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 fall in other countries and sectors, suggesting that the influence of the initial-localised crisis is spreading.

One view of financial contagion is that it represents a period of weeks or months during which pairwise correlations of returns between certain countries and market sectors rise to much higher than average levels. Of course, the number of ways pairwise correlations of price movements can be measured is almost unlimited, and, 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 step, we study aimed to compare the known crisis with the epochs of high-correlation found in our analysis and discuss their characteristics.

The data used are extracted from the Russell database, encompassing 21 countries, 6 sectors, accounting for a total of more than 5.8 million stock quotes. Missing data are addressed by creating clusters to regroup countries that exhibit missing data.

**Analysis and method**

**Graph description**

**Chart 1** shows the six time series of highest pairwise correlations (collar 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 crisis event.

**Chart 2** above is an example of one of the six sets of time series of pairwise correlations used to generate the above. The chart has one period of crisis from week 24 to week 29, for the 81 pairs of market sectors is shown. The chart is color-coded to show the 10% 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.

**Results and discussion**

**Results:**

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

We also find that using different criteria and assemble their Z scores are more robust since some high correlation levels 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, the analysis illustrates the contagion but does not measure their characteristics. It might be relevant to evaluate the contagion speed as well as its propagation pattern.

Eventually, an investigation about the “unknown episodes” 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. The study used two measures: first, by Russell market sectors; and by Russell’s large, medium, and small market capitalization categories.

For each partition, we calculated the mean weekly returns, and the weekly cross-sectional dispersion of returns (using cross-sectional standard deviation as the measure). We then calculated the pairwise correlation, at a time lag, for “pair” 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 correlation, we used rolling 24 weeks of data.

The result was six sets of time series of weekly correlations, three starting with raw index 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. Then we took the weekly mean of the absolute correlations (for each of the 6 sets of time series).

This six series represent six different ways to measure the influence of weekly return or dispersion upon the next week’s returns or dispersion. In other words, they are a tough measure of how much predict the weekly returns have. We also took the weekly dispersion. This way the weekly dispersion has more luck to the next week.

Because we are more interested in changes in mean correlations that may be associated with a crisis than we are in absolute correlation levels, we also normalized the data using a moving time window of mean pairwise correlations into six steps.

**Acknowledgement**

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**References**


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