A Study on the Volatility of Olympic Games – Hosted Countries' Stock Markets

A. Kotishwar*

* Department of Business Administration, CMR College of
Engineering & Technology, Medchal Road, Telangana

Abstract

In the modern economy, all developed nations are searching for the opportunities to strengthen their economy by taking the advantage of few events such as global sports. Olympic games are the biggest sport events in which all the countries will participate directly or indirectly to make the event success. Olympic games consume billions of dollars to hosting countries in providing infrastructure, hotels, tourism, etc. My analysis has been emphasized how equity markets got influenced by the economic strength to the hosted country. In this study, I have considered 4 countries (USA, Greece, Australia, China, UK) which have hosted olympic games in the year 1996-2012. Risk, returns, volatility has been measured and found in the post-period of olympic games were found to be better than the pre-period of the olympic games in all four countries. The multi-regression model had indicated that all the hosting countries' equity indices have succeeded in influencing the global market benchmark in the post-period analysis. This study is useful to the countries who wanted to host large scale sport events, equity investors, industries who participate in these kinds of events.

INTRODUCTION

Economists accept that in a short span of time sports events will contribute to boost the economy more than any other concept which stimulate spending by the federal govt. along with the industries. Many studies by the research scholars have been proven that global sports events such as Olympic Games conducted by IOC, Foot Ball, Cricket World Cup and other events boosted

the hosted countries' economy in many ways.

The goal of the Olympic Movement is to contribute to building a peaceful and better world by educating youth through sports practiced in accordance with Olympism and its values. Belonging to the Olympic Movement requires compliance with the Olympic Charter and recognition by the IOC. In the present global economic crisis, many countries are searching for the opportunities to take the advantage of capital infusion, so that all the sectors of key pillars of their country economy boosters will be re-energized.

The sectors which will get boost with immediate effect are tourism, hotel industry, hospitality and basic infrastructure. In olympic games, almost more than 200 countries' athletes along with their coaches and team managers will participate. More than 5 crore people will visit the hosted country during that period.

Sports ▮ Chart of the Day

Sports-Related Cost of Olympics

■Summer ■Winter
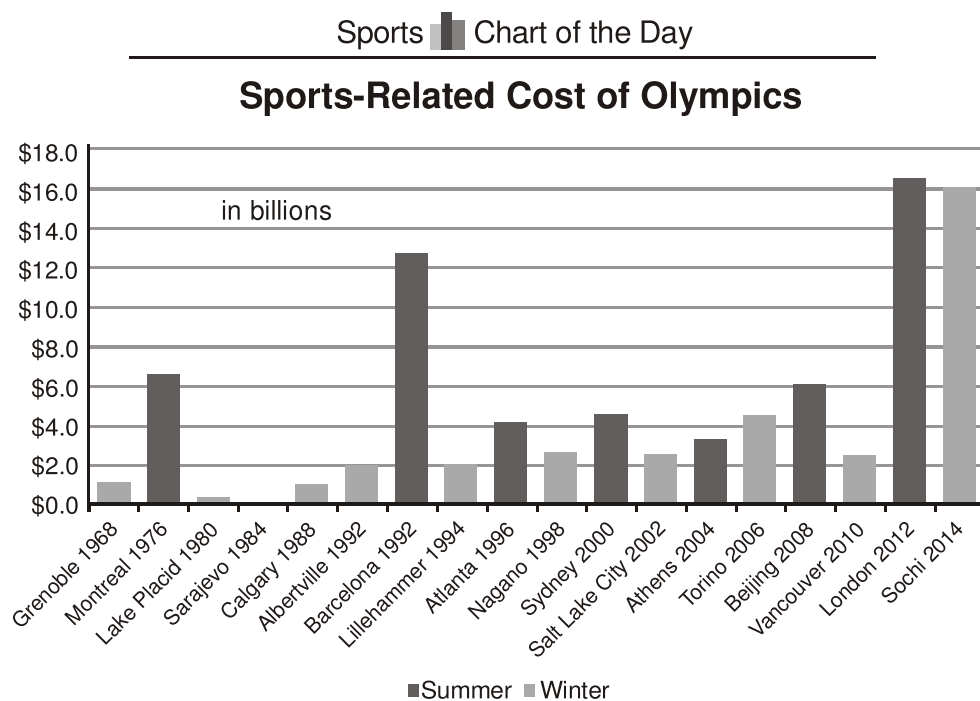
BUSINESS INSIDER

Totals are adjusted for inflation and are in 2015 US$
SOURCE : University of Oxford, The Guardian

1996 Atlanta Olympics cost $ 4 billion but this cost has increased to $ 50 billion, which consists of security, transportation and requirements. Every coin has two sides, likewise conducting big ticket sports events are always crossing cost estimates and many countries are avoiding participating in bidding the sports events. This study has focused to find the volatility of the stock markets

indices of the hosted countries, so that their risk level can be measured from the global investor's perspective.

SCOPE OF THE STUDY

This study has been emphasized for the period of 4years which has been bifurcated into two parts i.e., 2 years pre-period analysis and 2 year post period analysis along with the hosting period of the olympic games with the respective countries. In this analysis equity, indices were considered from 4 countries.

REVIEW OF LITERATURE

Wolfgang Maennig and Felix Richter (2012): The researchers studied the impact of olympic games on the country's exports. Their analysis results unveil the hosting countries use certain signals through which openness and competitiveness. The researchers challenged with the help of their empirical study that structurally different and non-matching groups of countries might suffer from the selection.

Wonho Song (2010) : The researcher has emphasized on the effects of long and short-term benefits on the hosting countries. This study has found that the summer olympic games are having positive impact on country exports in long run and tourism sector will be affected in short-term period. The finding implies that without carefully considering the time horizons on the effects of mega events such as olympic games.

Andrew K. Rose, Mark M. Spiegel (2009) : The authors of this study had proven that the countries which hosted the olympic games and the countries which are applying to host the games, also improved their exports significantly. This study found almost 30% increase in their national exports. These study researchers had developed a political and economic model that formalizes this idea. The countries, who wanted to liberalize their economy, opt for the bidding of the global events.

William Kite (2015) : The author had done the research on the economic changes in the country before they bid for the rights to host the olympic games. This study had investigated the GDP and per capita income of the country and found a significant improvement. Few countries try their level best to improve certain facilities, so that they can bid for the games. The researchers observed few negative effects but many positive impacts that are forcing the country international trade. Though this study has ignored stock markets' behaviour during the hosting period but the present study focused

on volatility of the markets.

Anita Mehrotra (2011) : This study has emphasized to measure the impact on the country which is bidding for the rights of hosting the olympic games. The researcher has considered 10 years' data on post-period. The GDP of the countries which hosted the game and the 1st runner up had found negative or decreasing trend. One time event is forcing the countries to spend detrimental expenditure on certain things which were not contributing for the growth of the country. This paper has been limited to economic growth but failed to consider on stock market effect by the country's economic impact.

RESEARCH GAP

Many researchers had done analysis on the macro level economic factors such as GDP, per capita income, hotel industry, tourism and infrastructure spending. Latest research by the Harward University research scholar, Miss Anita had analyzed pre and post economic impact on the countries which are bidding for the rights to host the olympic games. By studying many research papers she observed that no research has been concentrated on the stock market behavior and its volatility. The present study has been emphasized to understand the risk level by measuring the volatility of the hosting country stock indices.

OBJECTIVES OF THE STUDY

1. To measure the risk of olympic games hosting countries' equity indices during pre and post-period.
2. To know the volatility and returns for the olympic games hosting countries.
3. To measure the impact of olympic games hosting countries' equity indices impact on global equity benchmark volatility.

RESEARCH METHODOLOGY

Stock indices of four olympic hosted countries.

Countries	Australia	Greece	China	United Kingdom
Indices	ASX	ATHEX20	SSE	FTSE

This analysis has been done on secondary data by using descriptive statistical tools. The following formulas were considered for the analysis.
Source of Data : Websites, books, newspapers and journals.
1. **Johensen Co-integration :** Co-integration is a statistical property of time

series variables. Two or more time series are co-integrated if they share a common stochastic drift. If two time series x and y are co-integrated, a liner combination of them must be stationary.

Y – βx = u, Where u is stationary.

2. **Augmented Dickey-Fuller Test :** Augmented Dickey-Fuller Test is a test for a unit root in a time series sample. It is an augmented version of the Dickey-Filler test for a larger and more complicated set of time series models.

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \cdots + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t,$$

Regression : A statistical measure that attempts to determine the strength of the relationship between one dependent variable and the series of other changing variable.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \in$$

Volatility : Volatility will measure the risk of the investment. Standard deviation will give us the fluctuations in form of volatility.

$$\sigma = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (u_i - \bar{u})^2}$$

Beta : Beta will help the investors to ascertain risk level. Beta is also a measure used in fundamental analysis of equity segment to determine the volatility of an asset or portfolio in relation to the bench mark.

Beta : Covariance (ri,rm)/Variance of Market

DATA ANALYSIS

1. To Measure the Risk of Hosting Countries Equity Indices

Table 1

Risk of Hosting Countries Equity Indices

Beta Pre	Beta During	Beta Post
0.20254	0.045646589	0.101687234
1.24103	0.086409058	1.219439716
1.270704	0.185320701	0.182738258
0.179358	0.381238969	0.251200529

Source : Complied data

Interpretation : The above analysis of beta has been applied to measure the risk of the hosting countries' equity indices during the olympic games hosting period and along with the two years of pre and post-period. The risk has been observed is less in post-period analysis than the pre-period. But during the olympic game hosting period risk is found to be less i.e. 0.69 < 1

2. To Measure the Volatility and Returns in Pre and Post-Period of Olympic Games

Table 2
Volatility and Returns in Pre and Post-Period of Olympic Games

Country	Volatility Post	Returns Post	Volatility Pre	Returns Pre
ASX	0.184838894	36.69841698	0.195417176	-9.161974818
Athens	0.190750481	6.784477109	0.223699431	65.33798272
SSE	0.337950415	73.88396319	0.260959545	7.591459246
FTSE	0.581335028	4.150550222	0.510841996	14.14290895
	1.294874819	121.5174075	1.190918147	77.91037609

Source : Complied Data

Interpretation : Volatility and returns has been measured in pre and post-period for the olympic games hosted countries. The volatility in both periods were found to be more or less similar but returns of hosting countries stock indices were observed stronger in post-period than the pre-period returns.

3. To Know the US Markets Influence the Olympic Games Hosted Countries Equity Indices.
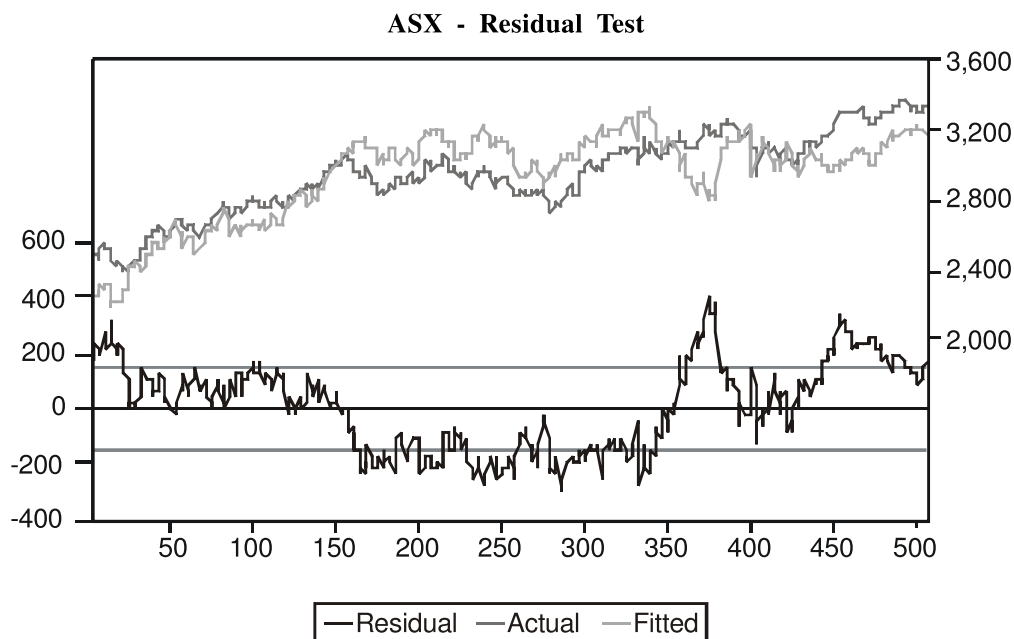
Table 3
ASX Heterokedasticity Test Result

Ask Dow			
Heteroskedasticity Test : ARCH			
F-statistic	1754.788	Prob. F(1,504)	0
Obs*R-squared	393.097	Prob. Chi-Square(1)	0

Source : Complied data

The above analysis of arch test under heteroskedasticity result unveils that the probability value between Australian index and the benchmark Dow Jones observed significance i.e. 0.00 < 0.5

ASX - Residual Test

Interpretation : The above graph of residual test has been applied to find the volatility of ASX and the trend line indicates that volatility is existing during the analysis period as the trend line is moving above the fitted line

Table 4
ASX-DOW JONES from Multi Regression Model

	Variable	Coefficient	Std. Error	z-Statistic	Prob.
ARCH	DOW	0.289983	0.000283	1023.49	0
GARCH	DOW	0.290248	0.000292	994.2586	0
TARCH	DOW	0.290248	0.000319	909.7586	0
EGARCH	DOW	0.290361	0.00029	999.8761	0
PARCH	DOW	0.290596	0.000338	858.7481	0

Source : Complied data

Interpretation : The above Table of multi-regression model has been applied on ASX with DOW JONES in all models of arch, garch, torch, egarch and parches probability found to be significant. It indicates that benchmark Dow Jones volatility got influenced by the ASX (Australian Index). The mean values were stated to be decreasing trend.

Table 5

ATHENS Heterokedasticity Test Result

Asthens Dow			
Heteroskedasticity Test : ARCH			
F-statistic	6717.648	Prob. F(1,417)	0
Obs*R-squared	393.5106	Prob. Chi-Square(1)	0

Source : Complied data

The above analysis of arch test under heteroskedasticity result unveils that the probability value between Athens index and the benchmark Dow Jones observed significance i.e. $0.00 < 0.5$

<p align="center">ATHEX-20 - Residual Test</p>

The above graph of residual test has been applied to find the volatility of Athens-20 and the trend line indicates that volatility is existing during the analysis period as the trend line is moving above the fitted line

Table 6

ATHEX20-DOW JONES from Multi-Regression Model

	Variable	Coefficient	Std. Error	z-Statistic	Prob.
ARCH	DOW	0.208925	0.000367	569.1539	0
GARCH	DOW	0.208807	0.000369	566.6346	0
TARCH	DOW	0.208803	0.000382	546.5478	0
EGARCH	DOW	0.210302	0.000265	792.6684	0
PARCH	DOW	0.209728	0.000392	534.9795	0

Source : Complied data

Interpretation : The above Tables of multi regression model has been applied on ATHENS with DOWJONES in all models of arch, garch, torch, egarch and parch probability found to be significant. It indicates that benchmark Dow Jones volatility got influenced by the ATHENS (Athens Index). The mean values were stated to be decreasing trend.
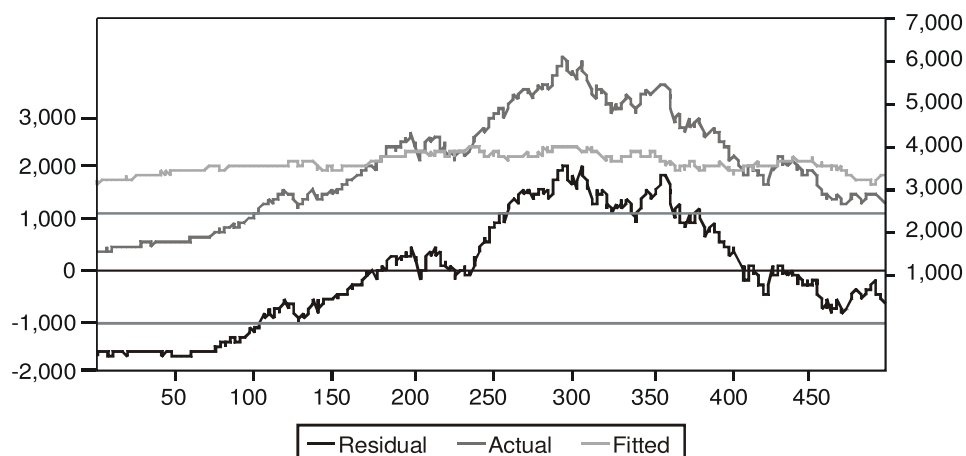
Table 7
SSE Heterokedasticity Test Result

Ask Dow			
Heteroskedasticity Test : ARCH			
F-statistic	17050.33	Prob. F(1,491)	0
Obs*R-squared	479.2004	Prob. Chi-Square(1)	0

Source : Complied data

The above analysis of arch test under heterokedasticity result unveils that the probability value between China index and the benchmark Dow Jones observed significance i.e. 0.00 < 0.5

SSE COMPOSITE - Residual Test

The above graph of residual test has been applied to find the volatility of SSE composite and the trend line indicates that volatility is existing during the analysis period as the trend line is moving above the fitted line

Table 8
SSE COMPOSITE-DOW JONES from Multi-Regression Model

	Variable	Coefficient	Std. Error	z-Statistic	Prob.
ARCH	DOW	0.278385	0.005406	51.49645	0
GARCH	DOW	0.281463	0.000891	315.9117	0
TARCH	DOW	0.280751	0.001324	212.0477	0
EGARCH	DOW	0.280003	0.003144	89.05062	0
PARCH	DOW	0.281402	0.001017	276.6944	0

Source : Complied data

Interpretation : The above Tables of multi-regression model has been applied on SSE COMPOSITE with DOWJONES in all models of arch, garch, torch, egarch and parch probability found to be significant. It indicates that benchmark Dow Jones volatility got influenced by the SSE (Shanghai Stock Index). The mean values were stated to be decreasing trend

Table 9

FTSE Heteroskedasticity Test Result

Ftse Dow			
Heteroskedasticity Test : ARCH			
F-statistic	1840.214	Prob. F(1,504)	0
Obs*R-squared	397.2113	Prob. Chi-Square(1)	0

Source : Complied Data

The above analysis of arch test under heteroskedasticity result unveils that the probability value between London index and the benchmark dowjones observed significance i.e. 0.00 < 0.5

FTSE - Residual Test

The above graph of residual test has been applied to find the volatility of FTSE and the trend line indicates that volatility is existing during the analysis period as the trend line is moving above the fitted line

Table 10

FTSE-DOW JONES from Multi-Regression Model

	Variable	Coefficient	Std. Error	z-Statistic	Prob.
ARCH	DOW	0.472417	0.000737	640.8388	0
GARCH	DOW	0.472252	0.00137	344-6465	0
TARCH	DOW	0.472963	0.001388	340.8654	0
EGARCH	DOW	0.472937	0.000672	703.3033	0
PARCH	DOW	0.474157	0.001118	423.9428	0

Source: Complied data

Interpretation : The above Table of multi regression model has been applied on FTSE with DOW JONES in all models of arch, garch, torch, egarch and parch probability found to be significant. It indicates that benchmark Dow Jones volatility got influenced by the FTSE (Frankfurt Stock Index). The mean values were stated to be decreasing trend

LIMITATIONS OF THE STUDY

1. Dow Jones of USA equity index has been considered as a global equity benchmark
2. Working days of Dow Jones were more than the all 4 countries equity markets working days which have been reduced according to the hosting countries' equity markets functioning dates

FINDINGS OF THE STUDY

1. Risk of the hosting countries' equity indices were found to be less during the hosting period of the Olympics
2. All the countries' average risk is found to be less in the post-period analysis than the pre-period.
3. Returns of the stock indices were improved significantly in post-period analysis than in pre-period returns
4. Volatility of the olympic games hosted countries were found to be similar in both the of pre and post-periods
5. Global equity benchmark volatility has been influenced by the all Olympic Games-hosted countries such as ASX, ATHENS, SSE, and FTSE.

CONCLUSION

I conclude the analysis on equity markets of Olympic Games hosting

countries in pre and post-periods. This study has been bifurcated in two paths to measure and compare the returns, risk and volatility from pre-period analysis to post-period analysis. This study revealed that Olympic games had influenced all the hosting countries economy in post-period analysis significantly. These countries were able to influence the global market movement after the olympic games because the volatility is slightly higher which is 1.29. This study considered only equity data of Olympic Games hosting countries which reflects their economic picture through their equity indices. Hence, there is a future scope to do research on sports events like Olympic Games by considering various economic factors which were not included in the present study.

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