

# Stock return distribution in the BRICS

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## Abstract

Stock returns in emerging market economies exhibit patterns that are distinctively different from developed countries: returns are noted to be highly volatile and autocorrelated, and long horizon returns are predictable. While these stylized facts are well established, the assumption underlying the distribution of returns is less understood. In particular, the empirical literature continues to rely on the normality assumption as a starting point, and most asset pricing models tend to overstretch this point. This paper questions the rationale behind this supposition and proceeds to test more formally for normality using multivariate joint test for skewness and kurtosis. Additionally, the paper extends the literature by examining a number of empirical regularities for Brazil, Russia, India, China and South Africa (the BRICS for short). Our main findings are that the distribution of stock returns for the BRICS exhibits peakedness with fatter and longer tails, and this is invariant to both the unit of measurement and the time horizon of returns. Volatility clustering is prevalent in all markets, and this decays exponentially for all but Brazil. The relationship between risk and return is found to be significant and risk premiums are prevalent in our sample.

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## 1. Introduction

Since Goldman Sachs economist, Jim O'neil coined the term BRIC in the early 2000s, the economies of Brazil, Russia, India and China have taken centre stage in both the global politics and economics. In 2010, South Africa joined the club, officially spreading the tentacles of the largest emerging market economies over four continents. By 2013, the BRICS accounted for almost 3 billion of the world's population, with a combined nominal GDP of US\$16.039 trillion. About US\$4 trillion of foreign reserves are held by the BRICS, with China alone accounting for more than a quarter.

Over the past few years, the performance of BRICS stock markets has been sterling. Data from Reuters (2012) shows that viewed in a 10 year horizon, the Morgan Stanley Capital International (MSCI) BRIC index returned a striking 450%, compared to the 320% and 98% returns on other emerging and developed markets respectively. Between 2001 and 2007 the MSCI's BRIC index returned over 500%, significantly outperforming other emerging markets. However, recent evidence shows that the hay days may be over soon. There have been slumps in the most recent period with losses of 8.6% in the past five years in dollar terms. There are also indications that China's impressive double digit growth spurt is fading. Brazil and South Africa's growth has been anaemic, and Russia faces problems in the oil and gas sector while reforms in India have been sluggish. The volatility in growth rates and stock market performance raises important questions pertinent to investments, portfolio diversification and the overall role of the BRICS in global economic growth. Will the BRICS assets continue to receive the attention they have enjoyed over the past decade? What is the nature of the risk return relationship in these markets? Questions such as these

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both on the distributional patterns, volatility and predictability of stock returns as well as the efficiency of the BRICS. This article concerns itself with return distribution, and on the time series properties of stock returns. The paper extends the literature in two directions.

The first is methodological. Standard asset pricing models such as the mean variance model takes the normality of asset returns as given. Although this assumption has been pointed out to be highly unrealistic (see Mandelbrot, 1963; Rachev, 2003) even for developed markets, a significant amount of research continue to focus on the normality of returns as a starting point. This is not surprising since the computational intensity underlying alternative distributions is both time consuming and more daunting. More so, the properties of the normal distribution are sufficiently well known and studied in the literature. However, the consequence of relying on models of normal returns may lead to significant underestimation of the risk of investing in emerging markets, particularly if the distribution is skewed and fat tailed. This paper thus questions the over reliance on the normality assumption that exist in the extant literature on the distribution of returns in emerging markets. Departing from extant literature we employ a multivariate skewness and kurtosis test of Mardia (1970) and the joint skewness and kurtosis test of Henze and Zirkler (1990).

The second contribution is to extend the literature on the peculiarities of asset returns in the BRICS. A number of research efforts have been expended in understanding the return distribution of emerging markets generally, however, a lot remains to be learned about the BRICS stock markets efficiency in allocating scarce resources. Moreover, the most comprehensive study of the return distribution of emerging markets appeared nearly two decades ago (Bekaert et al., 1998). On the empirical regularities emerging markets are noted to have low/or negative correlations with the more developed world (see Harvey, 1995; Alagidede, 2010); emerging market economies offer returns that exceed industrial-market returns (Buckberg, 1995; Reuters, 2012). Both of these facts suggest that unexploited profit opportunities may exist. At the same time, emerging market returns tend to exhibit high volatility and autocorrelation, long run predictability and generally low levels of liquidity (Bekaert and Harvey, 1997; Aggarwal et al., 1999; Kasman et al., 2009; Blitz et al., 2013; Hull and McGroarty, 2014). These stylized features may signal market inefficiency and opportunities for profitable arbitrage. Understanding the dynamic behaviour of stock returns in the BRICS is crucial for portfolio managers, policy makers, and researchers. We contribute to this strand of the literature by accounting for return dynamics in different time horizons and currencies.

### 1.1. Stylized facts of BRICS stock markets

The key facts about BRICS stock markets are indicated in Table 1. For the sake of brevity, and in line with data availability, the World Development Indicators for the stock market variables are only reported for 2012. The market capitalization, turnover ratio and trading value are all expressed as a percentage of GDP. Market capitalization is the share price multiplied by the number

of shares outstanding, and it is a rough benchmark for judging a company's net worth. The turnover ratio is derived by dividing the value of total shares by the market capitalization. While the total value traded ratio captures trading relative to the size of the economy, and the turnover ratio measures trading relative to the size of the stock market. In practice, the turnover ratio proxies the liquidity of the market: high turnover is an indicator of low transaction costs.

From Table 1, no single BRICS country dominates in terms of all indicators, unsurprisingly confirming the diversity of depth, performance and influence of the national stock exchanges. Judged by market capitalization, the Chinese market stands out. The Shenzhen, Shanghai and Hong Kong stock markets had a market capitalisation of \$3.7 trillion dollars at the end of 2012. The Shenzhen stock exchange is overwhelmingly dominated by state owned enterprises which are the back bone of the Chinese economy, while the Shanghai is not fully opened to foreign investors. Brazil and India have market capitalisation of about \$1.2 and \$1.3 trillion as of 2012, respectively. In the BRICS, Russia and South Africa are the smallest markets using this indicator at \$874 billion and \$612 billion, respectively. In relation to the size of the domestic economy, however, South Africa dominates as seen from Table 1. The size of the stock market as a proportion of GDP is a whopping 159%. This gives a high value of shares traded as proportion of GDP in South Africa (81%) than any country in Table 1. Interestingly, China's stock market is 44% of GDP, slightly bigger than the Russian 43% but less than Brazils 54% and India's 68%. With the exception of South Africa and China, total value traded as a share of GDP is less than 40% as of 2012.

The number of listed domestic companies amounted to 5191 in India in 2012. This is about 15 times the number of companies in Brazil and South Africa and about 19 times the number of domestic companies listed in Russia's stock market. China comes second with 2494 companies. The most liquid of the BRICS stock markets is China (164%), followed by Russia (87%) and Brazil (67%). India and South Africa have a turnover ratio of about 54%.

## 2. Empirical strategy and data

The analysis of the data for this study follows three steps. First we examine the nature of the probability distribution of the index return series for the BRICS measured in both US dollars and local currency and for different holding periods: daily, weekly and monthly. While this analysis is an end in itself, it also offers important information relevant for selecting the appropriate statistical model for performing inference on the return generating process. To achieve this aim, we employ the Mardia (1970) skewness and kurtosis, and Henze and Zirkler (1990) test for joint skewness and kurtosis.

Tests and estimates based on the sample mean vector and sample covariance matrix have been shown to have poor efficiency properties when heavy tailed noise distributions are present in a data set. Mardia (1970, 1974 and 1980) pioneered measures of skewness and kurtosis, and demonstrated that functions of the third and fourth moments are asymptotically distributed as

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