The Center and the Periphery: The Globalization of Financial Turmoil

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Outline

- Big Picture
- Data (too short?)
- Conditioning Biases in Measuring Distributions ("weak-form globalization")
- Comments on the Logit Model ("strong-form globalization")
- Further Suggestions
- Conclusions
Big Picture

• When a calamitous event happens in the US, is Brazil more likely to have low returns than when the US does not experience any financial turmoil?

• What about if Argentina experiences a large negative shock? Are there differences for Brazil’s returns than for the US case?

⇒ Need to quantify and measure spill-over and contagion effects
Comments on the Data

- The sample period is Jan 1997 to Aug 1999. This is not even three years of data!
- The authors want to examine “extreme returns,” in the 5th and 95th percentile of the distribution. We can’t even pin down a mean in 3 years of data, how are we going to pin down an entire distribution?

<table>
<thead>
<tr>
<th>US Daily Data from CRSP</th>
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<tbody>
<tr>
<td>Normal</td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Length</strong></td>
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<tr>
<td>3 yrs</td>
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<tr>
<td>10 yrs</td>
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<td>20 yrs</td>
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Annualized Returns

1998–2001 $\mu = 0.0779$, $\sigma = .2058$
1991–2001 $\mu = 0.1466$, $\sigma = .1556$
1981–2001 $\mu = 0.1490$, $\sigma = .1625$
• Daily data also contains a lot of bid-ask bounce and non-synchronous trading effects (eg see Karolyi and Stulz, 1996).

⇒ Use a much longer, at least a 10 year sample period
   IFC emerging market returns go back to 1988
⇒ Also look at weekly data for robustness. If something event is truly calamitous, its effects will not just be felt at a daily frequency.
Conditioning Biases

- Question: Is the distribution of returns in Brazil the same when the US has an extreme draw as when the US has a regular draw?

- The authors use a Kolmogorov-Smirnov test to show that the distribution of Brazilian returns is NOT the same when the US return is large, compared to when the US return is small.

- However, the answer to this question is always YES, by construction, as long as the US and Brazil are correlated.
Plot of Normal Density with $\rho = 0.4$
• Conditioning on “large” (extreme) moves induces conditioning biases in the distribution. We expect the marginal distribution of $y$ conditional on large absolute moves of $x$ to be different from the distribution conditional on small absolute moves of $x$. [see Boyer, Gibson and Loretan (1999), Ang and Chen (2002), Forbes and Rigobon (2002)]

• Testing for differences in distributions with conditioning biases is tricky, maybe impossible without a parametric framework:

1. Suppose the joint distribution of $(x, y)$ is normal. Then, using points $\{ (x, y) | x > h_1 \}$, we estimate $f(y|x > c)$ and infer the implied distribution $\hat{f}(y|x < c)$.

2. Compare this with $f(y|x < c)$ directly estimated from the points $\{ (x, y) | x < c \}$.

• However, asset returns overwhelmingly reject simple parametric distributions like normals!
Logit Model

• Question: Is the likelihood of the number of countries simultaneously experiencing extreme returns (LHS) dependent on whether a particular country, say the US, is experiencing turmoil? (RHS dummy variable)

• Problem: Conditioning biases always means the answer to this question is YES!

• Illustration: two assets \((x, y)\) drawn from a standard normal with correlation \(\rho = .4\). Suppose we condition on \(x > 1.65 = c\). Then \(E(y) = 0.8269\) and \(\text{var}(y) = 0.8620\).

[see Ang and Chen (2002) for full characterization of \(E(x^i y^j | h_1 < x < h_2, k_1 < y < k_2)\)]

\(\Rightarrow\) By construction, we expect \(y\) is more likely to also have an extreme draw!
• For any reasonable empirical model (GARCH, regime-switching, copulas etc), the conditioning biases are even more severe

• We need to know that standard DGP’s cannot account for these results.

⇒ Run Monte Carlo’s for various DGP’s to ensure that (i) common DGP’s do not account for your results “by construction” and (ii) that there are contagion effects in excess of those implied by the DGP’s.
Additional Comments

- There is a lot of evidence that downside returns are different from upside returns
  \[ \Rightarrow \] Examine the downside exceedances separately from the upside exceedances. Is contagion only reflected in the downside periods?

- The definition of “weak-form globalization” is “when country \( j \) experiences returns following an extreme event in country \( i \).
  \[ \Rightarrow \] This is a statement about predictability, not contemporaneous returns. However, the testing of distributions of weak-form globalization tests exceedance moves, not necessarily simultaneous, but \textit{contemporaneous} in time.
The logit exercise is very similar to Bae, Karolyi and Stulz (2002), except:

- BKS use *economic* explanatory variables, eg conditional volatility, exchange rates, interest rates, etc. (rather than dummy variables indicating large moves in particular countries)

- The detailed chronology of events should complement these statistical studies, but we need to rely on formal analysis to make inference, particularly for policy
Conclusion

• The tests of whether distributions of a country $y$ are the same conditioning on high or low absolute returns of country $x$. By conditioning biases, we always expect these distributions to be different!

• Conditioning biases also lead to difficulties inferring results from the logit model.

• We need to examine contagion effects relative to interesting empirical models and account for conditioning effects.