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GRAPHICAL AND STATISTICAL ANALYSIS TO DETERMINE THE DEGREE OF US FINANCIAL CONTAGION ON THE BRICS ECONOMY

Avnish Grover
University for Delhi

ABSTRACT

Financial contagion is the harmful effect caused by one economy on the other. In today's global market there is bound to exist some level of dependence of markets, but is that due to contagion or interdependence? In this paper, we analyze the stock indices data of the BRICS economies vs. the US index during the period 2008 and 2009 as the period of the 2008 financial crises as well as a period of tranquility during 2013 and 2014. Our aim is to find out the effect of contagion in these five emerging economies as well as the degree of contagion effect caused by financial movements in the US economy. We shall also try to prove whether the contagion effect is omnipresent or is stronger during times of crisis. This can be seen by analyzing markets that are dependent on each other even during tranquil times. Graphical Analysis, followed by Statistical Evaluation using SPSS has been done on the average monthly values of the major stock indices of each country. The NASDAQ (USA),BOVESPA (Brazil), MICEX (Russia), CNX Nifty (India), SSE Composite index (China) and The FTSE/JSE(South Africa) data for1st Jan 2008 to 31st Dec 2009 and 1st Jan 2013 to 31st Dec 2014 has been collected and analyzed. Linear Regression and correlation tests have been computed for the select stock market indices. Statistical Significance of the correlation has been tested by applying correlation t-test. The results of these studies support the view that there is a significant contagion effect of the US market on the BRICS international financial markets.

***Keywords**: BRICS economies, US index, contagion Effect, Correlation and Linear Regresion*

OBJECTIVES

- To see whether the Contagion effect has taken place in the BRICS economies due to the US economy
- To check the strength of correlation during the financial crisis
- To check the strength of correlation during the tranquility period
- To prove that the contagion effect leads to stronger correlation during the period of crisis as compared to the period of tranquility

- To check the degree of dependence of the BRICS economies on the US economy compared to each other
- To establish a relationship of the various BRICS economies and the US economy based on the study of the two different periods – crisis and tranquility

HYPOTHESIS

DURING CRISIS PERIOD OF 2008-09

H1: Establishing a relationship between USA's stock index (NASDAQ) and Brazil's stock index (BOVESPA)

H0: The stock indices are not correlated

H1: The stock indices are correlated

H2: Establishing a relationship between USA's stock index (NASDAQ) and Russia's stock index (MICEX)

H0: The stock indices are not correlated

H1: The stock indices are correlated

H3: Establishing a relationship between USA's stock index (NASDAQ) and India's stock index (CNX Nifty)

H0: The stock indices are not correlated

H1: The stock indices are correlated

H4: Establishing a relationship between USA's stock index (NASDAQ) and China's stock index (SSE Composite Index)

H0: The stock indices are not correlated

H1: The stock indices are correlated

H5: Establishing a relationship between USA's stock index (NASDAQ) and South Africa's

stock index (FTSE/JSE)

H0: The stock indices are not correlated

H1: The stock indices are correlated

HYPOTHESIS

DURING TRANQUIL PERIOD OF 2013-14

H6: Establishing a relationship between USA's stock index (NASDAQ) and Brazil's stock index (BOVESPA)

H0: The stock indices are not correlated

H1: The stock indices are correlated

H7: Establishing a relationship between USA's stock index (NASDAQ) and Russia's stock index (MICEX)

H0: The stock indices are not correlated

H1: The stock indices are correlated

H8: Establishing a relationship between USA's stock index (NASDAQ) and India's stock index (CNX Nifty)

H0: The stock indices are not correlated

H1: The stock indices are correlated

H9: Establishing a relationship between USA's stock index (NASDAQ) and China's stock index (SSE Composite Index)

H0: The stock indices are not correlated

H1: The stock indices are correlated

H10: Establishing a relationship between USA's stock index (NASDAQ) and South Africa's

stock index (FTSE/JSE)

H0: The stock indices are not correlated

H1: The stock indices are correlated

DATA AND METHODOLOGY

Two types of analysis have been done:

1. Graphical Analysis
2. Hypothesis Testing

Graphical analysis has been done by using the 10 year data of all the BRICS nations' stock market indices along with the US index, to see whether a similar pattern can be observed visually during the 2008 financial crises

Observations made during Graphical analysis are then tested using data from two periods: Crisis period – 2008 and 2009 as well as a tranquility period – 2013 and 2014. This data undergoes linear regression tests to check correlation and its strength with the help of SPSS.

GRAPHICAL ANALYSIS

The stock index data of the past ten years for each of the BRICS economies as well as the US stock index data has been plotted on a chart with the value on the y axis and the time period on the x axis.
It is done to observe similar patterns in the various economies to identify any trends that can be tested subsequently in the statistical analysis
All data regarding all the index prices have been taken from investing.com
The creation of charts and import thereof has also been done with the help of that website.
This analysis method makes it easy to understand any obvious trends observed in the markets.
Although some trends may be fairly obvious, nothing can be proved by simple visual observation alone hence we try to prove it by showing correlation during the crisis periods as well as the tranquility periods.

USA

Fig.1 : NASDAQ 10 year Index values

Since this is our base economy, it's fairly obvious that we are able to see the dip in the index value during the financial crisis. It can be seen that the recovery has been good and the major trend after the crisis seems to be largely upward. The lowest point during the crisis can be seen to be around 1400. For a contrasting comparison, the current index is at 5000 points.

BRAZIL

Fig.2 : BOVESPA 10 year Index values

In Brazil's main stock index – BOVESPA, we can see the affect very obviously in the year 2009. The dip is very sharp but the recovery seems to be sharp as well. By 2010, the economy seems to have recovered from the financial crisis completely reaching a peak value close the highest peak it reached pre-crisis.

RUSSIA

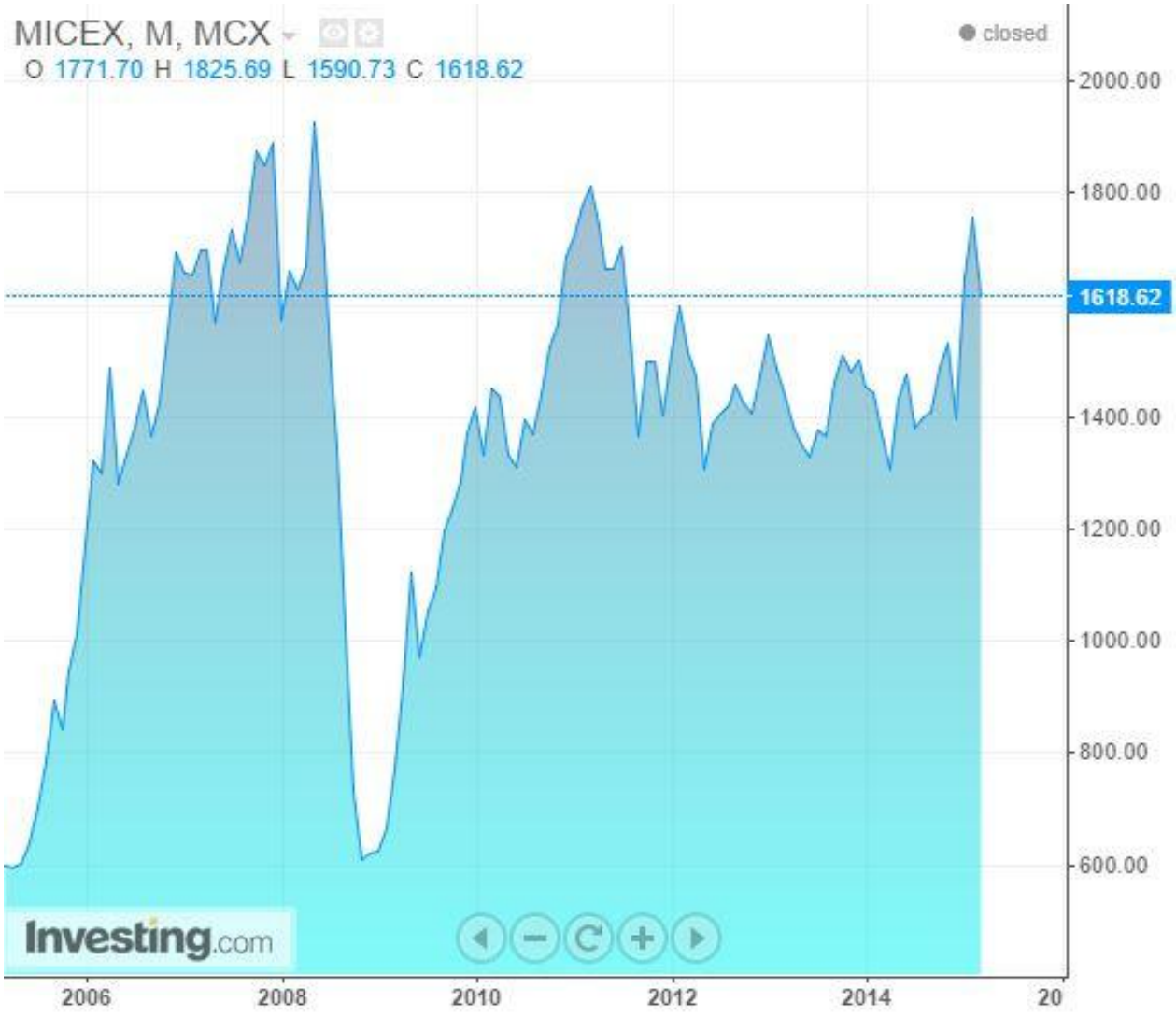

Fig.3 : MICEX 10 year Index values

In Russia's index prices we see almost a free fall continuous drop as soon as the crisis is observed. Not even minor trends going upward are visible hence proving that it was affected by the crisis as well. It is interesting to note that the immediate value before the drop can be seen as the highest value in the past 10 years.

INDIA

Fig.4 : CNX Nifty 10 year Index values

In India, we can observe a dip during 2007 itself. After a few minor trends of recovery it dips further due to the financial crisis and is the lowest during 2008. Current index value around 8500 eclipses the values of the past few years with a sharp increase seen immediately after the crisis and in 2014.

CHINA

Fig.5 : SSE Composite Index 10 year Index values

China shows a similar drop when compared to Russia as it too had hit its highest point in 2007 before the impact of the financial crisis started to take place. After recovering immediately it seems to have been largely on the downward trend till a sharp increase is seen close to the end of 2013. The effect of the financial crisis is very evident in the economy as well.

SOUTH AFRICA

Fig.6 : FTSE/JSE 10 year Index values

South Africa's index has largely been going up in the years following the financial crisis. The effect of it is still seen during 2009.Although the dip doesn't seem to be as significant as the one seen in Russia and China. It can also be observed that the current value of the FTSE/JSE is close to its peak in the last 10 years.

HYPOTHESIS TESTING DURING CRISIS

The software SPSS has been used on the index values of two years pertaining to two periods of our testing. The crisis period has been chosen as 2008 and 2009, whereas the tranquility period has been taken as 2013 and 2014. The open and close prices of the index have been taken from the site investing.com. These values have been averaged and arranged in cells for the testing of SPSS.

In this section we shall focus on the CRISIS period, hence use the data of the years 2008 and 2009

The data for the US index has been used as the independent variable for the correlation and linear regression testing. The dependent variables have been taken as each of the BRICS economies, tested one by one with the US economy.

A correlations table is used to see the correlation strength and hypothesis testing using the p values

Model summary has been taken for the R Square values which would show the percentage of change on the dependent variable due to the independent variable.

Finally ANOVA table has been taken to see the goodness of fit of the tests.

The results are interpreted immediately with overall inferences, observations and conclusions drawn later.

H1: Establishing a relationship between USA's stock index (NASDAQ) and Brazil's stock index (BOVESPA)

H0: The stock indices are not correlated

H1: The stock indices are correlated

Correlations

		BRAZIL	USA
Pearson Correlation	BRAZIL	1.000	.894
	USA	.894	1.000
Sig. (1-tailed)	BRAZIL	.	.000
	USA	.000	.
N	BRAZIL	24	24
	USA	24	24

Table 1 : Brazil and USA correlation (CRISIS)

Alpha Value = .05

Pearson correlation = .894

P value = .000

Since P value is less than our alpha value, we shall reject the null hypothesis and accept the alternative hypothesis

Hypothesis accepted : H1 – The stock indices are correlated

This shows that there is a statistically significant correlation relationship between the USA index (NASDAQ) and the Brazil index (BOVESPA)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.894[a]	.798	.789	5032.16353	.798	87.166	1	22	.000

a. Predictors: (Constant), USA

Table 2 : Brazil and USA Model Summary (CRISIS)

R Square value - .798

This value shows that 79.8% of a change in the Brazil index (BOVESPA) can be explained by the changes in the USA index (NASDAQ)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2207265168.947	1	2207265168.947	87.166	.000[b]
	Residual	557098734.907	22	25322669.768		
	Total	2764363903.854	23			

a. Dependent Variable: BRAZIL

b. Predictors: (Constant), USA

Table 3 : Brazil and USA ANOVA (CRISIS)

P value = .000

Since this value is less than our alpha value, we can say that this is a good fit model

H2: Establishing a relationship between USA's stock index (NASDAQ) and Russia's stock index (MICEX)

H0: The stock indices are not correlated

H1: The stock indices are correlated

Correlations

		RUSSIA	USA
Pearson Correlation	RUSSIA	1.000	.944
	USA	.944	1.000
Sig. (1-tailed)	RUSSIA	.	.000
	USA	.000	.
N	RUSSIA	24	24
	USA	24	24

Table 4 :Russia and USA correlation (CRISIS)

Alpha Value = .05

Pearson correlation = .944

P value = .000

Since P value is less than our alpha value, we shall reject the null hypothesis and accept the alternative hypothesis

Hypothesis accepted : H1 – The stock indices are correlated

This shows that there is a statistically significant correlation relationship between the USA index (NASDAQ) and the Russia index (MICEX)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.944[a]	.891	.886	136.64709	.891	179.239	1	22	.000

a. Predictors: (Constant), USA

Table 5 :Russia and USA Model Summary (CRISIS)

R Square value - .891

This value shows that 89.1% of a change in the Russia index (MICEX) can be explained by the changes in the USA index (NASDAQ)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3346829.170	1	3346829.170	179.239	.000[b]
	Residual	410793.397	22	18672.427		
	Total	3757622.568	23			

a. Dependent Variable: RUSSIA

b. Predictors: (Constant), USA

Table 6 : Russia and USA ANOVA (CRISIS)

P value = .000

Since this value is less than our alpha value, we can say that this is a good fit model

H3: Establishing a relationship between USA's stock index (NASDAQ) and India's stock index

(CNX Nifty)

H0: The stock indices are not correlated

H1: The stock indices are correlated

Correlations

		INDIA	USA
Pearson Correlation	INDIA	1.000	.882
	USA	.882	1.000
Sig. (1-tailed)	INDIA	.	.000
	USA	.000	.
N	INDIA	24	24
	USA	24	24

Table 7 :India and USA correlation (CRISIS)

Alpha Value = .05

Pearson correlation = .882

P value = .000

Since P value is less than our alpha value, we shall reject the null hypothesis and accept the alternative hypothesis

Hypothesis accepted : H1 – The stock indices are correlated

This shows that there is a statistically significant correlation relationship between the USA index (NASDAQ) and the India index (CNX Nifty)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.882[a]	.778	.768	421.61702	.778	77.320	1	22	.000

a. Predictors: (Constant), USA

Table 8 :India and USA Model Summary (CRISIS)

R Square value - .778

This value shows that 77.8% of a change in the India index (CNX Nifty) can be explained by the changes in the USA index (NASDAQ)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13744409.997	1	13744409.997	77.320	.000[b]
	Residual	3910740.127	22	177760.915		
	Total	17655150.124	23			

a. Dependent Variable: INDIA

b. Predictors: (Constant), USA

Table 9 :India and USA ANOVA (CRISIS)

P value = .000

Since this value is less than our alpha value, we can say that this is a good fit model

H4: Establishing a relationship between USA's stock index (NASDAQ) and China's stock index (SSE Composite Index)

H0: The stock indices are not correlated

H1: The stock indices are correlated

Correlations

		CHINA	USA
Pearson Correlation	CHINA	1.000	.719
	USA	.719	1.000
Sig. (1-tailed)	CHINA	.	.000
	USA	.000	.
N	CHINA	24	24
	USA	24	24

Table 10 :China and USA correlation (CRISIS)

Alpha Value = .05

Pearson correlation = .719

P value = .000

Since P value is less than our alpha value, we shall reject the null hypothesis and accept the alternative hypothesis

Hypothesis accepted : H1 – The stock indices are correlated

This shows that there is a statistically significant correlation relationship between the USA index (NASDAQ) and the China index (SSE Composite Index)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.719[a]	.516	.494	558.21568	.516	23.484	1	22	.000

a. Predictors: (Constant), USA

Table 11 :China and USA Model Summary (CRISIS)

R Square value - .516

This value shows that 51.6% of a change in the China index (SSE Composite Index) can be explained by the changes in the USA index (NASDAQ)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7317725.186	1	7317725.186	23.484	.000[b]
	Residual	6855304.395	22	311604.745		
	Total	14173029.581	23			

a. Dependent Variable: CHINA

b. Predictors: (Constant), USA

Table 12 :China and USA ANOVA (CRISIS)

P value = .000

Since this value is less than our alpha value, we can say that this is a good fit model

H5: Establishing a relationship between USA's stock index (NASDAQ) and South Africa's stock index (FTSE/JSE)

H0: The stock indices are not correlated

H1: The stock indices are correlated

Correlations

		SAFRICA	USA
Pearson Correlation	SAFRICA	1.000	.942
	USA	.942	1.000
Sig. (1-tailed)	SAFRICA	.	.000
	USA	.000	.
N	SAFRICA	24	24
	USA	24	24

Table 13 :South Africa and USA correlation (CRISIS)

Alpha Value = .05

Pearson correlation = .942

P value = .000

Since P value is less than our alpha value, we shall reject the null hypothesis and accept the alternative hypothesis

Hypothesis accepted : H1 – The stock indices are correlated

This shows that there is a statistically significant correlation relationship between the USA index (NASDAQ) and the South Africa index (FTSE/JSE)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.942[a]	.888	.883	1325.24391	.888	174.668	1	22	.000

a. Predictors: (Constant), USA

Table 14 :South Africa and USA Model Summary (CRISIS)

R Square value - .888

This value shows that 88.8% of a change in the South Africa index (FTSE/JSE) can be explained by the changes in the USA index (NASDAQ)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	306763754.200	1	306763754.200	174.668	.000[b]
	Residual	38637971.315	22	1756271.423		
	Total	345401725.514	23			

a. Dependent Variable: SAFRICA

b. Predictors: (Constant), USA

Table 15 :South Africa and USA ANOVA (CRISIS)

P value = .000

Since this value is less than our alpha value, we can say that this is a good fit model

HYPOTHESIS TESTING DURING TRANQUILITY

The software SPSS has been used on the index values of two years pertaining to two periods of our testing. The crisis period has been chosen as 2008 and 2009, whereas the tranquility period has been taken as 2013 and 2014. The open and close prices of the index have been taken from the site investing.com. These values have been averaged and arranged in cells for the testing of SPSS.

In this section we shall focus on the TRANQUIL period, hence use the data of the years 20013 and 2014

The data for the US index has been used as the independent variable for the correlation and linear regression testing. The dependent variables have been taken as each of the BRICS economies, tested one by one with the US economy.

A correlations table is used to see the correlation strength and hypothesis testing using the p values

Model summary has been taken for the R Square values which would show the percentage of change on the dependent variable due to the independent variable.

Finally ANOVA table has been taken to see the goodness of fit of the tests.

The results are interpreted immediately with overall inferences, observations and conclusions drawn later.

H6: Establishing a relationship between USA's stock index (NASDAQ) and Brazil's stock index (BOVESPA)

H0: The stock indices are not correlated

H1: The stock indices are correlated

Correlations

		BRAZIL	USA
Pearson Correlation	BRAZIL	1.000	-.206
	USA	-.206	1.000
Sig. (1-tailed)	BRAZIL	.	.168
	USA	.168	.
N	BRAZIL	24	24
	USA	24	24

Table 16 : Brazil and USA correlation (TRANQUIL)

Alpha Value = .05

Pearson correlation = -.206

P value = .168

Since P value is greater than our alpha value, we shall not reject the null hypothesis and assume that it is true

Hypothesis accepted : H0 – The stock indices are not correlated

This shows that there is no statistically significant correlation relationship between the USA index (NASDAQ) and the Brazil index (BOVESPA)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.206[a]	.042	-.001	3750.88509	.042	.971	1	22	.335

a. Predictors: (Constant), USA

Table 17 : Brazil and USA Model Summary (TRANQUIL)

R Square value - .042

This value shows that 4.2% of a change in the Brazil index (BOVESPA) can be explained by the changes in the USA index (NASDAQ)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13665918.734	1	13665918.734	.971	.335[b]
	Residual	309521057.877	22	14069138.994		
	Total	323186976.610	23			

a. Dependent Variable: BRAZIL

b. Predictors: (Constant), USA

Table 18 : Brazil and USA ANOVA (TRANQUIL)

P value = .335

Since this value is more than our alpha value, we can say that this is not a good fit model

H7: Establishing a relationship between USA's stock index (NASDAQ) and Russia's stock index (MICEX)

H0: The stock indices are not correlated

H1: The stock indices are correlated

Correlations

		RUSSIA	USA
Pearson Correlation	RUSSIA	1.000	.027
	USA	.027	1.000
Sig. (1-tailed)	RUSSIA	.	.450
	USA	.450	.
N	RUSSIA	24	24
	USA	24	24

Table 19 : Russia and USA correlation (CRISIS)

Alpha Value = .05

Pearson correlation = .027

P value = .450

Since P value is greater than our alpha value, we shall not reject the null hypothesis and assume that it is true

Hypothesis accepted : H0 – The stock indices are not correlated

This shows that there is no statistically significant correlation relationship between the USA index (NASDAQ) and the Russia index (MICEX)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.027[a]	.001	-.045	64.68881	.001	.016	1	22	.900

a. Predictors: (Constant), USA

Table 20 : Russia and USA Model Summary (TRANQUIL)

R Square value - .001

This value shows that 0.1% of a change in the Russia index (MICEX) can be explained by the changes in the USA index (NASDAQ)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	67.209	1	67.209	.016	.900[b]
	Residual	92062.126	22	4184.642		
	Total	92129.334	23			

a. Dependent Variable: RUSSIA

b. Predictors: (Constant), USA

Table 21 : Russia and USA ANOVA (TRANQUIL)

P value = .900

Since this value is more than our alpha value, we can say that this is not a good fit model

H8: Establishing a relationship between USA's stock index (NASDAQ) and India's stock index (CNX Nifty)

H0: The stock indices are not correlated

H1: The stock indices are correlated

Correlations

		INDIA	USA
Pearson Correlation	INDIA	1.000	.850
	USA	.850	1.000
Sig. (1-tailed)	INDIA	.	.000
	USA	.000	.
N	INDIA	24	24
	USA	24	24

Table 22 : India and USA correlation (CRISIS)

Alpha Value = .05
Pearson correlation = .850

P value = .000

Since P value is less than our alpha value, we shall reject the null hypothesis and accept the alternative hypothesis

Hypothesis accepted : H1 – The stock indices are correlated

This shows that there is a statistically significant correlation relationship between the USA index (NASDAQ) and the India index (CNX Nifty)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.850[a]	.722	.709	510.92722	.722	57.051	1	22	.000

a. Predictors: (Constant), USA

Table 23 : India and USA Model Summary (TRANQUIL)

R Square value - .722

This value shows that 72.2% of a change in the India index (CNX Nifty) can be explained by the changes in the USA index (NASDAQ)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14893058.196	1	14893058.196	57.051	.000[b]
	Residual	5743025.787	22	261046.627		
	Total	20636083.984	23			

a. Dependent Variable: INDIA

b. Predictors: (Constant), USA

Table 24 : India and USA ANOVA (TRANQUIL)

P value = .000

Since this value is less than our alpha value, we can say that this is a good fit model

H9: Establishing a relationship between USA's stock index (NASDAQ) and China's stock index (SSE Composite Index)

H0: The stock indices are not correlated

H1: The stock indices are correlated

Correlations

		CHINA	USA
Pearson Correlation	CHINA	1.000	.225
	USA	.225	1.000
Sig. (1-tailed)	CHINA	.	.145
	USA	.145	.
N	CHINA	24	24
	USA	24	24

Table 25 : China and USA correlation (CRISIS)

Alpha Value = .05

Pearson correlation = .225

P value = .145

Since P value is greater than our alpha value, we shall not reject the null hypothesis and assume that it is true

Hypothesis accepted : H0 – The stock indices are not correlated

This shows that there is no statistically significant correlation relationship between the USA index (NASDAQ) and the China index (SSE Composite Index)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.225[a]	.051	.008	204.19081	.051	1.176	1	22	.290

a. Predictors: (Constant), USA

Table 26 : China and USA Model Summary (TRANQUIL)

R Square value - .051

This value shows that 5.1% of a change in the China index (SSE Composite Index) can be explained by the changes in the USA index (NASDAQ)

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	49035.608	1	49035.608	1.176	.290[b]
	Residual	917265.527	22	41693.888		
	Total	966301.135	23			

a. Dependent Variable: CHINA

b. Predictors: (Constant), USA

Table 27 : China and USA ANOVA (TRANQUIL)

P value = .290

Since this value is more than our alpha value, we can say that this is not a good fit model

H10: Establishing a relationship between USA's stock index (NASDAQ) and South Africa's stock index (FTSE/JSE)

H0: The stock indices are not correlated

H1: The stock indices are correlated

Correlations

		SAFRICA	USA
Pearson Correlation	SAFRICA	1.000	.940
	USA	.940	1.000
Sig. (1-tailed)	SAFRICA	.	.000
	USA	.000	.
N	SAFRICA	24	24
	USA	24	24

Table 28 : South Africa and USA correlation (CRISIS)

Alpha Value = .05

Pearson correlation = .940

P value = .000

Since P value is less than our alpha value, we shall reject the null hypothesis and accept the alternative hypothesis

Hypothesis accepted : H1 – The stock indices are correlated

This shows that there is a statistically significant correlation relationship between the USA index (NASDAQ) and the South Africa index (FTSE/JSE)

Model Summary

Mod	R	R	Adjusted R	Std. Error	Change Statistics

el		Square	Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.940[a]	.883	.877	1480.89746	.883	165.613	1	22	.000

a. Predictors: (Constant), USA

Table 29 : South Africa and USA Model Summary (TRANQUIL)

R Square value - .883

This value shows that 88.3% of a change in the South Africa index (FTSE/JSE) can be explained by the changes in the USA index (NASDAQ)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	363199867.307	1	363199867.307	165.613	.000[b]
	Residual	48247260.568	22	2193057.299		
	Total	411447127.876	23			

a. Dependent Variable: SAFRICA

b. Predictors: (Constant), USA

Table 30 : South Africa and USA ANOVA (TRANQUIL)

P value = .000

Since this value is less than our alpha value, we can say that this is a good fit model

OBSERVATIONS

CORRELATION BETWEEN THE BRICS ECONOMIES AND THE US ECONOMY DURING THE PERIOD OF CRISIS (2008-2009)

COUNTRY	HYPOTHESIS ACCEPTED	CORRELATION
BRAZIL	H1 : ALT	.894
RUSSIA	H1 : ALT	.944
INDIA	H1 : ALT	.882
CHINA	H1 : ALT	.719
SOUTH AFRICA	H1 : ALT	.942

Table 31 : Correlation between BRICS and US during the period of crisis

As can be seen from the table above, there is a very strong effect of contagion of the USA economy on the all the BRICS economies.

Brazil has a strong positive correlation with the US economy, but not to the extent of Russia and China.

Russia is impacted the most by the financial crisis in the US. It almost faces the exact kind of dip that the US faces.

India has the second least impact of the financial contagion effect, but even then has a strong positive correlation

China has the least impact out of all of the BRICS economies.

South Africa is hit the hard by the financial crisis happening in the US. Its fall is similar to that of Russia's.

CORRELATION BETWEEN THE BRICS ECONOMIES AND THE US ECONOMY DURING THE PERIOD OF TRANQUILITY (2013-2014)

COUNTRY	HYPOTHESIS ACCEPTED	CORRELATION
BRAZIL	H0 : NULL	-.206
RUSSIA	H0 : NULL	.027
INDIA	H1 : ALT	.850
CHINA	H0 : NULL	.225
SOUTH AFRICA	H1 : ALT	.940

Table 32 : Correlation between BRICS and US during period of tranquillity

In the period of tranquility, the level of correlation is very low comparatively and inconsistent among the different countries. During crisis, they all were similarly correlated, but in time of stability, they have different relationships with the US economy.

The test between Brazil and the US gave a result by which the null hypothesis could not be rejected.

Russia gave a similar result, hence showing that it doesn't have a significant relationship with the US economy during the period of tranquility.

India yielded a rejection of the null hypothesis, hence signifying that there is a significant relationship between the Indian economy and the US

China's index prices gave a rejection of alternate hypothesis as well. It too, during periods of tranquility isn't affected by the US index values.

South Africa gave an acceptance of the alternative hypothesis, that too with very strong positive correlation. It is strongly dependent on the US economy even during tranquility

CONTRASTING EFFECT OF CONTAGION DURING THE CRISIS PERIOD AND THE TRANQUILITY PERIOD

COUNTRY	CRISIS	TRANQUIL	HIGHER
BRAZIL	.894	-.206	CRISIS
RUSSIA	.944	.027	CRISIS
INDIA	.882	.850	CRISIS
CHINA	.719	.225	CRISIS
SOUTH AFRICA	.942	.940	CRISIS

Table 33 : Comparison of contagion effect during Crisis and Tranquil periods

This table clearly shows that the contagion effect is very evident during the Crisis period and not so much or non-existent during the tranquility period.

All the economies have a higher correlation with the US market in times of turmoil, whereas only a few are correlated during tranquil times.

Brazil is only correlated during the crisis period, hence we can say that there is a contagion effect during periods of crisis, but otherwise it is interdependent with the US economy.

Russia is another that is only affected by the US economy during turbulent times.

India is an exception compare to the above to countries, as it is correlated with the US economy during both periods, but even then it can be seen that contagion effect is higher during crisis.

China showed the lowest contagion effect but the effect was there as it can be seen that during the tranquility periods the effect does not exist.

South Africa is almost indifferent to the extra presence of contagion during crisis; it is always dependent on the US market, and not only falls with it, but also rises with it.

R SQUARE VALUES SHOWING PERCENTAGE EXPLAINABILITY OF US CONTAGION ON BRICS

COUNTRY	DURING CRISIS	DURING TRANQUILITY
BRAZIL	79.8%	4.2%
RUSSIA	89.1%	0.1%
INDIA	77.8%	72.2%
CHINA	51.6%	5.1%
SOUTH AFRICA	88.8%	88.3%

Table 34 : Percentage of change in BRICS explained by movement in US

This table shows the R square values that signify what percentage of change in the dependent variable is caused by the independent variable.

The values have been shown in percentages and can be interpreted as follows:

During crisis, the movement in the Brazil index can be explained to the extent of 79.8% due to the movement in the US index, whereas during periods of tranquility, only 4.2% of any change in the index values can be explained by the changes of the index values in the US.

Russia shows the highest reasoning of index changes during periods of crisis and the lowest during periods of tranquility.

India shows similar reasoning in both periods, but has a greater explainability percentage during crisis.

China could only explain 51.6% of change during crisis with the justification of movement in the US economy.

South Africa’s economy has a very high expectation to move in a direction based on the US economy

RANKING OF CONTAGION EFFECT OF US DURING THE PERIOD OF CRISIS AND THE PERIOD OF TRANQUILITY

RANK	DURING CRISIS	DURING TRANQUILITY
1	RUSSIA	SOUTH AFRICA
2	SOUTH AFRICA	INDIA
3	BRAZIL	CHINA
4	INDIA	BRAZIL
5	CHINA	RUSSIA

Table 35 : Ranking contagion effect during crisis and tranquillity

The table above ranks the BRICS nations based on the effect that can be seen on them due to changes in the US.

During Crisis the country that experienced the highest contagion effect is ranked 1st in the middle column, whereas the country that experienced the lowest contagion effect of the financial crisis in the US is ranked 5th.

From observing the middle column we can see the Russia is the most vulnerable in times of Crisis if the contagion starts from the US. It is followed by South Africa, whereas China experiences the lowest contagion effect out of all the BRICS economies during periods of crisis.

The rightmost column shows the ranking of the most dependent of the BRICS economies on the US.

South Africa, as seen from previous tables is highly dependent on the US even in calm financial times.

Russia which is the most effected economy during contagion has the least impact on it during tranquility.

CONCLUSIONS

After looking back at all our observations as well as our initial objectives, we can say that the through our graphical analysis, we were able to spot a very obvious contagion effect during the financial crisis caused in the US.

Russia, Brazil and China took a major hit based on their stock index values as compared to India and South Africa during the financial crisis, but all the BRICS economies suffered along with the US

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To simply claim that it was a contagion effect would have been incorrect; hence we looked at the average monthly index values during two years for the period of the financial crisis as well as the tranquility period.

The index data for the years 2008 and 2009 was compared to find results of the Crisis period, whereas the values of 2013 and 2014 were compared for the tranquility period.

We found a very strong correlation between the BRICSSKS economies with the US during the crisis period proving the contagion effect.

During the periods of tranquility however we go inconsistent results further proving that it was financial contagion that caused a movement not just dependence.

India and South Africa were correlated to the US in both periods, hence irrelevant to prove that the contagion effect in isolation.

Brazil, Russia and China however showed a correlation only during crisis, suggesting a strong contagion effect that otherwise doesn't exist.

Russia was the most affect victim of the contagion effect, while China suffered the least consequences.

All the economies however proved that the contagion effect was stronger during the Crisis period when compared to the period of Tranquility.