Assessing the extent of the interaction between the stock market and foreign exchange market in BRICS economies

By

Lumengo Bonga-Bonga

1. Introduction

The BRICS (Brazil, Russia, India, China and South Africa) countries, by their rapid economic growth and their geopolitical influence, are expected to become important player in the world economy and bring about a new world order, establishing a balance of power between developed and emerging economies. Neill and Stupnytska (2009) predicts that the combined economies of the BRICS grouping could overtake those of the US and European Union blocks in the next four decade. There are some evidences to support to such a prediction; for example, BRICS economies represent more than 40% of the world population and more than a quarter of the world land area, making those economies the drivers of global consumption and demand. In addition, most of the BRICS countries are endowed with natural resources that are in increasing demand mostly in the face of recurrent global financial crises. In addition to the prospect of becoming of the global suppliers of goods and services, China and India have the advantage of being the most populated countries in the planet. Moreover, Russia, Bazil and South Africa are well endowed with natural resources and naturally constitute the logical supplier of raw materials to China and India.

The growing capital market among BRICS countries entails that those countries are becoming the important centre for direct and portfolio investments in the world. The stock market capitalisation of BRICS equity markets have grown considerably in the last decade. For example, China's share of

global market capitalisation has grown from 1% in 1999 to 11% in 2010[1]. Moreover, a number of authors expect China to overtake the US in terms of stock market capitalisation by 2030, due mainly to its expanding investment and high economic growth in China (Moe et al,2010).

While there seems to be good prospect for high economic growth, triggered by massive capital flow in the BRICS countries, a number of authors have alluded to the fact that financial crises in emerging markets have been preceded by episode of high capital flow. Moreover, the large capital flow in BRICS equity markets may trigger asset bubble and a possible financial panic in case the bubble busts. In addition, the flow of capital in BRICS equity markets may lead to the appreciation of their respective currencies and possible balance of payments problems. It is important to note that a major source of financial crisis in the emerging markets has been the changes in the valuation of their currencies and the balance of payments problems that ensued. This reality indicates that the massive capital flow in the BRICS equity markets may become the source of uncertainty and financial crisis in the absence of appropriate policy measures. A number of emerging market crisis seems to suggest a strong link between capital inflow and currency appreciation in the pre-crisis period. The negative effect of a strong currency on the balance of payment and the loss of competitiveness and investors panics that ensue are the common cause of most emerging market crises. This seems to suggest that emerging markets economies need to effectively monitor the effects of capital inflow on the exchange rate and implement proper policy measures to mitigate the negative effect of equity market capital flow on exchange rate. Thus, the aim of this paper is to assess the spillover between the equity and foreign exchange market and propose policy measures that could assist in avoiding equity market performance becoming the source of uncertainty and financial crisis in BRICS economies.

The paper is divided as follows; section 2 presents the methodology of the paper. Section 3 introduces the data used in the paper and the estimation of the model. Section 4 presents and discusses the finding of the paper and section 5 concludes the paper.

2 Methodology

---

[1] IMF

I order to assess the spillover between the equity market and foreign exchange market in BRICS countries, this paper applies the methodology of multivariate VAR-EGARCH. While a family of multivariate GARCH models are important and relevant to analyse the transmission of volatility shocks between markets or countries, a number of these models do not account for asymmetric transmission of shocks and leverage effect in that negative shocks to stock return produce a higher conditional volatility. Beside assessing the transmission of volatility shocks, the VAR EGARCH model provides the lead/lag relationships of the mean return which are also essential in evaluating the extent and degree of financial integration among countries.

The multivariate VAR-EGARCH model can be expressed as follows:

$$r_{it} = \beta_{i0} + \sum_{j=1}^{5} \beta_{ij} r_{j,t-1} + \upsilon_{it} \quad \text{for } i,j=1,2 \tag{1}$$

$$\ln \sigma_{it}^2 = \alpha_{i0} + \sum_{j=1}^{5} \alpha_{ij} f_j(z_{j,t-1}) + \gamma_i \ln(\sigma_{i,t-1}^2) \tag{2}$$

and

$$f_j(z_{j,t-1}) = (|z_{j,t-1}| - E(|z_{j,t-1}|) + \delta_j z_{j,t-1}) \tag{3}$$

Where r_{it} and σ_{it}^2 represent the return and conditional volatility, respectively, in South Africa at time t. $z_{it} = \upsilon_{it}/\sigma_{it}$ represents the standardised innovation. Equation 1 expresses the mean equation for the change in exchange rate $(i, j = 1)$ and equity returns $(i, j = 2)$ where the lead/lag relationship between the two variables is captured by the coefficient β_{ij} for $i \neq j$. Equation 2 represents the

conditional variance (volatility) the two variables. The natural logarithm transformation indicates that these conditional volatilities can have any sign, positive or negative.

In addition the functional form of $f_j(z_{j,t-1})$ embeds the asymmetric reaction of the conditional volatility to past standardised innovation in that for a positive value of α_{ij} the impact of $z_{j,t-1}$ on $\ln\sigma_{it}^2$ will be positive (negative) if the magnitude of $z_{j,t-1}$ is greater (smaller) than its expected value $E(|z_{j,t-1}|)$ (Koutmos, 1996). The sign effect of past volatility shocks on the conditional volatility is reflected in the term $\delta_j z_{j,t-1}$. Given $\alpha_{ij} > 0$, stock market decline in country j, that is $z_{j,t-1} < 0$ will be followed higher conditional volatility in country i than stock market improvement if δ_j is negative. The coefficient γ_i measures the degree of the persistence of conditional volatility in that past conditional volatility has greater impact on current volatility.

3. Data and Estimation

We focus in presenting the results for South Africa, as a sample BRICS member country. To determine the extent and direction of price and volatility spillovers between the foreign exchange and equity markets in South Africa, weekly data from 1 July 1995 to 31 October 2010 are used. The sample periods correspond with the period after the liberalisation of the Johannesburg Stock Exchange, the main stock exchange in South African. The paper uses the first difference of the natural logarithm of real equity price (dEQT))and the first difference of the natural logarithm of exchange rate (dEXCH)). It is important to note that the first difference of the natural logarithm of real equity prices represents the stock returns series and that the first difference of the natural logarithm of exchange rate represents the change in exchange rates. Table 1 presents the results as in Equations 1,2 and 3.

4. Discussion of the results

It is clear from the results that while shocks to equity market influences the volatility of exchange rate, given that the coefficient $\alpha_{12} = 0.066$ is statistically significant at 95% confidence level. Nonetheless, the results reported in Table 1 shows that shocks to exchange rate does not affect the conditional volatility of equity returns, given that $\alpha_{21} = 0.011$ is not statistically significant . The results reported in Table 1 shows that the leverage effect is statistically significant for equity return, but not for the change in exchange rate. Given that shocks to equity returns affect the volatility of exchange rate, this indicates and that the return in the equity market impact on the change in exchange rate, this finding suggest that capital flow to equity market in South Africa, as BRICS member country, may cause currency crisis and possible financial crisis.

5. Conclusion

Given that shocks to equity returns affect the volatility of exchange rate, this indicates and that the return in the equity market impact on the change in exchange rate, this finding suggest that capital flow to equity market in South Africa, as BRICS member country, may cause currency crisis and possible financial crisis.

Table 1. Estimation of the VAR-GARCH model

Variable	Coefficients	Std Error	T-Statistics	Probability
1. β_{10}	0.226572723	0.024144255	9.38413	0.00000000
2. β_{11}	-0.003985699	0.003472606	-1.14775	0.25106997
3. β_{12}	0.034954020	0.002533919	13.79445	0.00000000
4. β_{13}	0.028925274	0.014185056	2.03914	0.04143635
5. β_{14}	-0.005497451	0.018676051	-0.29436	0.76848413
6. β_{20}	0.147377499	0.039894900	3.69414	0.00022063
7. β_{21}	0.007637516	0.036220436	0.21086	0.83299491
8. β_{22}	-0.010269487	0.033567087	-0.30594	0.75965096
9. β_{23}	0.020706283	0.029652090	0.69831	0.48498478
10. β_{24}	-0.020194781	0.027953952	-0.72243	0.47002997
11. α_{10}	0.085770049	0.018525228	4.62991	0.00000366
12. α_{11}	0.372232193	0.050086733	7.43175	0.00000000
13. α_{12}	0.066686740	0.028147972	2.36915	0.01782907
14. α_{20}	0.107660163	0.032297123	3.33343	0.00085783
15. α_{21}	0.011925337	0.030375236	0.39260	0.69461448
16. α_{22}	0.150212680	0.023735358	6.32865	0.00000000
17. δ_{1}	0.025845246	0.053582351	0.48235	0.62955999
18. δ_{2}	-0.769095556	0.109219110	-7.04177	0.00000000
20. γ_{1}	0.949751662	0.012591732	75.42661	0.00000000

21. γ_2	0.950744629	0.014598078	65.12807	0.00000000

O'neill, J. And Stupnytska,A.(2009). The long-term outlook for the BRICS and N-11 post crisis, Glaobal Economics papaer N0.192, Goldman Sachs.

Moe, T; Maasry,C. And Tang,R. (2010)"EM Equity in two decades: A changing landscape". Goldman Sachs Global Economic paper No. 204.