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Inter-linkages and causal relationships between US and BRIC equity markets: An empirical investigation

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ABSTRACT

The US and BRIC economies are sharing increasing trade as well as financial linkages since the last decade. In this regard, the present study attempts to capture long run and short run inter-linkages and causal relationships between the US and BRIC equity markets during different time frames, i.e., pre-crisis, crisis and post-crisis periods. The study employs Johansen cointegration, VAR, VECM, Toda-Yamamoto's Granger causality, generalized impulse responses, and variance decomposition models to account for the said linkages. For the full sample period analysis, Gregory-Hansen cointegration and Diebold and Yilmaz's (2011) spillover index approaches are also employed. Overall, the results report changing market dynamics and partial integration across the years 2004–2014.

1. Introduction

The important issues in stock market integration are price discovery and return-volatility spillover effects due to increasing financial flows across foreign boundaries. Price discovery is the process by which a market attempts to react and reach its equilibrium price level in the short and long run (Booth, So, & Tse, 1999; Sehgal, Ahmad, & Deisting, 2015). The dynamic version of this price discovery process also describes how information produced in one-equity market transmits across the other equity markets owing to increasing trade and financial linkages among the foreign economies. An understanding of spillover or contagion effects support construction of optimal international portfolios and management of risks thereon. In short, the dynamics of price spillover effects support price prediction and arbitrage trading strategies to the market participants (Dimpfl & Jung, 2012; Pati & Rajib, 2011). Additionally, information about volatility spillover effects is also found to be helpful for option pricing, portfolio optimization, computation and management of value-at-risk, and risk hedging (Aragó & Salvador, 2011).

According to the strong form of Efficient Market Hypothesis (EMH), stock markets reflect and discount every type of available and relevant information in stock prices. However, in practical scenarios, stock markets are not found to be efficient in reflecting every type of information, i.e. past, present and future owing to information asymmetry and certain behavioral aspects attached to the market participants. It is well documented that past events also have an impact on current stock prices. In addition to this,

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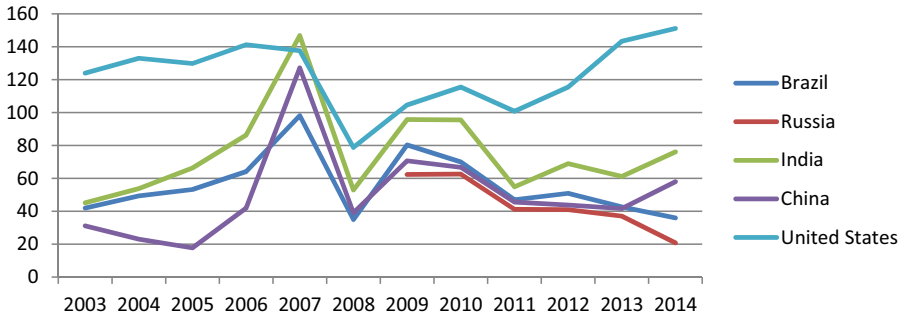

Fig. 1 – Market capitalization of listed domestic companies (% of GDP).
***Source*: IMF data.**

cross market past events also have an impact on domestic stock prices, thereby making the markets inefficient and establishing lead-lag relationships. These cross market events further make the international equity markets to witness co-movement or greater degree of interdependence among themselves undermining diversification benefits. Harvey (1995) thus suggests inclusion of emerging market asset classes in an internationally diversified investment portfolio because the latter markets do not correlate strongly with developed markets and further have little exposure to global risk factors (see also, Carrieri, Errunza, & Hogan, 2007; Lagoarde-Segot & Lucey, 2007; Lehkonen & Heimonen, 2014; Singh & Singh, 2016; Wuthisatian, 2014; etc.).

BRIC is a geopolitical, economic collection of Brazil, Russia, India and China; the most promising emerging markets' group. Owing to increasing economic ties within the bloc and with the mature markets, the decoupling hypothesis amongst the respective economies is under scanner. The unprecedented US financial crisis led to significant damage to investors' confidence across the worldwide markets. During the turbulent time period, i.e. from September 2008 to early March 2009, the US stock market fell by 43 percent and those in emerging markets witnessed a drastic fall of around 50 percent, and further frontier stock markets also witnessed a substantial fall of around 60 percent (see, Samarakoon, 2011; Zouhair, Lanouar, & Ajmi, 2014). This clearly depicts the impact of the said financial crisis on other international economies. Moreover, according to IMF (April, 2014), emerging markets with higher exposure to volatile capital flows and current account deficits or fiscal imbalances, are likely to be more vulnerable to global financial shocks. Consequently, our objective is to capture inter-linkages and causal relationships between the US-BRIC equity markets during different time frames concerning the recent US financial crisis. Additionally, ever since the financial crisis, there has been a significant increase in equity asset allocations to the emerging markets, so, studies relating to equity market linkages holds an important place in financial economics (IMF CPIS, October 2014).

Fig. 1 reports graphical presentation of market capitalization of listed domestic companies as a percentage of GDP of the respective US-BRIC[1] economies. A very high value (generally above 100) indicates over-valuation of the concerned market. High market capitalization values in the US, Brazil, China and India during 2007–2008, spotlight buoyancy in the respective stock markets before the emergence of the global financial crisis. However, after this point, a significant decline in these values can be observed due to the emergence of the US financial crisis. Moreover, the time-varying movement of the market capitalization pattern point out toward strong co-movement among the respective equity markets, making a strong case for dynamic interactions among the said markets. Interestingly, since the financial crisis, market capitalization has even surpassed its previous highest level with respect to the US economy. Seemingly, the present study employs Johansen Cointegration, Vector Autoregression (VAR) and Vector Error Correction Model (VECM) approaches. The said approaches are widely used by the researchers in order to account for causal linkages among the markets (for instance, Dekker, Sen, & Young, 2001; Masih & Masih, 2001; Royfaizal, Lee, & Azali, 2007; Singh & Kaur, 2016; Valadkhani & Chancharat, 2008; etc.).

The models are capable of studying the impact and magnitude of past events on current conditional returns. They also capture the speed and direction with which one variable respond to innovations in another variable. Apart these approaches, Granger causality test, generalized impulse responses, and variance decomposition analysis (VDA) models are also employed accounting for short run dynamic interactions among the concerned variables. Overall, the results report significant long run and short run dynamic interactions among the US-BRIC equity markets during different time horizons thereby impacting the degree of market integration over the years. The rest of the paper is organized as follows; Section 2 reports relevant literature review, Section 3 highlights rationale and objectives of the study, Section 4 reports empirical framework part, Section 5 discusses empirical findings and lastly Section 6 concludes the paper.

2. Relevant literature review

Investors allocating a part of their portfolio in internationally diversified emerging markets' portfolios enjoy increased ex-ante portfolio returns with managed increase in risk (Syriopoulos, Makram, & Boubaker, 2015). According to Wang and Ye (2016),

[1] The market capitalization values with respect to the Russian economy are available with effect from 2009 only.