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# Research in International Business and Finance

journal homepage: [www.elsevier.com/locate/ribaf](http://www.elsevier.com/locate/ribaf)

## Spillover effects between exchange rates and stock prices: Evidence from BRICS around the recent global financial crisis

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### ARTICLE INFO

#### Article history:

Received 23 June 2015  
Received in revised form 5 October 2015  
Accepted 16 October 2015  
Available online 19 October 2015

#### JEL classification:

G15  
G11

#### Keywords:

BRICS  
Foreign exchange market  
Stock market  
Interest differentials  
Global financial crisis  
Spillover effects

### ABSTRACT

This study examines the dynamic relationships among local stock returns, foreign exchange rates, interest differentials, and U.S. S&P 500 returns. The research countries are Brazil, Russia, India, China, and South Africa (BRICS) in the regime of managed floating exchange rate, but China manipulates the foreign exchange rate, interest rate and restricts foreign capital flows most strictly. We find significant spillover effects from foreign exchange rates to stock returns in the short-run, but not vice versa. U.S. S&P 500 shocks significantly influence stock markets in Brazil, China, and South Africa. Furthermore, there are stronger spillover effects between exchange rates and stock returns during the 2007–2009 financial crisis.

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## 1. Introduction

With the development of economic globalization, the five major emerging national economies, including Brazil, Russia, India, China, and South Africa (BRICS), increase interconnectedness with the global economy through trade flow and capital flow. Because BRICS are the crucial recipients of global investments and major trading partner with U.S., Japan, German et al., both their stock and currency markets are closely connected with those major economies. In this study, we examine whether spillover effects exist between BRICS stock and currency markets as well as between U.S. market and BRICS markets. This study contributes to the current international finance theories which we provide evidence for trade flow-oriented model. In addition, this study contributes to the debates regarding potential reforms of globalization between advanced and emerging countries. Moreover, this study provides evidence that financial crisis shocks aggravated spillover effects between exchange and stock markets. Understanding and estimating the dynamic spillover effects have significant consequences on asset allocation, portfolio diversification, and stock and currency market return predictability.

The first is to explore the dynamic spillover effects between exchange rates and stock returns. From the previous literature, the two classical theories clearly express linkages between exchange rates and stock prices. Flow-oriented model

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emphasizes the current account as an important element in exchange rate determination, suggesting the currency exchange will impact the international competitiveness and trade balances, thereby affecting the countries' outputs, and therefore influencing stock prices (Dornbusch and Fischer, 1980). Stock-oriented model shows exchange rates are affected by stock prices' movements via the capital account (Frankel, 1987), since stocks market movements lead to money flow into or out of the countries, which affects the demand for money, thereby leading to changes in interest rates and exchange rate movements. The relationships between exchange rate and stock price have been studied in international finance, but the current empirical evidence is still difficult to interpret if the relationships are unilaterally, bilaterally or interactively influential.

On the one hand, in recent years, a number of research focuses far more on emerging countries' foreign exchange and stock market. Inci and Lee (2014) show that exchange rates have a significant impact on stock returns. Pan et al. (2007) show mixed relationships between exchange rates and stock prices in seven East Asia countries before the Asian financial crisis, but during the Asian crisis, exchange rates significantly impact stock prices. Chkili and Nguyen (2014) show the unilateral impact from stock market to foreign exchange market is significant for all BRICS during the period of the high volatility, except South Africa by using Markov switching VAR models. Zhao (2010) also finds the bidirectional volatility spillover effects between two markets in China by using MGARCH. On the other hand, in developed countries, the relationships between exchange rate and stock price are still ambiguous. Nieh and Lee (2002) show there are no long-run relationships between stock prices and exchange rates in the G-7 countries, and in the short-run, stock prices cause currency depreciation the next day in Italy and Japan. Kim (2003) shows that the stock price is positively impacted by the industrial production and negatively caused by exchange rate, interest rate, and inflation. Yang and Doong (2004) examine the nature of the mean and volatility transmission mechanism in the two markets for G-7 countries, and found stock price fluctuations impact exchange rate and asymmetric volatility spillover effects.

Second, spillover effects between U.S. and BRICS stock markets are estimated, because capital flows between developed and developing countries have been increasing (Inci and Lee, 2014; Ozdemir et al., 2009). Ozdemir et al. (2009) show a significant causal relationship between U.S. S&P 500 and all emerging stock markets, suggesting center-periphery relation exist in global stock markets. Syriopoulos et al. (2015) also find shocks and volatility transmission effects exist between U.S. and BRICS stock markets. Gilenko and Fedorova (2014) show during pre-crisis period U.S. stock market significantly impacted Chinese stock market, but during the crisis and recovery period the results were mixed.

Third, we compare spillover effects between exchange rates and stock returns during 2007–2009 crisis and tranquil periods. The known structure break of 2007–2009 financial crisis is examined, and then we specifically test spillover effects of sub-sample in 2007–2009 crisis. The hypothesis is that a spillover effect between exchange rate and stock return is stronger in crisis than tranquil periods. Lin (2012) shows a spillover effect between exchange rates and stock prices becomes stronger during crisis periods. Ding and Pu (2012) show the market linkage becomes stronger in the crisis by exploring spillover effects across the U.S. stock, corporate bond, and credit derivative markets.

Overall, this study confirms unilateral spillover effects from exchange rate to stock-markets in BRICS, and insignificant long-run effects between the two markets except China. This study supports trade flow-oriented model because global trade can significantly impact a company's performance in major export countries. Globalization is accelerating both trade flow and capital flow in the world economy, but most emerging countries still strongly intervene their currency's exchange rate and capital flows across their border, which can crimp the role of foreign investors. Moreover, we also find spillover effects between U.S. stock markets and stock markets, suggesting U.S. stock price have the information to predict the stock price of BRICS stock markets. Thus, the spillover effect may have affected the perception of investors with respect to portfolio decision making, such that investors began to adjust weight on the linkage between exchange rate and stocks. Furthermore, we find stronger spillover effects between exchange rates and stock returns during 2007–2009 financial crisis. Since BRICS are major exporters, a minor appreciation on exchange rate can significantly decrease a local firm's profit. Especially in financial crisis, substantial fluctuations in currency valuation can negatively impact the BRICS economies and stock markets.

The paper is organized as follows. Section 2 introduces the data and methodology. Section 3 interprets the overall results, and Section 4 includes implications and conclusions.

## 2. Data and methodology

### 2.1. Data

This study uses U.S. dollar-denominated daily exchange rates, stock prices, and 3-month interest rates for the BRICS countries (Brazil, Russia, India, China, and South Africa), and U.S. 3-month interest rates and U.S. S&P 500 index from Thomson Reuters DataStream. Interest differentials are calculated by the difference of U.S. 3-month T-bill rates and each local interest rates. The return of exchange rates, stock indexes, and S&P 500 is measured by  $\text{LN}(P_t/P_{t-1})$ . Table 1 shows returns of exchange and stock index are close to zero, and volatility of returns are close to 0.01 for each country.

In order to reduce the influence of government interference in the foreign exchange market, the data is selected after adopting the managed floating exchange rate in BRICS countries. Unlike industrial countries, most emerging countries have not implemented a free floating exchange rate regime, so that the better way to weaken regime impacts is excluding periods of adopting fixed exchange rate. In the BRICS, only South Africa adopts a freely floating exchange rate. By contrast, exchange rates of China and Russia are still intervened significantly by the governments. Detailed information is shown in Table 2.

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