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The Macroeconomic and Institutional Drivers of Stock Market Development: Empirical Evidence from BRICS Economies*

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Abstract

The stock markets in the BRICS (Brazil, Russia, India, China and South Africa) countries are the leading emerging markets globally. Therefore, it is pertinent to ascertain the critical drivers of stock market development in these economies. The currrent study empirically investigates to identify the linkages between stock market development, key macro-economic factors and institutional factors in the BRICS economies . The study covers the time period from 2000 to 2017. The dependent variable is the country's stock market development and the independent variables consist of six macroeconomic variables and five institutional variables. The study employs a panel cointegration test, Fully Modified OLS (FMOLS), a Pooled Mean Group (PMG) approach and a heterogeneous panel non-causality test.The findings of the study indicate co-integration among the selected variables across the BRICS stock markets. Long-run estimations reveal that five macroeconomic variables and four variables related to institutional quality are positive and statistically significant. Further, short-run causalities between stock market capitalization and selected variables are detected through the test of non-causality in a heterogeneous panel setting. The findings suggest that policymakers in the BRICS countries should enhance robust macroeconomic conditions to support their financial markets and should strengthen the institutional quality drivers to stimulate the pace of stock market development in their countries.

Keywords: Emerging Markets, Panel Econometric Models, Stock Market Development, Macro-Economic Indicators, Institutional Indicators

JEL Classification Code: F02, G15, N20

1. Introduction

A robust stock market serves a central role in promoting economic activities and accelerating the growth and development of an economy. Extant theoretical literature highlights the role of stock markets in promoting economic growth, showing that well-functioning stock markets can encourage market liquidity, lessen the cost of raising capital, strengthen corporate governance, and stimulate international risk-sharing, thus supporting the growth of their economies (Levine, 1991; Obstfeld, 1992). It is evident from various empirical studies that stock market growth is an appropriate explanatory variable affecting economic growth (Beck & Levine, 2004; Levine & Zervos, 1998). Multiple studies show that stock market capitalization describes the attributes of the stock market development (Billmeier & Massa, 2009; Garcia & Liu, 1999). The principal factors of stock market development can be categorized as either macroeconomic or institutional (Garcia & Liu, 1999).

The BRICS countries have grown rapidly and have become more integrated with the developed world in the arena of trade and investment. In the same vein, BRICS stock markets have progressed in terms of size and volume of investments, and have received much attention from both domestic and international investors (Mensi et al., 2017). BRICS stock markets have steadily generated high average returns, thereby garnering attention for investors seeking to form internationally diversified portfolios. These markets offer substantial diversification gains for international investors. A range of financial reforms has taken place in

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the BRICS countries, namely the use of electronic trading, enacting insider-trading laws, and creating links between local stock exchanges. Due to this favorable economic outlook, the BRICS have garnered substantial attention from domestic and global investors, portfolio managers and policymakers (Hammoudeh et al., 2013). Multiple studies highlight the future prospects of the BRICS markets. Cheng et al. (2007) reveal that in the coming four decades, the BRIC economies (excluding South Africa) could become larger than the combined economies of the original G6 countries in US dollar terms. Mensi et al. (2014) estimate that the BRICs combined stock markets will account for more than 40% of the global stock market capitalization by 2030. Wilson and Purushothaman (2003) substantiate these studies, stating that the total nominal GDP of the BRICs (again, excluding South Africa) will grow to $128 trillion by 2050, compared to $66 trillion for the G7 nations. Another study corroborates the BRICS' importance using IMF data, revealing that the BRICS' economic growth rate will be significant and higher than growth in the developed markets and in other emerging economies by 2030 (Kose & Ozturk, 2014).

The essential point of this investigation is to empirically determine the linkage between macro-economic, institutional factors and stock market development in the BRICS economies. Given that the BRICS stock markets produce robust average returns, they provide opportunities for enhancing the efficiency of internationally diversified portfolios. This economic block plays significant part in global equity markets in terms of investment prospects and stock market capitalization. As the emerging markets with the most rapid growth in recent decades, it is central for policymakers and regulators to know the variables that contribute to the BRICS' stock market growth. The theme of this study is topical and substantial as it analyzes the important economic block that consists of Brazil, Russia, India, China and South Africa (BRICS). These economies are expected to become even more important in the coming decades; thus, there are many reasons for selecting the BRICS economies as the focus of the study. As a group, these large emerging economies expanded rapidly after adopting measures to liberalize their markets. These countries have aggressively pursued global trade and investment, and have experienced higher growth rates compared with developed economies (Giannellis & Koukouritakis, 2018). The BRICS economies are notable on the landscape of emerging markets, which are defined as low-income economies undergoing swift economic growth due to governmental policies designed to encourage economic reform (Hoskisson et al., 2000). These emerging markets experienced substantial reforms during the 1980s and 1990s, thereby increasing their participation in the global economy during the period 1990–2000 (Levine & Zervos,1998).

This study adds to the current literature in three ways, as follows: first, the study investigates the short-run causalities and long-run linkages among the stipulated variables. Second, given the paucity of literature on how the BRICS stock markets are affected by macroeconomic variables and institutional factors, this study attempts to detect relationships among these variables. Third, unlike to previous studies on the BRICS stock markets, this study drives the existing literature by employing a Fully Modified OLS (FMOLS) regression, Pooled Mean Group (PMG) estimator and tests of non-causality in heterogeneous panels, following Dumitrescu and Hurlin (2012). In summary, the empirical results find co-integration among the macroeconomic variables, institutional quality variables and development in the BRICS stock markets.The long-run estimations reveal that five macroeconomic variables and four institutional quality variables are positive and statistically significant. Further, the results show that there are short-run casualties between stock market capitalization and a few variables based on the non-causality in heterogeneous panels test of Dumitrescu and Hurlin (2012). These findings have implications for international investors and portfolio managers who attempt to discern the key macroeconomic and institutional drivers before investing in the BRICS stock markets. The results have crucial implications for policymakers to deliberate and design policy measures to regulate these key macroeconomic variables and improve the degree of institutional quality to decrease business risk and accelerate stock market development. The rest of this paper is organized as follows. Section 2 provides a literature review, Section 3 describes the data, model and methods employed in the study, Section 4 presents the analysis and empirical results, and Section 5 offers conclusions and recommendations.

2. Literature Review

Multiple empirical studies have explored the connection between macroeconomic variables and stock market development. Some of the commonly examined macroeconomic factors are economic growth (Atje & Jovanovic, 1993), inflation (Boyd et al., 2001), interest rates (Mok, 1993), exchange rates (Lee & Zhao, 2014) and oil prices (Hondroyiannis & Papapetrou, 2001). Likewise, multiple researches analyze the institutional factors promoting the financial sector that encompasses the stock market. The studies pertaining specifically to stock market development covered legal origin (La Porta et al., 1997), legal protection (La Porta et al., 2000), trade openness (Rajan & Zingales, 2003) and corruption control (Pham, 2020).

Beck and Levine (2004) demonstrate a positive connection between stock market development and economic growth. Conversely, Levine and Zervos (1998) show that stock market development doesn't advance economic growth.

Studies on the connection between banking sector and the stock market growth uncover blended outcomes. Stiglitz (1985) finds that the banking sector is more proficient than the stock market in meeting the financial needs of an economy, whereas Levine (2005) shows that both contribute positively to a country. Studies that have researched the linkage between inflation and stock returns demonstrate that the reaction of stock returns to changes in inflation depends on the level of inflation. When inflation is relatively low, there is a negative linkage between inflation and stock returns, whereas in high inflationary environments, equity returns are positively related to changes in inflation (Barnes et al., 1999). With respect to linkage between foreign exchange rates and the stock market, empirical investigations show varied outcomes. Phylaktis and Ravazzolo (2005) find that stock prices and exchange rates are directly linked, whereas Areli Bermudez Delgado et al. (2018) show that exchange rates negatively and significantly affect stock prices, while Roubaud and Arouri (2018) and Dang et al. (2020) reveal a nonlinear relationship between the purported variables. Regarding the link between interest rates and stock prices, studies show differentiating results. Some studies find a negative (positive) link between interest rates and stock prices (Mok, 1993; Sadorsky, 1999).

Ho and Michaely (1988) reveal that strong institutional structures lessen distorted information issues and minimize transaction costs and risk. Likewise, La Porta *et al*. (1997) reveal that the quality of institutions is vital to the development of the broad financial system, including the country's stock market. Studies have shown that variations in the rate of financial development across economies are affected by the country's legal institutions. It has been shown that having robust legal institutions reduce the cost of capital relative to those in economies with weak legal systems (Beck & Levine, 2004; Rajan & Zingales, 2003). Likewise, recent studies involving panel data corroborate the value of institutional quality in assisting the financial sector to stimulate economic growth. In emerging markets, Khan *et al*. (2019) employed 2SLS based on ethnic fragmentation (ETHF) to show that IQ positively drives financial development in 15 emerging and growth-leading economies (EAGLEs). Chinn and Ito (2006) through the employment of employ panel data for 108 economies reveal the importance of an efficient institutional framework as a prerequisite for expansion in emerging equity markets.

A few investigations have employed pragmatic panel data models that encompass macroeconomic and institutional factors for understanding the multifaceted landscape of stock market development in emerging markets. Following the concept of an economic freedom index for the entire world as presented by Gwartney *et al*. (1996), multiple studies have investigated the linkages between economic freedom and other variables. Kacprzyk (2016), utilizing a GMM model, uncovers a positive linkage between financial development and four of the five parts of economic freedom in the context of 28 EU economies. Apergis and Cooray (2017) locate a negative relationship between economic freedom and income inequality utilizing panel data covering 138 countries. El-Wassal (2005) shows that macroeconomic and institutional indicators are important drivers of stock market development in 40 emerging market economies. Yartey (2007) investigates the macroeconomic and institutional drivers of stock market development in 13 African economies and uncovers that macroeconomic factors have a positive influence on stock markets. The investigation additionally shows that institutional elements are vital to enhancing stock market development in Africa.

Billmeier and Massa (2009) assess the macroeconomic and institutional factors affecting stock market development in 17 emerging markets and locate a positive and critical effect of certain variables on stock market capitalization. In like manner, Yartey (2010) utilizes the Calderon-Rossell model and reports that macroeconomic & institutional factors in panel data setting from 42 emerging economies are central determinants of stock market development in emerging market countries. Nguyen et al. (2019) utilize a gravity model and GMM estimators to investigate the effects of institutional quality and macroeconomic determinants on stock return co-movements between 33 emerging markets and the US stock market for the period 2002–2013. The investigation reveals a significant positive impact of the variables on the stock return co-movements. Narayan et al. (2014) find that in 15 out of 18 selected emerging economies, there is some proof that either institutions, macroeconomic indicators, or a combination of both contribute to excess returns. Based on this literature review, there is a paucity of studies pertaining to the BRICS economies. This effort attempts to fill this gap by delving into the link between stock market development, macro-economic factors and institutional elements in the BRICS economies.

3. Data, Model and Methods

3.1. Data

This study covers the five BRICS countries, namely, Brazil, Russia, India, China and South Africa. Yearly informational collection comprises of panel data that include macroeconomic indicators from the World Development Indicators (WDI) World Bank database (2019). These variables are: Broad Money (BM: as a % of GDP); Inflation (INF: annual %); Domestic Credit to Private Sector (DCPS: % of GDP); Economic Growth (EG: per capita GDP in constant 2010 US$); Exchange Rate (ER: real effective exchange rate index). An Institutional Quality Index is based on the Legal System (LS), Regulation (REG), Size of Government (SG),

Sound Money (SM), and Freedom to Trade Internationally (FTI).[1] These institutional factors are taken from the Fraser Institute's database[2](2019).The study covers the time period 2000-2017. All variables are measured in logarithms. The dependent variable is Stock Market Development (SMD), measured as the total Market Capitalization of listed domestic companies (US$), collected from the WDI.

3.2. Model Specification

The investigation examines the role of the macroeconomic indicators and institutional elements on Stock Market Development (SMD) in the BRICS countries using the following models.

$$SMDit = f(INF\,it, EG it, IQI it, BM it, DCPS it, ER it) \quad (1)$$

$$SMDit = f(SM it, SG it, REG it, LSPR it, FTI it) \quad (2)$$

i and *t* denote for cross-section country and time period, respectively.

All variables are converted into natural logarithms to lessen dispersion, multicollinearity and heteroscedasticity in the series, in line, the log-linear regression causes consistent results.

3.3. Methodological Approach

The study examines the linkage among the variables using various econometric tools. To start with, to determine the order of integration of the selected series through unit root tests in a panel setting. Next, the study employs the panel cointegration tests to evaluate whether there are long-term linkages among the time series. Fully Modified OLS (FMOLS) and error correction term (ECT_{-1}) methods are employed to ascertain the robustness of the relationship among the cointegrated variables. Ultimately, when there is affirmation of a drawn out linkage among the indicators, the study explores causalities through a heterogeneous panel non-causality test by Dumitrescu and Hurlin (2012), which takes cognizance of the dependency and heterogeneity among the purported countries.

3.3.1. Unit Root Tests

The stationarity of the selected series is assessed through the individual unit roots and panel unit root tests. When the persistence parameters are common across the cross-section, this is known as a common unit root process. The Levin, Lin and Chu (LLC) *t*-statistic is covered under it (Levin et al., 2002). When the persistence parameters vary across the cross-section, it is known as an individual unit root process. The Fisher-ADF and Fisher-PP tests are based on this concept (Choi, 2001; Maddala and Wu, 1999). In addition to the ADF and PP tests, the LLC *t*-statistic is applied to obtain robust results. The tests cover the null hypothesis of a unit root against the alternative hypothesis of no unit root.

3.3.2. Panel Cointegration Tests

Next, panel cointegration tests are applied among the selected variables. Employing cointegration techniques with panel data makes it possible to check for the existence of long-term linkage between integrated variables. One use of cointegration tests on panel data is to raise the test power. The Pedroni cointegration test relies on the Engle–Granger co-integration test. Pedroni (1999,2004) recommends multiple tests for the null hypothesis of no cointegration that enables for heterogeneous intercepts and trend coefficients across cross-sections; four of these tests (panel-type) are based on pooling within a single dimension, while the other three (group-type) tests center on pooling between dimensions. In addition to panel-type statistics, group-type statistics take into account the likelihood of an additional source of heterogeneity across the individual variables. Pedroni applies the tests to panels and utilizes the ADF and PP rules. The methods utilize residuals from a long-run regression of the following form:

$$y_{it} = \alpha_i + \delta_t t + \theta_t + \beta_{1i} x_{1it} + ... + \beta_{Mi} x_{Mit} + \varepsilon_{it} \quad \text{Eq. (1)}$$

where (i=1,…,N) and (t=1,…,T) are the number of cross-sectional units and time observations, respectively, and M is the number of regressors. It can be seen as a fixed-effects model where αi, λit and θt reveal individual-specific effects, individual-specific linear trends, and common time effects, respectively. The coefficients represented by βMi are taken to be heterogeneous.

Kao (1999) assumes homogeneity and suggests panel tests for cointegration as a generalization of the DF and ADF tests. The tests use the null hypothesis of no cointegration and employ the residuals derived from a panel static regression to derive the test statistics and compute the distributions. The ADF statistics takes into account the serial correlation of the error term. For the purpose of robustness, both Kao's and Pedroni's statistics are applied to sift the long-run equilibrium. Both panel cointegration tests utilize the null hypothesis of no cointegration and the alternative hypothesis of cointegration and limit the cointegrating vector to one.

3.3.3. Panel FMOLS Estimates

Once the cointegration between the data series is known, the linkage between the series and their magnitude is examined. The FMOLS estimator was used in Phillips and Hansen (1990) as an optimal co-integrating regression

estimation. Pedroni (1999, 2001) revealed that if a long-term cointegration association exists between series, estimators of panel regressors would be inconsistent and biased, and therefore uses an FMOLS (Fully-Modified OLS) method in the presence of a cointegration link. The FMOLS estimator by Pedroni (2000) produces asymptotically unbiased estimates of long-run elasticities and efficient, normally distributed standard errors. It controls for the expected endogeneity of the regressors, and for serial correlation. FMOLS is optimal for panel data that contains heterogeneous cointegration. The FMOLS estimator is a group mean, or between-group estimator that allows for a high degree of heterogeneity in the data set. Taking this into consideration, a panel FMOLS estimator for the coefficient β of equation 1 is

$$\beta_{NT} - \beta = \left(\sum_{i=1.}^{N} L_{22i}^{-2} \sum_{i=1.}^{T} (\overline{x}_{it} - \overline{x}_{it})^2 \right) \sum_{i=1.}^{N} L_{11i}^{-1} L_{22i.}^{-1} \sum_{i=1.}^{T} (x_{it} - \overline{x}_i)\mu_{it}^{*} - T\hat{y}_i) \quad \text{Eq. (2)}$$

Where

$$\mu_{it}^{*} = \mu_t - \frac{\hat{L}_{21i}}{\hat{L}_{22i}} \Delta x_{it}, \hat{y}_i = \hat{\Gamma}_{21i} \hat{\Omega}_{21i}^{0} - \frac{\hat{L}_{21i}}{\hat{L}_{22i}} (\hat{\Gamma}_{21i} \hat{\Omega}_{21i}^{0}), \quad \text{Eq. (3)}$$

and $\hat{L}\,i$ is the lower triangulation of $\hat{\Omega}$

3.3.4. Panel ARDL (PEG) ECM Estimation

The PMG approach is fundamentally a form of the panel procedure in the ARDL model. The PMG estimator is framed under the concept of heterogeneity in the short-term coefficients and homogeneity in the long-run slope coefficients (Pesaran et al., 1999). The initial conditions are handled as either fixed or random and the long-run coefficients are a non-linear association of the short-term coefficients. This model enables the identification of short and long-term relationships and can be reworked and be categorized as an error correction model (ECM). The estimates of this model simultaneously cover intra-and inter-dimensions. This approach enables short-run coefficients and error variances to differ across the groups. This study measures short-term dynamic relationships by estimating an error correction model defined as follows:

$$\Delta Y_{1,it} = \alpha_{1i} + \sum_{j=1.}^{p-1} \beta_{1ij} \Delta Y_{1,it-j} + \sum_{j=0.}^{q-1} \sum_{l=2.}^{k} \beta_{1ij} \Delta X_{1,it-j} + \mu_{1i} ECT_{1,it-1} + \varepsilon_{1it} \quad \text{Eq. (4)}$$

where the residuals ε_{lit} ($l = \{1, 2, 3, 4,5\}$) are independent and normally distributed with zero mean and constant variance and $ECT_{l,it-1}$ ($l = \{1,2,3,4,5\}$) is the error correction term specified by the long-term relationship. The parameter μ reveals the speed of adjustment to the equilibrium level. This coefficient must be negative, and between 0 and 1 in absolute value.

3.3.5. Dumitrescu and Hurlin's (2012) Panel Causality Test

Dumitrescu and Hurlin (2012) offer a test for the no-causality hypothesis by altering Granger's (1969) no-causality test as follows:

$$Y_{i,t} = \alpha_i + \sum_{K=1.}^{p} \gamma_{ik} Y_{i,t-k} + \sum_{K=1.}^{p} \beta_{iK} X_{i,t-K} + \mu_{i,t} \quad \text{Eq. (5)}$$

The unique feature of this test is that it encompasses the dependency and heterogeneity of the data. The test centers on the individual Wald statistics of Granger non-causality averaged across the cross-sectional units, and therefore assumes all of the coefficients to be unique across the cross-sections. The test forms the average statistic linked with the null Homogeneous Non- Causality (HNC) hypothesis as:

$$W_{N,T}^{Hnc} = N^{-1} \sum_{i=1.}^{N} W_i, \quad \text{Eq. (6)}$$

This test employs a structure for testing the null hypothesis of homogeneous no-causality against the alternative hypothesis of heterogeneous no-causality. In this method, the null hypothesis of no causality in any cross-section is examined against the alternative hypothesis of causality for at least some of the cross-sections. The goal is to examine the short-run causalities among various indicators. This test reveals that the harmonized Z-test statistic, adjusted for fixed T samples, also has a standard normal distribution as shown here:

$$\tilde{Z} = \sqrt{\frac{N}{2P}} X \frac{(T - 2P - 5)}{(T - P - 3)} X \left[\frac{(T - 2P - 3)}{(T - 2P - 1)} \overline{W} - P \right] \rightarrow N(0,1)$$

4. Empirical Results and Discussion

Initially, stationarity of the variables is assessed through panel unit root tests, in particular, the LLC test, ADF-Fisher test and PP-Fisher test. The LLC test detects a common unit root process and the ADF-Fisher and PP-Fisher panel unit root tests verify that there is an individual unit root process in the panel data. Table 1 shows the outcomes of the panel unit root tests for the selected variables. The results of the LLC test, ADF-Fisher test and PP-Fisher test show that the variables have unit roots at the individual level. Using first differences, it is revealed that the variables are stationary. These results indicate the feasibility of cointegration among the variables.

Table 1: Panel Unit Test Results

	Levin, Lin & Chu Test		ADF - Fisher Test		PP - Fisher Test	
	Level	First Difference	Level	First Difference	Level	First Difference
Variable	**Statistic**	**Statistic**	**Statistic**	**Statistic**	**Statistic**	**Statistic**
INF	-1.260	-10.523***	8.8124	94.166***	10.359	106.644***
EG	7.375	-1.499**	0.542	21.713**	0.124	20.513**
IQI	2.699	-8.232***	3.575	70.420***	3.942	70.418***
SM	1.913	-5.177***	1.424	27.449***	0.963	66.812***
BM	1.900	-2.049**	2.216	13.480**	9.5E-05	19.717**
DCPS	1.944	-4.923***	1.837	42.074***	0.563	46.617***
SG	3.358	-4.262***	9.492	22.323***	6.752	90.921***
ER	1.525	-6.514***	2.327	56.042***	2.3062	59.598***
REG	-0.608	-3.870***	5.637	25.376***	8.865	82.544***
LSPR	-0.043	-4.686***	5.389	24.529***	6.552	84.882***
FTI	-0.478	-4.550***	5.513	25.890***	4.762	69.813***
SMD	2.766	-8.334***	0.688	74.618***	0.463	74.467***

***Significant at the 1 percent level

Table 2: Pedroni Panel Cointegration Test

Panel (within dimension)			**Group (between dimension)**		
Statistics	**Value**	**Prob**	**Statistics**	**Value**	**Prob**
Panel v-Statistic	0.7899	0.214	-	-	-
Panel rho-Statistic	1.6609	0.951	Group rho-Statistic	2.565	0.994
Panel PP-Statistic	-7.5984***	0.000	Group PP-Statistic	-8.877***	0.000
Panel ADF-Statistic	-4.5419***	0.000	Group ADF-Statistic	-3.883***	0.000
(Series: SMD SM SG REG LSPR FTI)					
Panel (within dimension)			**Group (between dimension)**		
Statistics	**Value**	**Prob**	**Statistics**	**Value**	**Prob**
Panel v-Statistic	0.7899	0.2148	-	-	-
Panel rho-Statistic	1.6609	0.9516	Group rho-Statistic	2.5658	0.9949
Panel PP-Statistic	-7.5984 ***	0.0000	Group PP-Statistic	-8.8776 ***	0.0000
Panel ADF-Statistic	-4.5419 ***	0.0000	Group ADF-Statistic	-3.8834 ***	0.0001

***Significant at the 1 percent level

Table 3: Kao Cointegration Test

Series: SMD EG IQI INF ER DCPS BM			**Series: SMD SM SG REG LSPR FTI**		
	t-Statistic	**Prob**		**t-Statistic**	**Prob**
ADF	-3.494 ***	0.000	ADF	-2.154***	0.015

***Significant at the 1 percent level

The next step is to investigate whether or not the selected variables have cointegration link. Here, the Pedroni and Kao tests are applied and the results are shown in the Tables 2 and 3. The cointegration test of Pedroni panel reveals that of the seven measurements (panel and group), four are statistically significant, revealing a cointegration link among the variables.

Table 3 presents the outcome of the residual panel cointegration tests from Kao (1999), and the results reject the hypothesis of no cointegration at the 1% significance level. This shows there is a cointegration linkage among the indicators. The occurrence of cointegration in the panel data permits the analysis using FMOLS.

Results of both panel cointegration tests show that the selected macroeconomic indicators and the institutional indicators have long-run relationships with stock market development. To determine the sort of linkage that exists between the two series, the study employs the panel FMOLS method. Table 4 shows that estimates for the majority of the variables are positive and have statistically significant coefficients. The results indicate that a 1% increase in economic growth, in the institutional quality index and foreign exchange rates increases stock market development in the BRICS countries by 6.146%, 2.537%, and 1.793%, respectively and growth in BM reduces by 1.4 %. These results are consistent with the findings of Mohamed Dahir et al. (2018), Bonga-Bonga and Gnagne (2017) and Manasseh et al. (2017). Table 4 also reveals that a 1% increase in the strength of regulations, the legal system (including property rights), the soundness of money and the size of government increases the stock market development in the BRICS countries by 4.829%, 3.633%, 2.825% and 3.525%, respectively. The results indicate macroeconomic and institutional variables are instrumental in stimulating stock market development in the BRICS countries. These results are consistent with the findings of Shi et al. (2019) and Yartey (2010).

Table 5 presents the short-term estimate and co-integration relationship based on the error correction model. It is noticed that the error correction coefficient is negative and significant at the 1% level, supporting the presence of a statistically significant long term linkage between stock market development and the two set series of independent variables. The ECM coefficient reveals a mechanism to correct for any disequilibrium between the indicators. The ECM coefficients are estimated as -0.9784 and -0.7828, revealing the fast speed of adjustment of any disequilibrium towards long-run equilibrium.

Table 4: Panel Fully Modified Least Squares (FMOLS)

Dependent Variable: SMD					Dependent Variable: SMD				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**	**Variable**	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
EG	6.146***	1.064	5.776	0.000	SM	4.829***	0.652	7.403	0.000
IQI	2.537***	1.449	1.750	0.084	SG	3.633***	0.679	5.346	0.000
INF	0.036	0.057	0.628	0.531	REG	2.825***	0.976	2.892	0.005
ER	1.793***	0.347	5.165	0.000	LSPR	3.525***	0.825	4.271	0.000
BM	-1.435***	0.462	-3.105	0.002	FTI	-0.743	1.253	-0.593	0.554
DCPS	0.231	0.291	0.794	0.429	-	-	-	-	-

***Significant at 1 percent level

Table 5: ECM estimation (Δ SMD is dependent variable)

Macroeconomic factors	**EG IQI INF ER DCPS BM**			**Institutional factors**	**SM SG REG LSPR FTI**		
	Coefficient	**t-Statistic**	**Prob**		**Coefficient**	**t-Statistic**	**Prob**
ECT (−1)	-0.9784	-2.3589	0.0228**	ECT (−1)	-0.7828	-3.5762	0.0008***

*** Significant at the 1 percent level ** Significant at the 5 percent level

Table 6: Heterogeneous Panel Causalities Test among the variables

Null Hypothesis	W-Stat	Zbar-Stat.	Prob.	Null Hypothesis	W-Stat	Zbar-Stat.	Prob.
Macroeconomic Variable				**Institutional Quality**			
EG does not homogeneously cause SMD	2.9670	2.140	0.032**	SM does not homogeneously cause SMD	1.3140	0.175	0.861
SMD does not homogeneously cause EG	14.900	16.328	0.000***	SMD does not homogeneously cause SM	1.2058	0.046	0.962
IQI does not homogeneously cause SMD	1.3522	0.220	0.825	SG does not homogeneously cause SMD	1.4104	0.289	0.772
SMD does not homogeneously cause IQI	1.1487	-0.021	0.983	SMD does not homogeneously cause SG	4.6311	4.118	0.000***
INF does not homogeneously cause SMD	.4337	-0.871	0.383	REG does not homogeneously cause SMD	3.6674	2.972	0.003 ***
SMD does not homogeneously cause INF	1.0519	-0.136	0.891	SMD does not homogeneously cause REG	.8956	-0.322	0.747
ER does not homogeneously cause SMD	1.4014	0.279	0.780	LSPR does not homogeneously cause SMD	.4228	-0.884	0.376
SMD does not homogeneously cause ER	7.8470	7.940	0.000***	SMD does not homogeneously cause LSPR	.9454	-0.262	0.792
BM does not homogeneously cause SMD	2.9680	2.141	0.032**	FTI does not homogeneously cause SMD	1.0165	-0.178	0.858
SMD does not homogeneously cause BM	8.0692	8.204	0.000***	SMD does not homogeneously cause FTI	1.3060	0.165	0.868
DCPS does not homogeneously cause SMD	2.4071	1.474	0.140	-		-	-
SMD does not homogeneously cause DCPS	17.1935	19.050	0.000***	-		-	-

***Significant at the 1 percent

** Significant at the 5 percent

At the point when at least two factors are cointegrated, it is relevant to set up the course of causality among them. In this study, after assessing the long-run linkage among the factors, the study investigates short-run causalities among the variables using the heterogeneous panels non-causality test in Dumitrescu and Hurlin (2012). The short-run causalities are shown in Table 6. It is observed that stock market development has a significant feedback association with economic growth, corroborating the outcome of Marques et al. (2013). Likewise, stock market development reveals a significant feedback association with a broad measure of the money supply, and there is a directional impact from the stock market to domestic credit in the private sector. The two outcomes are in accordance with the findings in Levine (2005). Stock market development is shown to drive exchange rates, which is in line with the stock-oriented models of exchange rate determination (also called the Portfolio Balance approach) that holds the

view that there is a directional impact from stock prices to exchange rates (Frankel, 1983). This is consistent with the outcomes in Chkili and Nguyen (2014). To summarize, it is unearthed that stock market development drives economic growth, exchange rates, the broad money supply and domestic credit in the private sector. These short-run causalities indicate that stock market development has a significant impact on the four macroeconomic variables. With respect to the institutional quality indicators, there is one-way causality running from REG to SMD. This demonstrates that the enforcement of robust regulations for financial markets supports development of the country's stock market (Umar and Nayan, 2018). Furthermore, the results in Table 6 reveal that SMD also drives the size of the government. This is consistent with the fact that an increase in stock prices enhances government revenues from taxing financial transactions (and/or through capital gains taxes), thereby increasing opportunities for government outlays in the economy (Shirvani & Delcoure, 2012).

5. Conclusion and Policy Implications

BRICS countries are manifested as the leading markets in the domain of emerging economies. Thus, It is pertinent to include emerging markets as an asset class in investment portfolios to achieve higher risk-adjusted returns. BRICS countries offer bountiful possibilities in terms of businesses, technology transfers and foreign direct and portfolio investments. International investors and foreign asset managers seek to invest in countries characterized by strong corporate governance standards, better institutional quality and strict rule of law. Thus, an emerging market's growth potential rest on having vibrant capital markets that attract global capital through foreign portfolio and investment (Buchanan et al., 2011; Karolyi, 2015).

This investigation analyzed the attributes of the long run and short-run dynamic linkages between stock market capitalization, six macroeconomic variables and five institutional factors in the BRICS stock markets over the period 2000-2017. Panel cointegration tests provided evidence of cointegration among the selected variables. The long-run results through a panel FMOLS estimation reveal that most of the variables have a positive and significant impact on stock market capitalization in the BRICS stock markets. The study also found that the error correction coefficient is negative and significant at 1% level, indicating the presence of a statistically significant, long-term link between stock market capitalization and the two sets of independent variables. Finally, the outcome of Dumitrescu and Hurlin (2012) panel non-causality test uncovers that, from a macroeconomic perspective, stock market capitalization drives economic growth, exchange rates, the money supply and domestic credit to the private sector. Further, , from the viewpoint of institutional quality, there is single direction causality from regulation to stock market capitalization. In addition, stock market capitalization drives the size of government.

These outcomes show that to advance stock market development in the BRICS countries, it is essential to judiciously oversee key macroeconomic components, along with the institutional drivers identified in this study. Given these results, it is central from the point of view of policy implications that the BRICS economies create polices to spur income and create the best investment environment to accelerate stock market development. To garner investment inflows into the BRICS stock markets, policymakers should judiciously manage the macroeconomic indicators for stability and fortify the quality of their institutions while outlining investment policies. Enhancing the factors that comprise the institutional quality index, and supporting transparency across institutions will lessen business risk and encourage foreign and domestic inflows into stock markets. Future examination on this subject can incorporate the Volatility Index (VIX) and Crude Oil Volatility Index (OVX) as uncertainty variables, which would assist policymakers, researchers and portfolio managers in evaluating the impact of uncertainty components on BRICS stock markets.

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Endnotes

[1] The terms *economic freedom index* and *institutional quality index* are used interchangeably throughout the study.

[2] The index assesses the degree of economic freedom present in five principal parts. (1) Sound Money; (2) Size of Government; (3) Regulation; (4) Legal System and property rights; (5) Freedom to Trade Internationally. These five domains cover 26 components in the framework. Multiple components are included within various sub-components. As a whole, the index encompasses 44 unique indicators. All of the indicators are acquired from driving sources, namely the Global Competitiveness Report, the World Bank's Doing Business project and the International Country Risk Guide.

[3] Sound Money is framed through money growth, the standard deviation of inflation, Inflation and the opportunity to own a foreign currency bank account. Size of Government is defined through government consumption, transfers and subsidies, government firms and investment, the highest marginal tax rate and state ownership of assets. Regulation is based on credit market regulations, labor market regulations and business regulations. Lawful framework and property rights cover judicial impartiality, fair courts, protection of property rights, military interference in the rule of law and politics, reliability of the legal system, lawful execution of agreements, regulatory costs in the sale of real property, reliability of police, business expenses of wrongdoing, and a gender disparity adjustment. Freedom to trade worldwide covers tariffs, regulatory trade barriers, black-market exchange rates, and controls of the development of capital and individuals.