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Melis, Michael and Bonga-Bonga, Lumengo

University of Johannesburg

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Determinants of global capital volatility in the BRICS grouping.

Michael Melis

Lumengo Bonga-Bonga

Abstract

This paper assesses the determinants of capital flow volatility in the BRICS economies by differentiating between foreign direct investment (FDI) and portfolio capital flow volatilities. Moreover, the paper distinguishes between external variables, policy variables and control variables among the important drivers of capital flow volatility in these economies. Use is made of the general method of moment (GMM) estimation in panel regression for this end. The findings of the empirical analysis show, among other things, the importance of global volatility spillover in driving capital flow volatility in the BRICS countries

Keywords: capital flow volatility, BRICS, GMM panel regression, FDI, portfolio

JEL classification codes: C23, F32, F41

1. Introduction

Over the past two decades, developing and emerging countries have attracted significant amounts of capital flows. For example, the internationally issued corporate debt of Emerging Market Economies (EME) totalled about \$900 billion in 2016 (Bertaut et al., 2018). A group of countries made up of Brazil, Russia, India, China and South Africa (BRICS) have received a large portion of these capital flows, which has contributed towards greater economic growth and development within these countries. The increased capital flows have resulted in the surge of financial markets within the BRICS economies. For example, stock market capitalization per GDP has reached a high of 323% in 2016 from 220% in 2005 in South Africa (World Bank, 2017). The increase in capital flows have contributed to global financial integration, which accelerated the spillover of negative shocks, especially during the crisis periods. Spillover of shocks or financial contagion between countries has resulted to the volatility of capital flows. Given that the volatility of capital flows has been found to negatively affect economic growth within countries (Easterly, Islam, and Stiglitz, 2001; Broto, Diaz-Cassou and Dominguez, 2008), policymakers have attempted to develop policies and strategies to mitigate the volatility of capital flows. However, designing such policies or strategies require the identification factors contributing to increased volatility of capital flows.

Research concerning capital flow volatility has only received significant attention recently. As a result, empirical findings on the determinants of capital flow volatility remain scarce. Most studies on capital flow volatility have made use of panel datasets for over fifty countries. The results of these studies often depend on the type of capital flow studied, for example Lee, Park and Byun (2013), found inflation reduces the volatility of Foreign direct investment (FDI) and Portfolio investment but increases the volatility of other types of investment. The same sort of contradictions exists in other variables such as institutional quality and financial openness. The broadness of past studies may imply that the results are not applicable for assessing the determinants of capital flow volatility to specific groups of countries. For example, BRICS countries are considered to have large mining and agricultural sectors causing models based on broad panels with many countries to underestimate the influence of changes in commodity prices on capital flow volatility, in fact many of these studies excluded the influence of commodities on capital flow volatility. Ideally, any research done on the determinants of capital flow volatility should be insightful enough to allow for the development of policies capable of reducing capital flow volatility.

Despite the fact that BRICS economies have contributed to greater extent in global capital movement and its volatility thereof, no paper has ever attempted to assess the determinants of capital flow volatility in these economies. Thus, this paper will fill this gap in the literature of global capital volatility by assessing the determinants of capital flow volatility in the BRICS countries.

The study is carried out by first identifying factors that may influence capital flow volatility from the empirical literature topic. Once factors are identified, we estimate panel regression models with various types of capital flows as dependent variables. These capital flow volatilities are calculated using a normalization technique to control

for various issues normally arising from using the rolling standard deviation as a measure of volatility.

This paper is organized as follows: Section 2 will provide the literature review on the determinants of capital flow volatility. In section 3, the methodology and data employed in the paper will be provided and the results will be discussed in the fourth section. The last section will conclude the study and provide policy recommendations.

2. Literature Review

Becker and Noone (2008) identify three issues concerning capital flow volatility. When put in terms of GDP, capital flows in developing countries are proportionally larger. Second, capital flow volatility exhibits greater clustering in developing countries relative to developed countries. Lastly, the volatilities of different types capital flows exhibit unique patterns. These issues imply that developing countries are likely to have higher capital flow volatility and endure greater harm from increased volatility.

Hegerty (2011) compares capital flow volatility of developing countries in Eastern Europe and South America. The study was carried out using quarterly data from 1990 to 2008 and each country is examined as an individual time-series. Capital flow volatility is calculated using rolling standard deviation over eight quarters and is then expressed in terms of GDP to account for the different magnitudes of capital flows for each country. An Autoregressive Distributed Lag model is estimated on each country using variables representing GDP growth, inflation, foreign reserves, and financial openness as added explanatory variables. For most countries, it is found that increases in inflation, and financial openness tend to increase capital flow volatility. On the other hand, GDP growth usually decreases volatility, while holding foreign reserves significantly increases or decreases volatility.

Lee, Park and Byun (2013) applied a Generalized Method of Moment (GMM) estimation on a panel of 49 developing countries to determine whether global and regional effects exist on capital flow volatility. Instead of expressing volatility of capital flows in terms of Gross Domestic Product (GDP), a normalization technique is applied to capital flows and a 5-year rolling window is used to calculate the standard deviation of these normalized capital flows. Their findings suggest the existence of both global and regional spillover effects, further; it is also found that institutional strength has a significant effect on reducing capital flow volatility. For other variables, such as inflation and foreign reserves, the results give conflicting conclusions depending on the type of capital flow considered.

Kohli (2015) examines the relationship between capital flows and exchange rate volatility in India. GMM estimations are performed using volatility of the S&P 500, foreign reserves, interest rate differentials, financial openness, inflation, and GDP growth as explanatory variables. Using monthly data from 2004 to 2014, it is found that holding sufficient foreign reserves has a significant effect in reducing the volatility of capital flows. On the other hand, inflation was found to be statistically significant in increasing capital flow volatility.

Globan (2015) examines capital flow volatility in non-Eurozone EU member states and finds that macroeconomic circumstances of the main members of the EU have a

growing influence on the capital flow stability of non-Eurozone EU members. The main cause for this growing influence is attributed to the increased financial integration of EU economies and recommend such countries develop sufficiently advanced institutions for the efficient management of capital flows.

3. Data and Methodology.

This study makes use of quarterly data for the period 2004 to 2016 for the BRICS Block. The chosen period is informed by data availability. All data is obtained from the IMF's online database. Foreign direct investment (FDI) and portfolio investment represents our choices for capital flow. FDI includes capital flows to a country with the goal of increasing the productive capability of a company, while portfolio investment represents capital flows to countries based on risk and return characteristics of an investment. The VIX 3-month volatility index, Chin and Ito's financial openness index, CPI, foreign reserves as a percent of GDP, GDP per capita growth rate, and oil prices are also obtained to serve as regressors in the panel regression. Before calculating the volatility of our capital flows, we first normalize the flow in order to take into account the magnitude of flows received by countries with very different economies. The normalization is done using equation (1). The volatility can then be calculated using the normalized capital flows and the rolling standard deviation in equation (2). The choice of rolling window length is arbitrary and in this paper, is set to 6, which represents one and a half years of capital flows.

$$Nflow_{ik} = \frac{flow_{ik}}{highest\ flow} \times 100 \quad (1)$$

$$\sigma_{it} = \frac{1}{6} \sum_{k=t-(n-1)}^t (Nflow_{ik} - \mu)^2 \quad (2)$$

Where μ represents the average of normalized capital flows, $Nflow_{ik}$ and $flow_{ik}$ represent the normalized and regular capital flows. The use of a rolling average to calculate volatility does create certain problems. Since there is overlapping present for each calculated volatility and the volatility is the dependent variable, the error term will be serially correlated (Mercado and Park, 2011). The GMM estimator of Blundell and Bond (1998) is employed to overcome the problem of serial correlation of the error term. The GMM estimator considers moment conditions for level and first difference in the model.

A panel regression is specified in (3) with capital flow volatility as the dependent variable. The independent variables are separated into external, policy and control variables.

$$\sigma_{it} = \beta_0 + EV_{it}\beta_1 + PV_{it-1}\beta_2 + CV_{it-1}\beta_3 + \varepsilon_{it} \quad (3)$$

Where σ_{it} represents the normalized capital flow volatility, β represents each of the coefficients that need to be estimated. EV , PV and CV represent vectors of the external variables, policy variables and control variables. Policy and control variables are also lagged by one period to reduce endogeneity problems.

Equation (3) will be estimated twice. In the first estimation, the volatility of FDI is used as the dependant variable while in the second the volatility of portfolio investment is used as the dependant variable. We define them as follows:

-VFDI: 18-month standard deviation of normalized FDI flows

-VPORT: 18-month standard deviation of normalized portfolio investment flows.

For the external variables, we consider global volatility and commodity prices. The global volatility is required to assess whether there exist any contagion effects in capital flow volatility of BRICS countries. Commodity prices are required to capture the influence of commodity markets on the BRICS countries. This study makes use of the implied volatility for the S&P 500 to represent global volatility and the oil price is taken as a proxy for commodity prices. We expect a positive relationship between global volatility and BRICS volatility, while the coefficient on oil prices may be positive or negative depending on the influence of commodity prices within the BRICS countries.

-VIX: 3-month implied volatility of the S&P 500 index.

-OIL: log of the price of a barrel of crude oil.

To control for different levels of development within the BRICS countries, we include variables representing GDP growth rate and GDP per capita. The expectation of the relationship between GDP growth rate and volatility is that they should be negatively related, as GDP increases flows to countries tend to become more stable. The same expectation is provided for the relationship between GDP per capita and capital flow volatility.

-GDP_PC: Log of GDP per capita.

-GDP_GR: GDP growth rate.

Policy variables are included to examine the influence of macroeconomic and governmental factors on capital flow volatility. The first policy variable considered is the degree of financial openness. This is measured using Chin and Ito's financial openness index, the relationship between financial openness can be positive or negative. Although, an open financial market attracts stable capital flows, however, the absence of controls on the flow of capital countries can be more susceptible to domestic or global economic shocks. Institutional quality is also examined with various indicators from the World Bank. Having strong institutions should lead to reductions in capital flow volatility. CPI serves as a proxy for macroeconomic stability. High levels of inflation tend to be signs of economic mismanagement and therefore cause capital flow volatility to increase. The final policy variable is the stock of foreign reserves relative to GDP. Reserves also have an ambiguous relationship on volatility, as large reserves provide buffers against liquidity crisis and reduce capital flow volatility, but some countries also maintain substantial reserves to build up a cushion against expected large outflows of foreign capital.

-Open: Chin and Ito's financial openness index transformed into a quarterly series using quadratic interpolation

-Institutions: Institutional quality.

-CPI: Inflation rates

-Reserves: Foreign reserves held divided by GDP

4. Results and discussion

Table 1- GMM estimates of capital flow volatility

Variables	FDI (1)	Portfolio (1)
VIX	0.816**	0.849***
Oil	0.9880	-2.848***
Open	-0.1830	-0.338
Institutions	-0.492***	-0.00488
CPI	1.467**	0.114*
Reserves	0.00920***	0.1157**
GDP_PC	6.07E-06	0.000568***
GDP_GR	-0.0772**	-0.0387**
Constant	-9.347***	-13.156***
Number of observations	198	198

*GMM estimates are displayed with *, **, and ***
denoting significance at the 10%, 5% and 1% levels*

Table 1 presents the GMM estimates for the regressions on the volatility of FDI and the volatility of Portfolio investment. In general, the results conform to our prior expectations of the relationships among the variables and capital flow volatility. In line with the study by Lee, Park and Byun (2013), we find that the BRICS economies are susceptible to spillover effects from global volatility. This is indicated by the positive value of the estimated coefficients on the VIX variable. Further, the spillover exists for both types of capital flows although it is more significant on portfolio investment. Surprisingly, the coefficient on oil price indicates an insignificant impact on FDI but is statistically significant in reducing capital flow volatility when measured in terms of portfolio investment. This suggests that in times of rising commodity prices, the BRICS economies are likely to endure more stable portfolio investment flows.

Having strong institutions in place, is found to reduce significantly the volatility of FDI flows in the BRICS country, but does not have a statistically significant impact on portfolio investment. Although the relationship between financial openness and volatility is negative for both FDI and portfolio investment, neither coefficient is statistically significant. CPI has a positive influence on the volatility of FDI and portfolio and is statistically significant in both cases. Suggesting increases in the rate of inflation bring about large swings in capital flows and supporting the notion that economic agents view higher inflation as signs of economic mismanagement.

Increases in the proportion of foreign reserves held relative to GDP is also found to increase capital flow volatility for both types of capital flows. This finding may imply that the BRICS economies hold substantial reserves as a precaution against liquidity or exchange rate crisis, given the role of international reserves as a stabiliser of international capital during global financial turmoil.

With regards to the control variables, GDP per capita is found to have a positive effect on both types of capital flows but is also significant on portfolio investment. The positive relationship is puzzling as countries at higher stages of development should be able to maintain more consistent capital flows. The GDP growth rate is statistically significant and negative on both types of capital flow volatility suggesting that improving economic growth rates or maintaining existing high levels of economic growth support greater stability in capital flows.

5. Conclusion.

This study aimed to identify whether there exists global volatility spill over effects on the capital flow volatility of BRICS countries. Further, we examined two types of capital flows, FDI and portfolio investment. The examination was carried out using a panel regression framework and variables representing global volatility, commodity prices, and domestic factors.

The findings of this paper suggest that there is global volatility spill over effects on capital volatility, when measured in FDI or portfolio investment. This is in line with previous studies performed on developing and emerging markets and suggests that the BRICS economies are as susceptible to global volatility shocks as other developing countries. It is also found that various policy variables have different relationships on the volatility of FDI and the volatility of portfolio investment.

The implications of these findings on the potential policy actions of BRICS economies is that maintaining low rates of inflation can contribute to decreasing the volatility of capital flows among these economies. Another important finding is that growth in GDP also plays a role on the volatilities of capital flows. As a result, declining growth rates should be a concern for all BRICS economies.

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