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Comparative Study of Impact of Global Financial Crisis on Stock Markets of U.S.A. , India & U.K.

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ABSTRACT- The Great Recession Period or The Global Financial Crisis which majorly occurred due to the deregulation in the financial industry had varied and significant impact on the stock markets of various countries all over the world. One of the major event within this financial deregulation detailed easy availability of housing mortgages which had a direct quantifiable effect that is huge numbers of general public subscribing to this event. However, this set of events ran its course when due to eventual fall in people's ability to pay mortgages led to major decline in security backed by mortgages. These mortgage-backed securities (MBS) for the starting period, is said to offer attractive rates of return. However, eventually the lower credit quality of securities ultimately led to the causation ofbig defaults. The prove of the above stated statement reflected in reality when several banks, financial institutions and the economy as a whole had lost huge amount of money. Finally, this run resulted in having a global financial crisis which affected various stock markets.This paper describes the effect of the Great Recession Period or the Global Financial Crisis on stock market of three nations-India, United Kingdom and United States of Americaby acknowledging it through statistical analysis. The time period taken for study has been divided into three parts as pre-crisis period, during-crisis and post-crisis period and the performance of stocks will be evaluated during different periods.

Keywords: Global Financial Crisis, mortgage-backed securities (MBS), Great Recession Period

I. INTRODUCTION

The Great Recession is a term that represents the sharp decline in economic activity during the late 2000s. The Sub-Prime crisis or famously called 'The Great Recession' period uptill today is said to be one of the biggest financial crisis that the world's economy had hit upon. The occurrence of sub-prime crisis in United States of America during the period 2007-2009 was majorly due to deregulation in the financial industry.

The set of events which led to the financial crisis involvedthe sharp increase in high-risk mortgages that went into default. The high-risk mortgages were the securities given by hedge funds, banks and insurance companies for customer's asset obligations in various sectors especially the housing sector. In addition, the insurance companies is said to cover them with credit default swaps. With easy availability of loans and loans guarantees, there was a major increase in the demand for mortgages.This was the driving force for mortgage lenders to continually lower rates and standards for new borrowers. The low standards for new borrowers involved those who have poor credit histories and therefore were more likely to default.**As a result, a significant rise in foreclosures resulted in huge amount of 'money being sucked out of several banks, financial institutions and the economy as a whole'[1], finally leading to the collapse of many lending institutions and hedge funds**.

Apart from the given,there were various reasons that assisted the financial crisis:

- The Federal Reserve of U.S.A raised their fed funds rate which resulted in sending their adjustable mortgage interest rates skyrocketing. Those with adjustable-rate mortgages for housing obligations couldn't make these higher payments. Due to which demand fell, and so did the prices of housing sector for which debt were taken. When they couldn't sell their assets, they defaulted. No one was now able to pay the price, or sell, the now-worthless securities. And the insurance company almost went bankrupt by trying to cover.

- Mortgage-backed securities allow lenders to bundle loans into a package and resell them. In the days of conventional loans, this allowed banks to have more funds to lend. With the advent of interest-

only loans, this transferred the risk of the lender defaulting by resetting interest rates. They added so much liquidity in the market that it created boom in various sectors i.e. hoax rise in value of assets like houses that they were not worth of.

- At that point of time, all kinds of debt was repackaged and resold as collateralized debt obligations. Holders of collateralized debt obligations not only included lenders but also hedge funds, corporations, pension funds and mutual funds. Therefore when housing prices declined, many homeowners who had been using their homes as ATM machines found out that they could no longer support their lifestyle. This led to the defaults on all kinds of debt. As defaulters started to mount, banks were unable to sell these CDOs, and so had less money to lend. As well the people, who had funds now, did not want to lend their funds to banks that might be on the verge of default. The crisis had come full circle. Instead of lending the money too freely, banks were able to lend too little, resulting in causing the housing market to decline further.

Due to its grander effect, it eventually led to be called 'The Great Recession'. Weakening of the American economy was bad news, not just for India, but also rest of the world too. And as the cliché goes, '*whenever the US sneezes, the world catches a cold*'. This evident became true when markets all over globe crashed because of recession in the US. The recession period has a significant and varied impact on different nations and hence their stock exchanges.

The key objective of our study is to investigate the effect of sub-prime crisis on stock markets of three selected nations-India, United Kingdoms and United States of America. Our analysis involves comparison between NASDAQ100, NIFTY50 and FTSE100 from their respective exchanges; NASDAQ, National Stock Exchange& London Stock Exchange respectively on the basis of trends in stock prices, returns and various risk-adjusted measures.The criteria for selection of countries: United States of America, India and United kingdom for our analysis involves: 1) Sub-prime crisis took place in U.S.A markets & effect on U.S.A stock market results in having global level effects 2)India is touted to be the most developing & rising economy 3) United kingdoms is a substantial trade partner of United States of America as well as India& effect on India and U.S.A stock markets will have a gradual impact on it respectively. The selection of three indices from respective exchanges has been explained further in our paper.

The NASDAQ Stock Market is an American stock exchange. It is the second-largest exchange in the world by market capitalization located in the same city. When it was founded, NASDAQ stood for the acronym of "National Association of Securities Dealers Automated Quotations". NASDAQ was founded in the year 1971 by the National Association of Securities Dealers(NASD). The NASDAQ-100 is a stock market index made up of 103 equity securities issued by 100 of the largest non-financial companies listed on the NASDAQ. It is a modified capitalization-weighted index.

The National Stock Exchange of India Limited (NSE) is the leading stock exchange of India, located in Mumbai. Established in the year 1992, NSE was the first exchange in the country to provide a modern, fully automated screen-based electronic trading system which offered easy trading facility to the investors spread across the length and breadth of the country. The NIFTY 50 is the flagship index on the National Stock Exchange of India Ltd. The Index tracks the behaviour of a portfolio of blue chip companies, the largest and most liquid Indian securities. It includes 50 of the approximately 1600 companies listed on the NSE.

The London Stock Exchange (LSE) is a stock exchange located in the City of London, England. The Exchange had a market capitalisation of US$6.06 trillion, making it the third-largest stock exchange in the world by this measurement. The Exchange was founded in 1801. The Financial Times Stock Exchange 100 Index, also called the FTSE 100 informally, the "Footsie", is a share index of the 100 companies listed on the London Stock Exchange with the highest market capitalisation. It is seen as a gauge of prosperity for businesses regulated by UK company law. The index is maintained by the FTSE Group, a subsidiary of the London Stock Exchange Group.

II. LITERATURE REVIEW

Stock market is an important part of the economy of a country.[5] The stock market plays a play a pivotal role in the growth of the industry and commerce of the country.[5]This is the reason that the government, industry and even the central banks of the country keep a close watch on the happenings of the stock

market.[5] The stock market is very important from both: the industry's point of view as well as the investor's point of view. Various eminent scholars across the globe have studied upon different elements affecting stock markets during different periods.

- ***Dr. Jaspal Singh &Sidharath Seth (2016)*** aims at making a comparison between CNX NIFTY and S&P BSE SENSEX, the two most popular large cap indices of Indian stock market. They have used annualized return, annualized standard deviation, annualized Sharpe ratio and capital asset pricing model. Based on analysis, they discovered that statistically, there is no significant difference in the relative risk and return of both the indices. With results covering the economic significance, higher annualized return, slightly low annualized standard deviation, positive value of alpha, relatively lesser beta and superior Sharpe ratio of CNX NIFTY, their results showed that it is a better index to invest than S&P BSE SENSEX for a long term.

- ***Vanita Tripathi & Varun Bhandari (2015)*** showed whether the companies that are socially responsible are performing better than general companies in Indian stock market in terms of price discovery, return, risk and various risk-adjusted measures during different structural break periods (i.e. pre-crisis, crisis and post-crisis). Their findings support the view that socially responsible investing (SRI) is a boon for Indian investors during crisis period.[10] They also discovered that the growth rate of socially responsible index is significantly better than general index during crisis period.[10]Their results showed that despite having higher risk, socially responsible index generates significantly higher return than general index and hence outperformed all other indices on the basis of all risk-adjusted measures employed during crisis period.[10]

- ***Joseph TagneTalla , Per-Olof Bjuggren& Louise Nordström (2013)*** through their paper highlighted the impact of changes in selected macroeconomic variables on stock prices of the Stockholm Stock Exchange (OMXS30). To estimate the relationship, they used unit root test, Multivariate Regression Model computed on Standard Ordinary Linear Square (OLS) method and Granger causality test have been used. Based on estimated regression coefficients and t-statistics, they found that inflation and currency depreciation have a significant negative influence on stock prices. On the other hand, money supply is positively associated to stock prices although not significant.

III. OBJECTIVES

So as to evaluate the relationship of the effect of sub-prime crisis on NASDAQ100, NIFTY50, and FTSE100 from their respective exchanges; NASDAQ, National Stock Exchange& London Stock Exchange, we have used dummy regression model and paired sample-t test applied individually to all the 3 stock indices.
The time period used in the study is from 2001-2017.The study estimates the conclusion of the below listed objectives on the basis of various analytical tools as mentioned above.

Objective I: To examine how significant was the impact of sub-prime crisis on 3 different nations. For this, the following hypotheses are to be tested:

H_0:(1) The growth rate is same for all the indices in pre-crisis period
(2) The growth rate is same for all the indices during-crisis period
(3) The growth rate is same for all the indices in post-crisis period

H_A:(1) The growth rate is different for all the indices in pre-crisis period
(2) The growth rate is different for all the indices during-crisis period
(3)The growth rate is different for all the indices in post-crisis period

Objective II: To examine the growth rate of the individual indices during the time period taken. For this, the following hypotheses are to be tested:

H_0: The growth rate for an individual index is same throughout.
H_A: The growth rate for an individual index is different for different periods.

Objective III: To study whether returns differ significantly across these indices. For this, the following hypotheses are to be tested:

H_0: The difference between the mean returns of paired indices is zero
H_A: The difference between the mean returns of paired indices is non-zero

IV. DATA AND METHODOLOGY

In our study we have taken NASAQ 100, NIFTY50 & FTSE 100 as the stock indices of the three selected exchanges i.e. of NASDAQ, NSE& LSE respectively because they are good approximation of market indices Willshire 5000, CNX500 Equity & FTSE 350 respectively. This is further proved by below mentioned correlation matrix.For comparative analysis, we start with normality test. Further study involves usage of Dummy regression and Paired Sample T-test for concluding above stated objectives.Our study considers a period of 17 years starting from January 1, 2001 to December 31, 2017. This period has been divided into 3 parts for a better evaluation of the impact of the Great Recession/Global Financial Crisis on the 3 different stock indices.

The 3 parts into which the period is being divided are as follows:
January 1, 2001- December 31, 2006; Pre-crisis Period
January 1, 2007-December 31, 2009; Crisis period
January 1, 2010-Decemebr 31, 2017; Post-Crisis period

(A) CORRELATION OF MARKET INDICES WITH THEIR RESPECTIVE STOCK INDICES

Table 1: Paired Samples Correlations

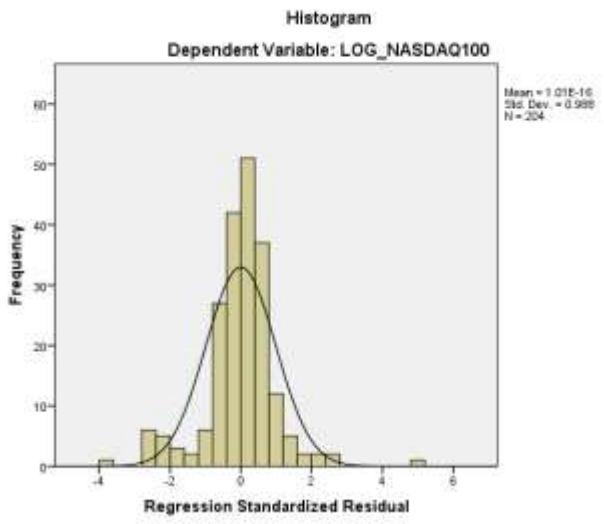
		N	Correlation	Sig.
Pair 1	**NIFTY50 & CNX 500 EQUITY**	204	.976	.000
Pair 2	**NASDAQ100 & WILLSHIRE5000**	204	.871	.000
Pair 3	**FTSE100 & FTSE350**	204	.969	.000

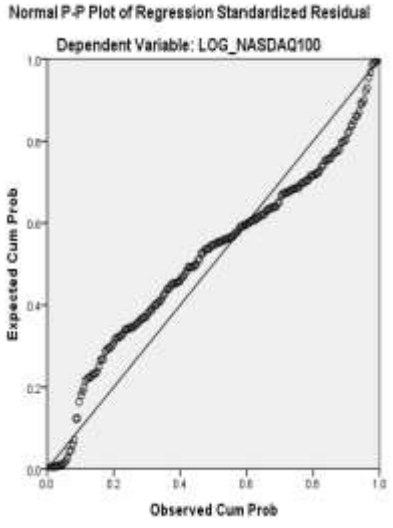
The above matrix exhibits that coefficient of correlation of NIFTY50 & CNX 500 EQUITY, NASDAQ100 & WILLSHIRE5000 and FTSE100 & FTSE350 is nearer to 1 which indicates that there is a strong positive linear relationshipbetween the indices. This means that when market index increases, the value of other paired index alsoincreases. Moreover, since the Sig. (2-tailed) value for paired indices is less than 0.01 i.e. 0.000, we can conclude that there is a statistically significant correlation between these stock indices.

(B) NORMALITY TEST

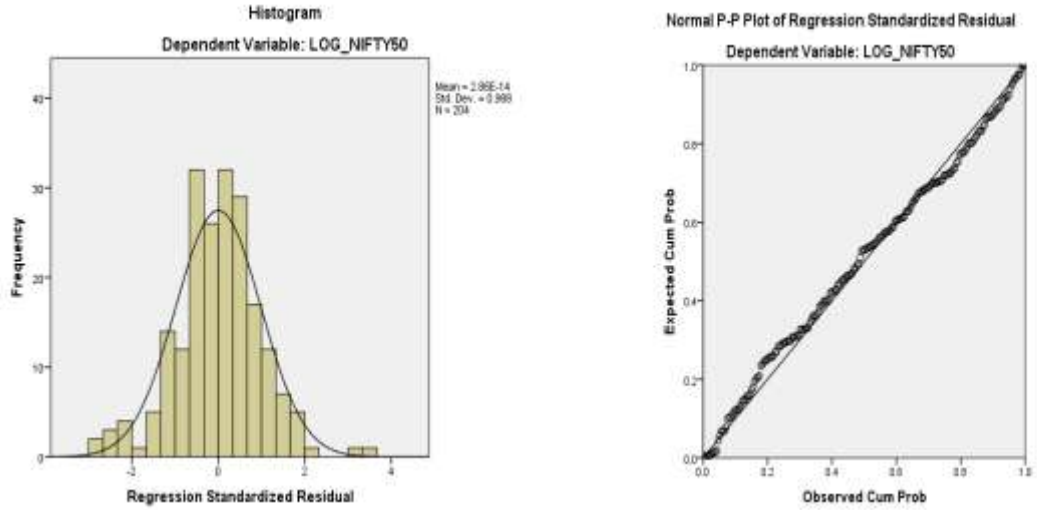
Most statistical test rests upon the assumption of normality; therefore we have performed the normality test to check whether our data is normal or non-normal.

(a) NASDAQ 100





(b) NIFTY 50



(c) FTSE 100

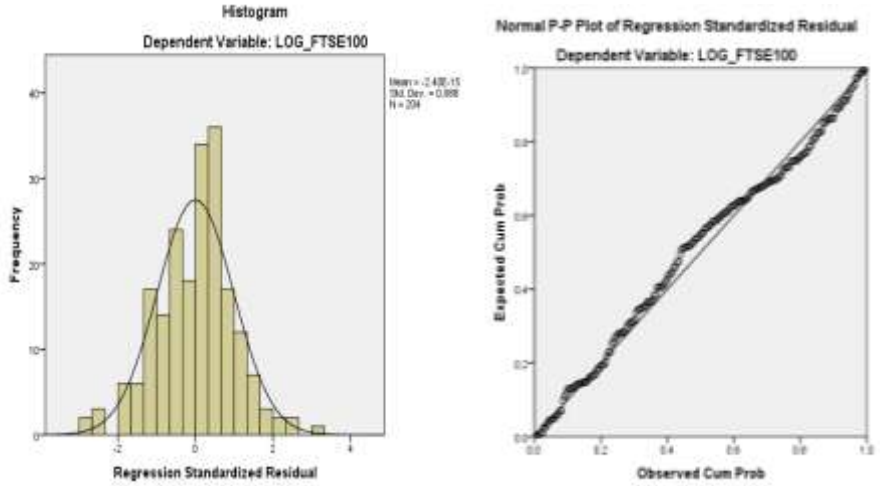


Figure 1: Histogram & P-Plot showing normality test of NASDAQ, NIFTY 50 and FTSE 100
As seen in the histograms above,the data is following a normal distribution. Also the data points are near to the regression line in the Normal P-P plot which shows that the error term is minimised. This show that our data is normal and validates that the statistical analysis performed further can be relied upon.

(C) DUMMY REGRESSION

Dummy regression is useful because it enables us to use a single regression equation to represent multiple groups(here the different periods).[6] Thus we don't need to write out separate equation models for each subgroup.[6]We are interested in knowing the fact that how these indices behave during these periods andthis can be achieved by fitting the following regression equation and using dummies for the different breaks.[6]

$$\mathbf{Ln(index\ value)=b_1+ b_2T+b_3D_1+b_4D_2+b_5TD_1+b_6TD_2}(1)$$

Where,Ln(index value)= Natural log of i^{th} index values
$D_1=0$, $D_2=0$ for pre-crisis period
$D_1=1$, $D_2=0$ during crisis period
$D_1=0$, $D_2=1$ for post-crisis period
b_1=Constant/ intercept for pre-crisis period
$b_1 + b_3$ = Constant/ Intercept during crisis period of i^{th} index values
$b_1 + b_4$ = Constant/ Intercept for post-crisis period of i^{th} Index values
b_2 = Growth rate for pre-crisis period of i^{th}Index values

$b_2 + b_5$ = Growth rate during crisis period of i^{th} Index values
$b_2 + b_6$ = Growth rate for post-crisis period of i^{th} Index values
T = Time period (1 for Jan 2001, 2 for Feb 2001,....., 204 for Dec 2017)
i covers three indices viz. NASDAQ 100, NIFTY50, and FTSE 100

The results obtained are as follow:-

Table 2: Results of Dummy Regression with Applied Data

S. No	COEFFICIENTS	NIFTY50	NASDAQ100	FTSE100
1.	**CONSTANT(b_1)**	6.687***	7.176***	8.426***
2.	**TIME(b_2)**	0.020***	0.003***	0.002***
3.	**D1(b_3)**	1.932***	1.083***	1.302***
4.	**D2(b_4)**	0.945***	-1.057***	-0.185***
5.	**TIME.D1(b_5)**	-0.022***	-0.012***	-0.015***
6.	**TIME.D2(b_6)**	-0.012***	0.010***	-0.001*

***** SIGNIFICANT AT 1% LEVEL OF SIGNIFICANCE * SIGNIFICANT AT 10% LEVEL OF SIGNIFICANCE**

In reference to the above given table, the intercept of the pre-crisis periodof NIFTY50 (i.e. 6.687) is lower than NASDAQ 100 (i.e. 7.176) and FTSE 100 (i.e. 8.426). Also, the intercept during the crisis period is highest of FTSE 100 (i.e. 9.728) in comparison to others. The intercept of post crisis period of NASDAQ100(i.e. 6.119) is lowest among the others. The p-values of all the intercepts are significant.
Now, on the basis of the above table, further analysis of growth rate within and between different countries is done.

The **growth rate of different indices during different periods** is shown in the following table:
Table 3: Comparison of Different Growth Rates from Dummy Regression

TIME/INDEX	NASDAQ100	NIFTY50	FTSE100
PRE-CRISIS	0.30%***	2%***	0.20%***
DURING CRISIS	-0.90%***	-0.20%***	-1.30%***
POST-CRISIS	1.30%***	0.80%***	0.10%***

***** SIGNIFICANT AT 1% LEVEL OF SIGNIFICANCE**

Interpretation of Analysis of Growth Rate between Different Countries:

As seen from the table above, the **growth rate during all the three periods; Pre-Crisis, During Crisis& Post-Crisisfor all the indices** are significant. Hence, we reject our null hypothesis and thus, this concludes that growth rates are significantly different for all the indices for the three periods taken separately.

It can be seen that the growth rate of NIFTY50 is higher than the others in the pre-crisis period. This is because there was an influx of large amount of investors due to the adoption of policy of Liberalization, Privatization & Globalisation by the Government of India which led to the positive economic growth of India from 2001-2006.

The global financial crisis occurred from 2007-2009. The UK economy experienced unexpectedly low productivity growth during that period. This was due to various reasons – low wage growth, flexible labour markets, limited technological innovation and investment.[12] Therefore there was a negative trend rate of UK's economic growth. During the recession, Europe also experienced a trade imbalance. Due to these reasons, UK suffered a dual crisis and hence, the FTSE 100's growth rate is the lowest among all the other indices.

The global financial crisis which erupted in full force in 2007had affected all the countriesin a very similar way,at least at the start. But, as the financial crisis mutated, the US economy grew by about six percentage points more. The main reason for this gap is the difference in private consumption and public consumption, which increased in the US economy immensely. US households were able to reduce their debt burden during a period of high unemployment and almost no wage gains while sustaining consumption growth. Thus, US economy grew at a much faster pace in comparison to others. This can be further confirmed from the fact that NASDAQ 100 growth rate is higher than others in the post- crisis period.

Interpretation of Analysis of Growth Rate within the Countries:

As seen from the table above, the **growth rate during all the three periods; Pre, During & Postfor all the indices** are significant. Hence, we reject our null hypothesis and thus, this concludes that growth rate for an individual index is different for different periods.

As seen above all the indices are following a similar trend i.e. in the pre-crisis period the growth rates are low. This is because the people were reluctant to invest in stock markets. However during the crisis period, the growth rates have further gone down i.e. there is a negative economic growth rate. This is because of the impact of crisis on different nations and their stock markets. And in the post-crisis period, it is seen that all the stock markets are recovering and as people are becoming more aware about investing in stock markets so the growth rates are increasing.

(D) PAIRED SAMPLE T-TEST

We have not estimated any equation for returns since there is much volatility in it. However, as we have to make comparative analysis of returns of the 3 different indices taken in consideration so we have used Paired Sample T-test. The aim of the test is to determine whether there is any statistical evidence due which the mean difference between paired observations on a particular outcome is significantly different from zero.We are applying Paired Sample T-test to compare returns of different indices with respect to 3 different period

(a) Pre-Crisis Period

Table 4: Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	**NIFTY50 - NASDAQ100**	.01833	.08402	.00990	-.00141	.03808	1.852	71	.068*
Pair 2	**NASDAQ100 - FTSE100**	-.00236	.06124	.00722	-.01675	.01203	-.327	71	.745
Pair 3	**FTSE100 - NIFTY50**	-.01597	.06076	.00716	-.03025	-.00169	-2.230	71	.029**

*** SIGNIFICANT AT 10% LEVEL OF SIGNIFICANCE** SIGNIFICANT AT 5% LEVEL OF SIGNIFICANCE**

It can be seen from the above table, that the results of mean difference of Pair 1 and Pair 3 is significant. This means that the null hypothesis of Objective 3 is rejected that the returns of the indices taken in pair are significantly different from zero. As seen in the Pair 1 and Pair 3, returns of NIFTY 50 are significantly higher in comparison to NASDAQ100& FTSE100. This is because India adopted the policy of Liberalisation, Globalisation & Privatization therefore a lot of investors across the globe were willing to invest in India in expectation of higher returns. Thus, making India's economy to rise. But in Pair 2, mean returns of NASDAQ100 and FTSE100 are different but not significant.

(b) During Crisis Period

Table 5: Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	**NIFTY50 - NASDAQ100**	.00944	.06795	.01132	-.01355	.03243	.834	35	.410
Pair 2	**NASDAQ100 - FTSE100**	.00667	.03862	.00644	-.00640	.01973	1.036	35	.307
Pair 3	**FTSE100 - NIFTY50**	-.01611	.07157	.01193	-.04033	.00810	-1.351	35	.185

The global financial crisis which erupted in full force in 2007had affected all the countries in a very similar way, at least at the start. It is evident from the above table, that the meandifferences of different indices pairs are insignificant i.e. the null hypothesis is not rejected and hence the difference between the mean returns is there but is insignificant.

(c) Post Crisis Period

Table 6: Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	**NIFTY50 - NASDAQ100**	-.00552	.04119	.00420	-.01387	.00282	-1.313	95	.192
Pair 2	**NASDAQ100 - FTSE100**	.00979	.02880	.00294	.00396	.01563	3.331	95	.001***
Pair 3	**FTSE100 - NIFTY50**	-.00427	.04210	.00430	-.01280	.00426	-.994	95	.323

***** SIGNIFICANT AT 1% LEVEL OF SIGNIFICANCE**

It can be seen from above table, that the mean difference of only Pair 2 is significant. This means that the null hypothesis of Objective 3 is rejected and that the returns of the indices taken in pair are significantly different from zero. It says that returns of NASDAQ100 are higher than FTSE100. This is because US economy grew at a much faster pace in comparison to others.The reason behind this is that US households were able to reduce their debt burden during a period of high unemployment and almost no wage gains while sustaining consumption growth; as already mentioned earlier. But in case of Pair 1 & Pair 3 the difference between the mean returns is there but is insignificant.

V. CONCLUSION

This paper examines the impact of Global Financial Crisis on three different stock market.

- For the comparison of growth rate between different countries, we found that in the:

a) Pre-crisis period, NIFTY50 was performing the best.
b) During the crisis period, NASDAQ100 was least affected & FTSE100 was the most affected by crisis.
c) Post-crisis period, NASDAQ100 recovered much faster than the other two indices.

- For comparison of growth rate within the countries, we found that all the indices followed a similar pattern i.e. a low growth rate in pre-crisis period followed by a negative growth rate in crisis period and a rising growth rate in the post-crisis period.

- For the comparison of returns in 3 different periods we found that:

a) Returns of NIFTY50 in the pre-crisis period are significantly higher than the others.
b) During the crisis period, there is difference between the mean return of the indices but thatdifference is insignificant.
c) In the Post crisis period, mean returns of NASDAQ100 are significantly higher than FTSE100. There is difference between the mean returns of NIFTY50 and NASDAQ100& FTSE100 and NIFTY50 but that difference is insignificant.

Thus we conclude that global financial crisis had different impact on different nations yet NASDAQ100 in NASDAQ Exchange was able to equip to the crisis and recover from it much faster in comparison to other two indices.

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