Cointegration of Equity Returns in Brazil, Russia, India, China and South Africa (BRICS)

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Introduction and Literature Review

Improvements in technology have reduced informational barriers that formerly restrained investment in international markets (Bekaert 1995). An overall movement towards fewer capital controls and reducing other market inefficiencies (e.g., poor credit ratings, high and variable inflation, exchange rate controls, etc.) due to globalization implies that equity markets are converging towards financial and economic integration over time (Bekaert, Harvey, Lundblad, Siegel 2011). Integration of emerging market economies into the world financial markets is generally followed by: a significantly larger and more liquid equity market, returns which are more volatile and more correlated with world market returns, a lower cost of capital (and thus lower risk premiums and increased investment), improved credit ratings, real exchange rate appreciation, and increased economic growth (Bekaert, Harvey, Lundblad).

Research Question

Over the next decade, the importance of the BRICS, and especially China, in world GDP will grow vastly. The IMF predicts that they will account for as much as 61% of global growth by 2016. This invites pertinent questions about the economic impact of fiscal and monetary policies in these countries, not only on the global economy, but also on the other members of the BRICS. We examine the co-integration of these countries’ markets over time, their response to economic shocks, and their interwoven Granger Causalities.

Theoretical Model

Taking a one-step forward, we examine the following model:

\[ \Delta Y_t = \rho \Delta Y_{t-1} + \delta X_t + \varepsilon_t \]

Where \( \Delta Y_t \) is the change in a financial variable of \( X_t \) at time \( t \) and \( \varepsilon_t \) is the error term. By taking the first order difference with respect to \( X_t \) we obtain:

\[ \hat{\phi} = \frac{\Delta Y_{t-1}}{\Delta Y_t} \]

As a result, the granger causality test is obtained by testing the null hypothesis that \( \hat{\phi} = 1 \) against the alternative that \( \hat{\phi} < 1 \).

Hypothesis

The loosening of capital controls in the 1980s and 1990s, along with increased availability of information, has caused the price of risk to be equally across assets. We therefore expect to see diminishing differentials in BRICS equity returns over time as different markets now demand the same compensation (i.e. returns should be converging).

Methodology

We consider three tests for stationarity:

1. Unit root, Dickey-Fuller Test
2. Cointegration
3. Error correction model (ECM)

Testing the joint significance test of lagged variables.

\( \psi \) at \( 0.05 \) level

Testing the significance of long-run component in the Error Correction Model.

Graphical Results

MSCI Equity Returns of the BRICS

Data

Research Question

The test for stationarity confirmed that MSCI returns in the BRICS are following a trend, and we adjusted for this non-stationarity (by differencing) in our model. The Error Correction Model suggests that the returns to equity in the BRICS follow a long-term trend. This result implies that if a shock drives any of these returns away from the current trend, in equilibrium, these returns will revert back to the trend.

Our Granger Causality tests suggest that beyond cointegration, some of these markets Granger-cause each other. For example, equity market returns in South Africa, Granger-causes returns in all the other BRICS at the 1% significance level. In other words, one can use the results from the returns of one country to predict the returns from another.

Because we orthogonalized the errors in the impulse response function, we can guarantee the consistency of the impulse response functions (IRF). With these functions, we can predict the impact that a shock on one country’s returns will have on another.

Conclusion and Further Research

Our analysis of equity returns in the BRICS showed evidence of co-integration between returns in the BRICS, and that some of the returns Granger-cause each other. Further, we note that shocks in some markets’ returns will affect others. Therefore, our study leaves room for forecasting the future extent of correlation, and investigating the underlying force of the co-integration. We suspect that the driving force behind the cointegration is globalization. Further research will employ structural VAR modeling techniques to tease out multi-directional influences.

Acknowledgements/References

We wish to thank the immensely helpful Dr. Bohara, the AEAA Summer Training Program 2013 and RW Foundation Center for Health Policy.

Supervised by Dr. Alok Bohara as partial fulfillment of the research requirement for ECON 404: Intermediate Applied Econometrics (Department of Economics, UNM)

References


Numerical Results

Granger Causality Matrix

Brazil - China Yes*** Yes Yes Yes***
China - Russia Yes No Yes* Yes***
Russia - India Yes No - Yes***
India - South Africa Yes*** Yes* Yes***
South Africa - Yes*** Yes*** Yes***

P-Values: *** p<0.01, ** p<0.05, * p<0.1

Cointegration between Brazil, India, & South Africa

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<th>VARIABLES</th>
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<td>D.ln_india</td>
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<td>D.ln_southafrica</td>
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Adjusted R-Square 0.289

Cointegration between China & Russia

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R-squared 0.269

Cointegration between South Africa, China, & Russia

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</table>

R-squared 0.465

MSCI Emerging Markets Index (1993-2013, monthly)


Discussion

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