlations show is 3:1. Note that this week is also shown on Chart 2 above.

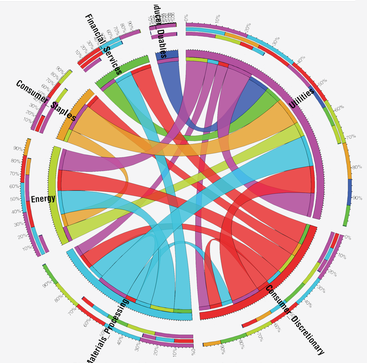


Chart 3: weekly return correlation during Credit Crisis, 29th october 2008

Results and discussion

Results:

Our research finds certain specific pair-wise correlations between price movement in markets and sectors that increase significantly during the primary identifiable crises periods of the last 12 years, but also increase at several other times not associated with any known crisis. In other words, we have **identified pair-wise correlations that are highly sensitive, but not highly specific, indicators of financial crises.**

We also find that using 6 different criteria and assemble their Z-scores is more robust since some high correlation periods seem to be more "return based" as opposed to others more "dispersion based".

Discussion:

Since we used discrete return as one underlying value, we did not take into consideration the Market factor by remove it. A further analysis with this value might be valuable.

Moreover, this analysis illustrates the contagion but does not measure their characteristics. It might be relevant to evaluate the contamination speed as well as its propagation pattern.

Eventually, an investigation about the "unknown episods" with high correlation that do not match any known crisis may be interesting to determine the nature of these periods.

Method

We first calculated weekly returns of all stocks that appear in the Russell emerging market database from 1996 - 2009. We then partitioned the data in three ways – by 15 country-clusters (by combining those emerging market countries lacking at least 15 equities in the Russell database for every week since 1996 into three regional clusters); by the nine Russell market sectors; and by Russell's large, medium, and small market capitalization categories.

For each partition, we calculated the mean weekly return, and the weekly cross-sectional dispersion of returns (using cross-sectional standard deviation as the measure). We then calculated the pair-wise correlation, at a one-week lag, for "raw" returns (not volatility-adjusted) and for level of cross-sectional dispersion, between each of 81 pairs of sectors, each of 225 pairs of country-clusters, and each of 9 pairs of market-capitalization levels. To calculate each week's correlations we used a rolling 24 weeks of data.

The result was six sets of time series of weekly correlations, three starting with raw returns in week 24 against raw returns in week 25, and three starting with cross-sectional dispersion in week 24 against cross-sectional dispersion in week 25. We then took the weekly mean of the absolute correlations (for each of the 6 sets of time series).

These six means represent six different ways to measure the influence of one week's returns or dispersion upon the next week's returns or dispersion. Or, in other words, they are a rough measure of how much predictive power this week's returns have regarding next week's returns, and how much predictive power this week's dispersion has on next week's dispersion.

Because we are more interested in changes in mean correlations that may be associated with a crises than we are in absolute correlation level, we also normalized the data by converting each time serie of means pair-wise correlations into z-scores.