Impact of Financial Crisis on Relationship between Aggregate Stock Returns and Macroeconomic Factors in BRICS Stock Markets

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Abstract

The relationship between Aggregate Stock Returns and prominent Macroeconomic Factors (i.e., GDP, Inflation, Interest Rate, Exchange Rate, Money Supply and Oil Prices) has been examined for BRICS economies for the period from 1995: Q1 to 2014: Q4 using quarterly data. To assess the impact of Global Financial Crisis, this relationship is further scrutinized during two sub periods viz., a Pre Crisis period (1995:Q1 to 2007:Q2) and a Post Crisis Period (2007:Q3 to 2014:Q4). ADF Unit Root Test, Correlation Analysis and Multivariate Regression Model have been applied.

We find strong positive contemporaneous relationship of BRICS stock returns with GDP growth rates, changes in Money Supply and changes in oil. Stock returns are negatively correlated with inflation rate, changes in interest rate and changes in exchange rate. Also, the correlations have increased substantially in the post crisis period indicating the impact of crisis in deepening the contemporaneous relationship.

Multivariate Regression results indicate that various Macroeconomic Factors significantly explain and predict Aggregate Stock Returns in different BRICS markets. These results were mostly consistent in pre and post crisis periods indicating no major impact of crisis.

These findings besides expanding the existing literature and knowledge base on the topic will have pertinent uses and implications for regulators, policy makers, investors and researchers.

Keywords: Aggregate Stock Returns, BRICS Stock Markets, Macroeconomic Factors, Global Financial Crisis, Regression Analysis.

Introduction

Arbitrage Pricing Theory (APT) propounded by Stephen Ross in 1976 suggested that an asset's returns can be predicted using the relationship between that asset and many common risk factors. With an ever increasing integration of the financial and real economy, the relationship between stock returns and macroeconomic variables have assumed great importance particularly for prominent emerging economies such as the BRICS (Brazil, Russia, India, China and South Africa) group. Researchers and Practioners through their work and insights over the past few decades have suggested few important macroeconomic variables which can potentially have a significant relationship with stock market performance, viz.,

GDP growth rate, Inflation rate, Interest rate, Foreign Exchange Rate, Money Supply and International Oil Prices.

GDP growth rate (proxy for real economic activity) should positively impact aggregate stock returns as any increase in it favourably affects demand and cash flows of corporations. Increase in inflation, on the other hand is generally taken to negatively impact stock returns as it increases input cost, reduces demand, increases interest rate and raises investors required rate of return. Like Inflation, Interest rate also causes increase in financial costs and investors opportunity rate of return by making other investment avenues more lucrative.

A depreciation in exchange rate can be favourable for an economy (thus positively impact stock returns) if the benefits of more foreign capital inflows and gains for exporters outweigh losses to importing firms. An increase in Money supply has similar debatable impact as on one hand it can cause inflation (thus negatively impact stock performance) and on the other hand it reduces interest rates and provides more funds for consumption and investment (which is positive for capital markets). Within the BRICS block, stock markets in an oil exporting country like Russia would clearly gain from increase in global oil prices While, stock markets in all other oil importing economies will suffer from the same on account of inflation, lower demand, increased costs and lower profitability of corporates.

The global financial crisis which originated in USA as subprime mortgage crisis had a devastating impact on equity markets across the globe with some losing upto two-third of their valuations in its aftermath. Thus, it would be very pertinent to probe whether the relationship between aggregate stock returns and macroeconomic variables (if any) was impacted (if yes then it what manner) or not at all impacted by global economic recession.

Our objective in this paper is to examine the nature and magnitude of contemporaneous relationship (if any) between aggregate stock returns and prominent macroeconomic factors. We also investigate whether any macroeconomic variables are useful in predicting future BRICS stock returns. Then, we examine the impact of USA global financial crisis on the above relationship.

The remaining paper is structured as follows: Section 2 provides review of literature. Section 3 explains the data and methodology. Section 4 elucidates the empirical results. Section 5 provides the conclusions and implications of the study.

Review of Literature

A large number of studies have examined the relationship between aggregate stock returns and macroeconomic variables in developed markets. However, the documented literature on such a relationship is emerging markets has been limited and is growing only recently especially in the context of BRICS economies.

Fama (1981, 1990) found that stock returns have strong relationship with macroeconomic variables, namely, inflation, national output and industrial production.

Chen et al. (1986) reported that interest rates, inflation and industrial production significantly affect stock market returns in USA.

Chang and Pinegar (1989) affirmed presence of close relationship between domestic economic activity and stock market performance.

Mukherjee and Naka (1995) suggested a positive relationship and long run cointegration between the Japanese stock returns and industrial production.

Maysami and Koh (2000) evidenced that changes in Singapore's stock prices are cointegrated with changes in interest rates (both short and long term), inflation, exchange rate and money supply.

Gay (2008) conveyedan insignificant, but positive relationship between exchange rates and stock prices and though non insignificant but, a negative relationship between respective oil prices and stock market in BRICS.

Singh (2010) indicated that Indian industrial production (proxied by IIP) and inflation(measured by WPI) have causal relationship with BSE Sensex (Indian Stock Market Proxy).

Dasgupta (2012) testifiedlong-run cointegration relationship between BSE SENSEX and index of industrial production and interest rate (proxied by call money rate).

Tripathi and Kumar (2015 c) used ARDL model and reported that Stock returns granger cause GDP and Inflation in BRICS. Also, they report significant negative relationship of stock returns with Interest Rate, Exchange Rate and Oil Prices and a positive relationship with money supply.

Overall, it can be said that, the studies have comprehensively analysed the developed markets and arrived at some common ground. But for developing markets, the consensus is largely lacking both due to varying results for most macroeconomic variables and paucity of research. Hence, a probe is warranted to clearly establish such relationship for emerging BRICS economies.

Data and Methodology

Data
The data comprises of quarterly data for the period 1995: Q1 to 2014: Q4. In order to incorporate the effect of global financial crisis on relationship between BRICS stock indices and macroeconomic variables in the study, the entire study period

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and data were divided into two sub-parts: a Pre-Crisis period (1995: Q1 to 2007:Q2) and a Post Crisis period (2007: Q3 - 2014: Q4). Rationale for the time frame of these sub-periods is the fact that there is a general acceptance among the global financial community that global financial crisis originated in the US on August 9, 2007 when BNP Paribas blocked withdrawals from three hedge funds citing "a complete evaporation of liquidity".

The data comprises of macroeconomic variables and stock indices values for all BRICS nations and International Oil Prices. We have considered six prominent macroeconomic variables, i.e., GDP, Inflation, Interest Rate, Exchange Rate, Money Supply and Oil Prices. The operational definitions, time period of availability, source and symbol of each macroeconomic variable for each country and international oil prices is provided in Table 1.

Table 1: Data Description (Macroeconomic Variables)

S. No.	Country	Macroeconomic Variables	Operational Definition and Unit of measurement	Time Period	Source	Symbol
1.	Brazil	GDP	Fixed PPP, 2005 Prices (in Billion USD)	1996: Q1 - 2014: Q3	OECD	BGDP
2.	Brazil	Inflation	Consumer Price Index, Base 2010	1995: Q1 - 2014: Q4	OECD	BINF
3.	Brazil	Interest Rate	Brazil Selic Target Rate (in Percentages)	1999: Q1 - 2014: Q4	Bloomberg	BIR
4.	Brazil	Exchange Rate	1 USD in Brazilian Real(BRL)	1995: Q1 - 2014: Q4	Bloomberg	BER
5.	Brazil	Money Supply	Broad Money Supply (M3)	1995: Q1 - 2014: Q4	Central Bank of Brazil	BMS
6.	Russia	GDP	Fixed PPP, 2005 Prices (in Billion USD)	1995: Q1 - 2014: Q3	OECD	RGDP
7.	Russia	Inflation	Consumer Price Index, Base 2010	1995: Q1 - 2014: Q4	OECD	RINF
8.	Russia	Interest Rate	Russia Refinancing Rate	1995: Q1 - 2014: Q4	Bloomberg	RIR
9.	Russia	Exchange Rate	1 USD in Russian Ruble (RUB)	1995: Q1 - 2014: Q4	Bloomberg	RER
10.	Russia	Money Supply	Narrow Money Supply (M1)	2002: Q2 - 2014: Q4	Bloomberg	RMS
11.	India	GDP	Fixed PPP, 2005 Prices (in Billion USD)	1996: Q2 - 2014: Q4	OECD	IGDP
12.	India	Inflation	Consumer Price Index, Base 2010	1995: Q1 - 2014: Q4	OECD	IINF
13.	India	Interest Rate	Weighted Average Call Money Rates	1995: Q1 - 2014: Q4	RBI	IIR
14.	India	Exchange Rate	1 USD in Indian Rupees	1995: Q1 - 2014: Q4	RBI	IER
15.	India	Money Supply	Broad Money (M3)	1995: Q1 - 2014: Q4	RBI	IMS
16.	China	GDP	GDP at current prices (in BillionUSD)	1995: Q1 - 2014: Q3	National Bureau of Statistics	CGDP
17.	China	Inflation	Consumer Price Index, Base 2010	1995: Q1 - 2014: Q4	OECD	CINF
18.	China	Interest Rate	1 Year Benchmark Lending Rates	1996: Q2 - 2014: Q4	Bloomberg	CIR
19.	China	Exchange Rate	1 USD in Chinese Yuan (CNY)	1995: Q1 - 2014: Q4	Bloomberg	CER
20.	China	Money Supply	Money Supply (M2)	1996: Q1 - 2014: Q4	Bloomberg	CMS
21.	South Africa	GDP	Fixed PPP, 2005 Prices (in BillionUSD)	2002: Q1 - 2014: Q4	OECD	SAGDP
22.	South Africa	Inflation	Consumer Price Index, Base 2010	2002: Q1 - 2014: Q4	OECD	SAINF
23.	South Africa	Interest Rate	Average Repo Rate	2002: Q1 - 2014: Q4	Bloomberg	SAIR
24.	South Africa	Exchange Rate	1 USD in South African Rand	2002: Q1 - 2014: Q4	Bloomberg	SAER
25.	South Africa	Money Supply	Money Supply (M2)	2002: Q1 - 2014: Q4	Bloomberg	SAMS
26.	Inter-national	Oil Price	Simple average of three spot prices: Dated Brent, West Texas Intermediate, and Dubai Fateh.	1995: Q1 - 2014: Q4	Index Mundi	OIL

The detailed description of stock market variables of each country is given in Table 2.

Table 2: Data Description (Stock Market Variables)

S.No.	Country	Stock Exchange	Stock Index	Time Period	Source	Symbol
1.	Brazil	Sao Paulo Stock Exchange	Ibovespa	1995: Q1 to 2014: Q4	Yahoo Finance	BINDEX
2.	Russia	Moscow Stock Exchange	RTSI INDEX	1995: Q3 to 2014: Q4	Yahoo Finance	RINDEX
3.	India	Bombay Stock Exchange	BSE SENSEX	1995: Q1 to 2014: Q4	Yahoo Finance	IINDEX
4.	China	Shanghai Stock Exchange	Shanghai SE Composite	1995: Q1 to 2014: Q4	Yahoo Finance	CINDEX
5.	South Africa	Johannesburg Stock Exchange	FTSE-JSE All Share Index	2002: Q1 to 2014: Q4	Yahoo Finance	SAINDEX

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Methodology

Aggregate Stock Return
First of all, we compute the aggregate stock return as follows:

Stock return is calculated in terms of log returns through the following equation:

$$R_t = Log\ I_t - Log\ I_{(t-1)} \quad (1)$$

Where I_t = Closing Adjusted Stock Index Value in time t;

$I_{(t-1)}$ = Closing Adjusted Stock Index Value in time (t-1).

Augmented Dickey Fuller (ADF) Unit Root Test
Popular ADF unit root test has been applied to test the time series data of different variables for the property of stationarity. IHS (2013): "The Augmented Dickey-Fuller (ADF) test constructs a parametric correction for higher-order correlation by assuming that the y series follows an AR (p) process and adding p lagged difference terms of the dependent variable y to the right-hand side of the test regression:

$$\Delta y_t = \alpha y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + x'_t \delta + v_t \quad (2)$$

This augmented specification is then used to test the null and alternative hypothesis:

$$H_0 : \alpha = 0 \text{ and } H_1 : \alpha < 0 \text{ (p. 476-477)}.$$

Correlation Analysis
The Correlation Coefficient would reflect the nature and magnitude of contemporaneous relationship(if any) between macroeconomic and stock index variables of BRICS. In addition, a comparative bi-variate correlation index has also been constructed by dividing the post crisis bi-variate correlations with their precrisis values for each pair of stock indices and macroeconomic variables of BRICS economies. A value more than 1 would indicate an increase in the bi-variate correlation coefficient in the postcrisis period as compared to the precrisis period.

Bivariate Correlation Index =

Coefficient of Correlation Post Crisis .... (3)
Coefficient of Correlation Pre Crisis

Multivariate Regression Analysis
Multivariate regression analysis has been used in this research to find the linear trend and explanatory power of macroeconomic variables in predicting stock returns in BRICS markets. Stock return is considered as the dependent variable (Y) and macroeconomic factors (X) are considered as independent variables in the analysis. The model is stated below:

$$Y_i = \alpha_1 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 .... + \beta_n X_n + e_i \quad (4)$$

Where:
- Y_i - Dependent BRICS Aggregate Stock Returns;
- α_1 - Constant or Intercept;
- $X_1,..., X_6$ -Independent Macroeconomic Variables;
- $B_1,..., B_6$ - Slope of regression line or measure of degree and direction of this relationship; and
- e_i - Random Error Term accounting for all factors other than macroeconomic variables which influence stock returns.

Empirical Results and Discussion

ADF Unit Root Test Results
We applied Augmented Dickey Fuller (ADF) unit root test to check for the stationarity of the time series data in the total period, pre crisis period and post crisis period for individual countries. The results are shown in Table 3. The null hypothesis that the variable is non stationary is rejected for all the variables at first difference. Hence, the time series are integrated of order one [I (1)] and can be used in a regression framework.

Correlation Analysis Results
Country wise bivariate correlation results & Post/Pre Crisis Correlations Index is provided in Table 4. While, the. All the correlations have been computed using the stationary (first difference log) series of variables.We find strong positive contemporaneous relationship of BRICS stock returns with GDP growth rates, changes in Money Supply and changes in oil prices in almost every country. Stock returns are negatively correlated with inflation rate, changes in interest rate and changes in exchange rate.

As, there is insignificant correlation among the various macroeconomic factors, there is no major problem of Multicollinearity in Regression Model. Also, correlation between stock returns and macroeconomic factors has increased substantially in the post crisis period indicating impact of crisis in deepening the contemporaneous

Russia Inflation	-5.69*	0.00	-4.04*	0.00	-3.45*	0.02
Russia Interest Rate	-5.07*	0.00	-6.21*	0.00	-2.98*	0.00
Russia Exchange Rate	-5.77*	0.00	-4.98*	0.00	-2.10*	0.04
Russia Money Supply	-3.70*	0.03	-2.49*	0.02	-3.11*	0.04
India GDP	-8.37*	0.00	-6.12*	0.00	-6.22*	0.00
India Inflation	-8.72*	0.00	-6.92*	0.00	-6.58*	0.00
India Interest Rate	-11.90*	0.00	-6.49*	0.00	-4.61*	0.00
India Exchange Rate	-4.86*	0.00	-5.80*	0.00	-4.97*	0.00
India Money Supply	-4.12*	0.00	-10.47*	0.00	-7.92*	0.00
China GDP	-26.45*	0.00	-8.94*	0.00	-13.38*	0.00
China Inflation	-4.74*	0.00	-3.12*	0.03	-3.11*	0.04
China Interest Rate	-6.68*	0.00	-6.30*	0.00	-4.25*	0.00
China Exchange Rate	-4.88*	0.00	-6.20*	0.00	-3.32*	0.00
China Money Supply	-7.07*	0.00	-7.20*	0.00	-5.91*	0.00
South Africa GDP	-4.56*	0.00	-3.35*	0.02	-2.76*	0.00
South Africa Inflation	-4.61*	0.00	-3.53*	0.01	-3.11*	0.04
South Africa Interest Rate	-5.52*	0.00	-4.59*	0.00	-3.15*	0.00
South Africa Exchange Rate	-7.60*	0.00	-6.00*	0.00	-2.23*	0.03
South Africa Money Supply	-7.56*	0.00	-5.94*	0.00	-3.77*	0.04
International Oil Price	-7.50*	0.00	-6.62*	0.00	-4.17*	0.01
Brazil Stock Index	-8.52*	0.00	-5.92*	0.00	-4.51*	0.01
Russia Stock Index	-6.19*	0.00	-4.84*	0.00	-3.76*	0.01
India Stock Index	-7.33*	0.00	-6.50*	0.00	-4.10*	0.00
China Stock Index	-6.89*	0.00	-5.75*	0.00	-3.66*	0.01
South Africa Stock Index	-5.29*	0.00	-4.18*	0.02	-3.50*	0.02

*Note: * Denotes Significant at 5% Level.*

Table 3: ADF Unit Root Test Results (Log of First Difference)

Variable	Total Period		Pre Crisis Period		Post Crisis Period	
	t-Statistic	Probability	t-Statistic	Probability	t-Statistic	Probability
Brazil GDP	-7.62*	0.00	-7.59*	0.00	-2.94*	0.00
Brazil Inflation	-5.80*	0.00	-4.00*	0.00	-6.80*	0.00
Brazil Interest Rate	-7.79*	0.00	-7.10*	0.00	-2.37*	0.02
Brazil Exchange Rate	-7.32*	0.00	-5.74*	0.00	-4.40*	0.01
Brazil Money Supply	-5.95*	0.00	-4.28*	0.00	-4.94*	0.00
Russia GDP	-4.55*	0.00	-4.98*	0.00	-2.89*	0.00

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Table 4: Cross Correlation Matrix & Post/Pre Crisis Correlation Index

Variable	Study Period	DLOG (GDP)	DLOG (INF)	DLOG (IR)	DLOG (ER)	DLOG (MS)	DLOG (INTOIL)
DLOG (BINDEX)	Total	-0.04	-0.02	-0.20	-0.41	0.35*	0.10
	Pre Crisis	0.13	0.01	-0.05	-0.38	0.72*	-0.14
	Post Crisis	-0.24	-0.22	-0.44*	-0.44*	-0.26	0.24
	Post/Pre Index	4.21	-1.48	15.9	6.03	-0.33	-1.67
DLOG (RINDEX)	Total	0.22*	0.18	-0.37*	-0.41*	-0.05	0.51*
	Pre Crisis	0.15*	0.01*	0.00	0.01*	-0.26	0.01
	Post Crisis	0.07	0.19	-0.42*	-0.41*	-0.17	0.58*
	Post/Pre Index	-0.02	-3.08	1.06	1.08	-28.88	8.45
DLOG (IINDEX)	Total	0.53*	-0.10	0.05	-0.48*	-0.02	0.23
	Pre Crisis	0.41*	-0.23	-0.02	-0.45*	0.11	-0.02
	Post Crisis	0.68*	0.10	0.05	-0.51*	-0.28	0.44*
	Post/Pre Index	1.89	-0.52	-0.71	1.23	-2.23	-14.9
DLOG (CINDEX)	Total	-0.20	0.09	-0.05	0.10	0.16	0.08
	Pre Crisis	-0.30*	0.30*	-0.04	-0.38*	-0.02	0.05
	Post Crisis	-0.12	-0.18	-0.16	0.32*	0.32	0.07
	Post/Pre Index	0.39	-1.13	5.69	-1.09	4.6	-3.79
DLOG (SAINDEX)	Total	0.27	-0.48*	-0.23	-0.23	0.27	0.34*
	Pre Crisis	0.22*	-0.58	-0.35	0.16	0.50*	-0.06
	Post Crisis	0.22	-0.35	-0.17	-0.51*	0.03	0.48*
	Post/Pre Index	0.73	0.58	0.94	14.39	0.14	14.79

*Note: * Denotes Significant at 5% Level.*

relationship.

Multi-Variate Regression Model Results

In our Multi-Variate regression model, the dependent variable i.e., the aggregate stock return of a country has been regressed on macroeconomic variables of that country & international oil prices.All model results are provided in Table 5, followed by model summary in Table 6.

A. Brazil

The R square vale of the model suggests that these six macroeconomic variables can collectively explain 32 percent variation in stock return in the total period, 63 percent variation in pre crisis period and 64 percent variation in post crisis period. In the total and pre crisis periods, money supply changes significantly and positively affect stock returns, while in the post crisis period it significantly and negatively affect Brazil stock returns.

B. Russia

The R square value of the models suggest that these six macroeconomic variables can collectively explain 15 percent variation in stock return in the total period, 10 percent variation in pre crisis period and 19 percent variation in post crisis period. Thus, these variables taken together do not significantly explain stock returns in Russia, except oil price changes in the total period (at 10 percent level of significance). Hence, the relationship between macroeconomic factors and aggregate stock returns is very weak in Russia.

C. India

The R square value of the model suggests that these six macroeconomic variables can collectively explain 38 percent variation in stock return in the total period, 36 percent variation in pre crisis period and 69 percent variation in post crisis period. Hence macroeconomic variables have assumed more significance in post crisis period in India. In case of India, the regression results are more consistent. GDP growth rate has a significant positive relationship with stock returns while changes in exchange rate have a significant negative relationship with stock returns in India.

D. China

Here, the R square value of the models suggest that these six

macroeconomic variables can collectively explain 7 percent variation in stock return in the total period, 30 percent variation in pre crisis period and 16 percent variation in post crisis period. But none of the slope coefficient of the macroeconomic factors (except exchange rate changes in pre crisis period) is significant. Hence just like Russia, in China as well the relationship between stock returns and macroeconomic factors seems to be very weak.

E. South Africa

The R square values of the model suggest that these six macroeconomic variables can collectively explain 42 percent variation in stock return in the total period, 56 percent variation in pre crisis period and 51 percent variation in post crisis period. The results show that there is significant negative relationship between stock returns and inflation in total, pre as well as post crisis periods while significant positive relationship in case of oil

Table 5: Multi-Variate Regression Analysis Model Results (All Periods)

Regressand	Study Period	Regressors						
		Constant	DLOG (GDP)	DLOG (INF)	DLOG (IR)	DLOG (ER)	DLOG (MS)	DLOG (INTOIL)
DLOG (BINDEX)	Total	-0.06	-2.10	-0.02	-0.16	-0.64*	2.55*	0.01
	Pre Crisis	-0.21*	1.37	1.89	-0.04	-0.31	5.52*	-0.15
	Post Crisis	0.29*	-3.73*	-10.2*	-0.31	-0.91*	-3.31*	0.00
DLOG (RINDEX)	Total	0.04	0.19	-0.05	-0.83	-0.82	-0.76	0.35
	Pre Crisis	0.12	2.78	-0.71	0.10	-0.60	-0.74	-0.16
	Post Crisis	0.04	-0.77	-0.55	-1.1	-0.61	-1.63	0.46
DLOG (IINDEX)	Total	-0.05	4.80*	-0.27	0.02	-1.07*	0.21	0.05
	Pre Crisis	-0.04	5.27*	-1.36	0.01	-1.71*	0.38	-0.07
	Post Crisis	-0.03	5.05*	0.69	-0.13	-0.24	-1.33	0.19
DLOG (CINDEX)	Total	-0.02	-0.02	0.59	-0.26	1.43	0.82	0.09
	Pre Crisis	0.05	-0.03	2.66	-0.52	-0.12*	-1.24	0.04
	Post Crisis	-0.05	0.00	-0.99	-1.16	4.15	1.02	0.36
DLOG (SAINDEX)	Total	0.05	0.70	-3.90*	0.00	-0.12	0.63	0.14*
	Pre Crisis	-0.02	3.86	-4.42	0.12	0.05	1.89*	-0.08
	Post Crisis	0.09	-0.08	-4.86*	0.12	-0.33	0.32	0.15*

Values are regression coefficients. Denotes significant at 5% level.*

Table 6: Multi-Variate Regression Model Summary (All Periods)

Regression Model (Regressand)	StudyPeriod	F-Stat.	Probability	R^2	Adjusted R^2
DLOG (BINDEX)	Total	4.28*	0.00	0.32	0.24
	Pre Crisis	7.23*	0.00	0.63	0.54
	Post Crisis	6.09*	0.00	0.64	0.53
DLOG (RINDEX)	Total	1.57	0.11	0.15	0.12
	Pre Crisis	0.24	0.95	0.10	0.03
	Post Crisis	0.35	0.12	0.19	0.14
DLOG (IINDEX)	Total	6.91*	0.00	0.38	0.33
	Pre Crisis	3.53*	0.01	0.36	0.26
	Post Crisis	5.45*	0.00	0.69	0.49
DLOG (CINDEX)	Total	0.77	0.60	0.07	-0.02
	Pre Crisis	1.58*	0.03	0.30	0.18
	Post Crisis	1.21	0.34	0.16	0.05
DLOG (SAINDEX)	Total	5.27*	0.00	0.42	0.34
	Pre Crisis	3.01*	0.04	0.56	0.38
	Post Crisis	3.76*	0.01	0.51	0.37

*Note: * Denotes Significant at 5% Level.*

price changes in total and post crisis periods.

Conclusion and Implications

In this paper, the relationship between Aggregate Stock Returns and prominent Macroeconomic Factors (i.e., GDP, Inflation, Interest Rate, Exchange Rate, Money Supply and Oil Prices) has been examined for emerging BRICS economies for the period from 1995: Q1 to 2014: Q4 using quarterly data. To assess the impact of Global Financial Crisis, this relationship is further scrutinized during two sub periods viz., a Pre Crisis period (1995:Q1 to 2007:Q2) and a Post Crisis Period (2007:Q3 to 2014:Q4). ADF Unit Root Test, Correlation Analysis and Multivariate Regression Model have been applied.

ADF unit test results reveal that all the macroeconomic and stock market variables of BRICS are non stationary at level and stationary at first difference. We find strong positive contemporaneous relationship of BRICS stock returns with GDP growth rates, changes in Money Supply and changes in oil prices in almost every country. Stock returns are negatively correlated with inflation rate, changes in interest rate and changes in exchange rate.

As, there is insignificant correlation among the various macroeconomic factors, there is no major problem of Multicollinearity. Also, correlation between stock returns and macroeconomic factors has increased substantially in the post crisis period indicating impact of crisis in deepening the contemporaneous relationship.

Country wise multivariate Regression results indicate that various Macroeconomic Factors significantly explain and predict Aggregate Stock Returns in different BRICS markets, viz.,Brazil (Money Supply, Exchange Rate, GDP & Inflation), Russia (None), India (GDP & Exchange Rate), China (Exchange Rate-), South Africa (Inflation, International Oil & Money Supply).These results were mostly consistent in pre and post crisis periods indicating no major impact of crisis on estimated relationship indicated by Regression. Low R square and lack of any significant Independent variables shows that this relationship is very weak in case of Russia & China.

These findings besides expanding the existing literature and knowledge base on the topic will have pertinent uses and implications for regulators, policy makers, investors and researchers, particularly in emerging markets. Policy makers & regulators should watch out impact of their macroeconomic policies on capital markets as the contemporaneous relationship has significantly strengthened post crisis. Investment community can formulate suitable trading strategies based on select macroeconomic variables for BRICS economies individually as well as collectively.

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