

Analysing the Economic Impact of the Olympics Using Stock Market Indices of Host Countries

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Abstract: Hallmark events are defined as those which promote a host city as an international tourism destination (Hall, 1992). They are on a scale that can produce a high performance in tourism, media coverage and economic impact for the host community or destination (Getz, 1997). Moreover, most hallmark events have substantial government commitment. Mega events include religious, cultural, commercial, political and/or sports events. According to Hall (1992), sporting events are the most notable model of hallmark events. The Summer and Winter Olympic Games are identified as mega sports events.

Mega sporting events are the most notable model of hallmark events and they have the characteristics of a festival. Traditional sports events like the Olympics always combine ceremonies and festivals (Getz, 1997). A mega event has two main characteristics: internal aspects and external aspects. The internal aspect is mainly its scale while the external aspect is mostly its attractiveness to tourism and the media, and its economic impact on the host city. (Malfas, et al., 2004). Although mega events have a limited duration, they have a huge impact on the host country in terms of tourist volumes, visitor expenditure, heightened awareness and a positive image of the city. There are also related infrastructural and organizational developments, which increase the destination's competence and attractiveness (Fayos-Sola, 1997).

As the Olympics are mega event and arguably the most prestigious of all sporting events, the Games are held on a scale that can produce a high performance in tourism, media coverage and economic impact for the host community or destination. The purpose of this paper is to examine the economic impact of the Summer Olympic Games on the host cities using the stock market approach. There are very few studies which examine stock market reactions to mega sporting events selection announcement. Given the benefits of hosting the Olympic Games and the fierce competition which accompanies the selection of host Olympics cities, we would expect a positive (negative) market reaction on the stock exchange of the country which wins (loses) the bid to host the Games. Most of the cities which have hosted the Olympics are already tourist destinations. We will compare the stock market performance of countries which hosted the five Summer Olympic Games from 1988 to 2004. The host countries vary from the large economies of the USA, Japan and France to the smaller economies like South Korea (in the 1980s) and Greece. Hence, the economic impact of the Olympics varies among host cities, depending on the economic scale of the host country in terms of their Gross Domestic Product.

Keywords: *Olympic Games, sports tourism, economic impact, stock market indices*

1. INTRODUCTION

The number of sports events has increased rapidly over time. There are several classifications of sports events. For instance, sports events can be classified into four categories according to their scale. They include mega events, special events, hallmark events and community events (see Table 1). Mega events such as Expos, the Olympics and the World Cup Football, have a global target. As for special events like the Formula 1 Grand Prix, World regional Games such as the Pan-American Games or the Asian Games, their target is a world region or at the national level. Hallmark events include national sports events such as the Australian Games or the National Sports festival of Japan. Community events refer to rural or local community sporting competitions, and their target is a regional or local area (Roche, 2000).

Table 1. Sports Events: Types and Dimensions

Event type	Event	Dimension
Mega Event	EXPO, FIFA, World Cup	Global
Special Event	F1, Pan-American Games, Asian Games	Global-Regional
Hallmark Event	Australian games, national Sports festival of Japan	National
Community Event	Rural Community Event	National-Regional

Source: Roche (2000)

Gratton, et al. (2000) used another classification in which sports events are divided into four categories based on the extent to which the event is capable of generating substantial economic benefits (see Table 2). Type A and B sports events are both major international spectator events which generate significant economic impact for the host cities. As cities have to compete to host events such as the Olympics, Football World Cup, European Football Champions League Final, type A events are regarded as irregular or one-off from the host country perspective. Type B events are held annually either in the same or designated venue and they include the FA Cup Final, Six Nations Rugby Union Internationals, Test Match Cricket, Open Golf and the Wimbledon. However, most sports events belong to types C and D. They are smaller events with limited economic impact. Type C includes special international competitor events which move from country to country, and hence they are considered irregular or one-off events for host countries. The European Junior Boxing Championships, European Junior Swimming Championships, World Badminton Championships, IAAF Grand Prix belong to this category. Type D events are part of the annual cycle of sports events and National Championships in most sports are in this category.

Table 2. Type of Sports Event

Type	Frequency	Level of impact	Event
A	Irregular/ one-off	Significant economic activity, media interest	Olympic Games, FIFA World Cup, UEFA cup
B	Annual	Significant economic activity	FA Cup Final, Wimbledon, Cricket Test Match
C	Irregular/ one-off	Limited economic activity	European Junior Swimming Championship
D	Annual	Limited economic activity	National Championship in most sports

Source: Gratton, Dobson and Shibili (2000)

2. OLYMPIC GAMES

The Olympic Games are international mega sports events which are televised globally. Although they are one-off events, they contribute significant economic benefits to the host cities (Gratton, et al., 2000). The Ancient Olympic Games began at Olympia in Greece in 776BC and continued until the Christian Emperor Theodosius I abolished them in AD 394. The Modern Olympic Games started in the late 19th century. In 1894, the first Olympic Congress was held at the University of the Sorbonne in Paris. The Congress adopted Pierre Fredey, Baron de Coubertin's suggestion to rekindle the ancient Greek Olympic Games and the International Olympic Committee (IOC) was established in the same year. The decisions also included the hosting of the Olympic Games in a four-year cycle and in different sites or countries (Girginov and Parry, 2005).

The modern Olympic Games in Athens, Greece, began in 1896 and the Winter Olympic Games in Chamonix in 1924. After the Los Angeles Olympic Games in 1984, the scale of the Olympics continued to expand quickly. The Summer and Winter Games are each held every four years. They were held in the same year until 1992. However, the IOC voted to change the schedule of the Olympic Games in 1986. As a result, the Summer Olympic Games would be held in different years from the Winter Olympic Games. Since the

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Lillehammer Winter Olympic games in 1994, the Summer and Winter Olympic Games have been held two years apart (IOC Official Website of the Olympic Movement).

The Olympics is arguably the world's largest mega-event with considerable economic, social and political costs and benefits for the host city or country (Hall, 1992). Given the potential economic benefits, many cities have been attracted to participate in the bidding competition for the right to host the Olympic Games. The number of participating countries for the Summer Olympic Games has increased gradually from 14 countries in the first Olympic Games in 1896 to 121 countries in the 1972 Munich Olympics. In particular, it jumped quickly after the 1984 Los Angeles Olympics to as many as 200 participating countries for the Athens Olympics in 2004. On the other hand, the Winter Olympic Games began in 1924 with 16 countries and the number of participating countries gradually increased to 37 for the 1980 Lake Placid Olympics. After the Sarajevo Olympics in 1984, the number increased to 80 countries for the 2006 Turin Olympic Games (IOC Official Website of the Olympic Movement).

Invariably, the scale of the Summer Olympic Games is larger than the Winter Olympic Games. The number of athletes in the Summer Olympic Games has also increased gradually. In the 1996 Atlanta Olympics, there were more than 10,000 athletes and it reached 11,099 in the 2004 Athens Olympics. In contrast, the number of athletes in the Winter Olympic Game grew slowly from 1423 in the 1988 Calgary Olympics to 2508 athletes in the 2002 Salt Lake City Olympics. On average, there is about five times as many athletes in the Summer Olympic Games compared to the Winter Olympic Games. The number of events in the Summer Olympic Games rose from 263 in the 1988 Seoul Olympics to 300 events in the 2000 Sydney Olympics. On the contrary, the number of events at the Winter Olympic Games has increased gradually from 46 in the 1988 Calgary Olympics to 78 in the 2002 Salt Lake City Olympics. The number of events at the Summer Olympic is approximately four times that of the Winter Olympic Games (IOC Official Website of the Olympic Movement).

2.1. Bidding and selection processes

The host city for the Olympic Games is selected by a bidding process. It takes at least eight years to put forward a bid and set up the Olympic Games. The IOC declaration prescribes that all candidate cities must respond to a very comprehensive questionnaire and show detailed arguments in favour of their bid (Girginov and Parry 2005). Since the Modern Olympic Games began in 1896, more than 100 cities from 42 countries have participated in the bidding for the Olympic Games (GamesBids.com, IOC Official Website of the Olympic Movement).

The selection process for the host city of the Olympic Games is reviewed strictly by the IOC to ensure a fair judgment of the bids. Before the Salt Lake Olympic Games, some IOC members were forced to resign after they accepted excessive gifts in return for voting for the host city (Girginov and Parry, 2005). Although many cities have participated in the bidding competition, most of the past host nations are developed countries. About thirty developed countries manage the organisation of approximately 95% of all international and world sports events (Andreff, 2001). Furthermore, 86% of the host countries of the Olympic Games are located in either Europe or North America (GamesBids.com, IOC Vote History).

To measure the economic impact of the Olympic Games, it is important to consider the time scale involved. According to Blake (2005), the economic activities and impacts can be divided into three stages:

- i) pre-Olympic Games - impacts of the construction stage of the Olympic project, other pre-Olympic Games costs and visitor impact of the project.
- ii) during Olympic Games – impacts related to revenues and costs from staging the Olympic Games, and tourism.
- iii) post-Olympic Games - includes legacy visitor and infrastructural impacts.

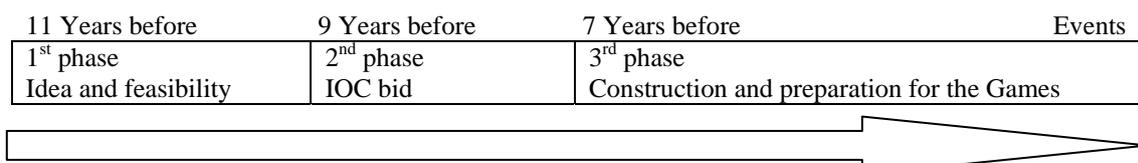


Figure 1. Phase of economic activities through Olympic Games
Source: Preuss (2004)

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The duration of economic activities and the benefits generated in stage (i) could be at least 11 years prior to the staging of the Olympic Games. The time period can be split into four phases (see Figure 1). The first two years are the idea and feasibility phase. When a city has won the bidding competition and been nominated as the host city, its term is more than two years. The next two years are the IOC bid phase, which is also split into two stages. The first year is the applicant stage in which the IOC evaluates the physical infrastructure of the cities. The second year is the candidature stage in which the secret ballot of the Olympic city are cast by all IOC members. The third phase of 6 or 7 years is the construction and preparation phase for the Olympic Games and it is a very important period for the economic impact on the host city and country (Preuss, 2004).

3. STOCK MARKETS AND SPORT EVENT STUDIES

Stock Exchanges are corporations in which public institutions and industries can raise long-term capital for development projects and/or for businesses to facilitate growth. They provide trading facilities for investors to buy and sell securities. A stock market index is used to monitor the performance of a group of stocks. It is a statistic reflecting the composite value of its components and a measure of the return that would accrue to the holder of a particular set of equities. A stock market index is a numerical representation of how well the set of equities has performed relative to a broad-based index at a start date in the past (Reuters Limited 1999). For example, the Dow Jones Industrial Average is an index based on the performance of the stocks of 30 large companies.

The end of the Cold War and policies favouring free markets have produced an expanding demand for funds to finance investment. Since 1990, the global financial markets have expanded rapidly and the value of the stock market has jumped from 1995 to 2000 (Teweles and Bradley, 1998). There are three main zones in the world stock exchanges: Asia, Europe and America. In 2005, the share value of stock of the American zone was 50.9%, followed by the European and Asian zones of 31.8% and 17.3%, respectively. There are over 50 stock exchanges in the world and the total value of all the companies on all stock exchanges amounts to more than £20,000 billion. New York, London and Tokyo account for over half of the world's total equity capital, with New York being the largest capital market (World Federation of Exchanges). The Tokyo stock exchange is the largest in the Asian zone with the Stock Exchanges in South Korea, Australia and Taiwan just behind. In the European zone, the London Stock Exchange is the largest, followed by Euronext and the Frankfurt Stock Exchange based in France and Germany, respectively. In the American zone, the New York Stock Exchange and the National Association of Securities Dealers Automated Quotations system have more than 90% equity market share in this zone, followed by Canada (World Federation of Exchanges).

Sports are estimated to make up 3 per cent of GDP in the OECD countries (Gratton and Henry 2001). The scale of the US sports industry was US\$ 152 billion in 1995 and was ranked the 11th largest industry in the country (Meek, 1997). As the sports industry continues to grow, mega sports events can have a significant impact on the financial markets, and stock market performance has been influenced by sports-related news. However, very few studies have been undertaken to examine the impact of sports events on the stock market, and the former includes those which used the event-study method. Event studies use data from financial markets to analyse the financial gains and losses associated with new information. These studies have been applied to a variety of corporate-specific and economy-wide events (MacKinlay, 1997). For instance, event study methodology is frequently used to analyse corporate mergers or acquisitions, and to measure how a company's stock price reacts to new information (Seiler, 2004).

There are few papers which examine mega sports events using event study methodology. Krueger and Kennedy (1990) investigated the relationship between the stock market performance and the annual American Football (also known as 'Super Bowl') between 1967 and 1988. Aston *et al.* (2003) examined the relationship between the performance of the English national football team and daily changes in the FTSE 100 index between January 1984 and July 2002. Their empirical findings show a significant relationship between the performance of the English national football team and the price change on the UK stock market.

To date, only two studies have analysed the impact of the Olympic Games on the stock market. Berman, *et al.* (2000) used the AR(1) model to examine the impact of the selection announcement of Sydney as the host city for the 2000 Olympics on the Australian Securities Exchange (ASX). Nine years of daily stock data for the All Ordinaries Index and twenty three ASX Industry accumulation indices (which include banks, construction, engineering, media, transport and so on) are used in the study. The announcement has no significant impact on the ASX. Subsequently, the market model was used for each of the twenty three ASX industry accumulation indices.

The Olympic Games announcement has positive impact on the stock prices of some industries such as building material, construction, engineering and miscellaneous service industries. The study also compared

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the performance between New South Wales-based stocks (the hosting state of the Games) and non New South Wales-based stocks (where the company's headquarters were located in other states). New South Wales-based stocks show significant and positive performance.

Veraros, et al. (2004) examined the impacts of the selection announcement for the 2004 Olympic Games on the stock prices of Greece and Italy. Since Athens was selected as the hosting city and Rome lost out in the bidding competition, this study compared the overall stock prices and industrial indices on the Athens and Milan stock exchange. Weekly stock price index over eight year period were used for the analysis. Although the selection announcement of Athens as the 2004 Olympic Games' host city resulted in a positive impact on the Athens Stock Exchange, this announcement did not have a significant negative impact on the Milan Stock Exchange.

Financial markets, especially the stock indexes, are sensitive to future business prospects. As the sports industry continues to expand, and economic activity is often influenced by sports events, more study on the possible links between the stock market and sports events is needed.

4. METHODOLOGY AND RESULTS

The purpose of this paper is to examine the impact of the host city selection announcement date on the stock market returns by using several host countries' stock market indices as proxies. A dynamic model (similar to the one in Berman, et al. (2000) and Veraros, et al. (2004)) is used to estimate the announcement impact of the Olympic Games from 1988 to 2004.

The stock index is used as a proxy for measuring the economic impact since the stock market basically reflects the country's economic fundamentals and relevant information that is known about a firm's future (Seiler, 2004). If the stock market expects a positive profit opportunity for business in the future as a result of the announcement, stocks are more likely to be bought and the share prices would increase. On the other hand, if the stock market expects future business to be negative, the affected stocks would be sold. The stock market often overreacts beyond the economic fundamentals because of psychological factors. However, the trending pattern of the stock market basically indicates the business or economic prospects of the country.

It is hypothesised that the announcement impact of the Olympic Games on the host countries would be different depending on their economic scale. For large economies, the economic impact compared to the total size of the economy is likely to be relatively small. On the other hand, the economic impact of the Olympic Games on small economies is likely to be large.

We will analyse five Summer Olympic Games between 1988 and 2004. The sample in this study includes: 1988 Seoul (South Korea), 1992 Barcelona (Spain), 1996 Atlanta (USA), 2000 Sydney (Australia), 2004 Athens (Greece)

Table 3. List of Stock Index for the Summer Olympic Games

Olympic Games		Stock Indexes
2004 Athens	winner	Athens Stock Exchange General Indexes
	loser	Milan MIB 30 Index
2000 Sydney	winner	The Standard & poor's / Australian Stock Exchange 200
	loser	The Shanghai Stock Exchange Composite Index
1996 Atlanta	winner	The Dow Jones Industrial Average
	loser	Athens Stock Exchange general Index
1992 Barcelona	winner	Spain MA Madrid Index
	loser	France DS market Index
1988 Seoul	winner	The KOSPI Index
	loser	The NIKKEI 225 Stock Average Index

Source: Bloomberg World Indexes (2008)

Table 4. Summer Olympic Selection Announcement Dates

Olympic Games	Observation Periods (2609 days)	Selection Announcement Date
1988 Seoul	30 Sep, 1980- 28 Sep, 1990	02 Oct, 1981
1992 Barcelona	16 Oct, 1985- 16 Oct, 1995	17 Oct, 1986
1996 Atlanta	18 Sep, 1989- 16 Sep, 1999	24 Sep, 1990
2000 Sydney	23 Sep, 1992- 23 sep, 2002	24 Sep, 1993
2004 Athens	05 sep, 1996- 05 sep, 2006	08 Sep, 1997

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All stock index data are obtained from DataStream. The selected stock market indexes of the host country for the Olympic Games (winner) and the runner-up country (loser) which lost out in the bidding are used in the study (see Table 3). For each Olympic Games, daily data from the main stock index of the host countries (for winning cities) and the runner-up countries (for losing cities) involved in the final stage of the bidding competition were collected for ten-year period (or 2609 business days). Specifically, the sample period starts approximately a year prior to the selection date. Table 4 shows the sample periods and the selection announcement date for the various Olympic Games from 1988 to 2004.

Using the EViews 5 econometric software package to estimate a single-equation model by OLS, the impact of the Olympic announcement date on the stock market is as follows:

$$R_t = \alpha + \beta R_{t-1} + \gamma D_t + e_t$$

where R_t is the daily stock return at time t , α , β and γ are the parameters to be estimated, D_t is the Olympic selection announcement dummy variable which takes the value 1 for the announcement day and zero otherwise. The dependent variable, R_t , is the daily stock return given by the percentage change in the stock index. The null and alternate hypotheses are:

$$H_0 : \gamma_W = 0 \quad H_1 : \gamma_W > 0 \quad (\text{winning city})$$

$$H_0 : \gamma_L = 0 \quad H_1 : \gamma_L < 0 \quad (\text{losing city})$$

Table 5. Impact of Selection Announcement on the Summer Olympic Winning Cities

Olympic Games	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\gamma}$
1988 Seoul	0.0006 (2.51)	0.086 (4.40)*	0.029 (2.47)*
1992 Barcelona	0.0004 (1.66)	0.225 (11.8)*	0.001 (0.10)
1996 Atlanta	0.0005 (3.0)	0.021 (1.07)	0.001 (0.11)
2000 Sydney	0.0003 (1.57)	0.038 (1.96)*	0.009 (1.08)
2004 Athens	0.0004 (1.35)	0.145 (7.51)*	0.076 (4.63)*

Note: t-statistics given in parentheses.

*Denotes 5% significance level

Table 6. Impact of Selection Announcement on the Summer Olympic Losing Cities

Olympic Games	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\gamma}$
1988 Nagoya	0.0004 (2.02)	0.072 (3.67)*	0.002 (0.21)
1992 Paris	0.0004 (1.69)	0.095 (4.84)*	-0.011 (1.04)
1996 Athens	0.0009 (2.51)	0.159 (8.23)*	-0.083 (4.56)*
2000 Beijing	0.0003 (0.58)	0.006 (0.30)	-0.010 (0.36)
2004 Rome	0.0004 (1.43)	-0.015 (0.77)	0.003 (0.23)

Note: t-statistics given in parentheses.

*Denotes 5% significance level.

Tables 5 and 6 show the impact of the selection announcement on the stock market of the host city and the runner-up/losing city in the Summer Olympic. The announcement has a significant impact on the stock returns for host/winning cities of Athens and Seoul at the 5% level. Additionally, the results show that the selection announcement has a significant negative impact on Athens when it lost its bid to Atlanta to host the 1996 Olympic Games.

The results provide some support to the argument that mega sports events like the Olympic Games have significant economic impact on small economies like South Korea (in the 1980s) and Greece but not large economies like the USA, France or Japan.

5. CONCLUDING REMARKS

The AR(1) model is used to analyse the impact of the Olympic selection announcement date on the various stock markets from 1988 to 2004. Stock returns are affected by systematic and unsystematic risk factors such as corporate earnings, economic indicators (changes in GDP, inflation, interest rates), political risk, labour

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strikes and so on. A mega sports event like the Summer Olympic Games is one of the many market factors that could have an impact on stock returns.

The stock index of shares listed on the Stock Exchange comprises the market capitalisation of many types of industries such as manufacturing, banking, insurance, transport, media, construction and so on. Future research should include the analysis of stock returns by industry group. The stock prices of companies related to tourism, construction and miscellaneous services could be more responsive to selection announcement and the hosting of the Olympic Games than other industries like mining or chemicals which are not directly affected by the Olympic Games.

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REFERENCES

- Andreff, W. (2001). The correlation between Economic Underdevelopment and Sport, *European Sport Management Quarterly* 5, 251-279.
- Ashton, J., B. Gerrard & R. Hudson (2003). Economic impact of national sporting success: evidence from the London stock exchange. *Applied Economics Letters*, 10, 783-785.
- Blake, A. (2005). The Economic Impact of the London 2012 Olympics Games. http://www.nottingham.ac.uk/ttri/pdf/2005_5.pdf, accessed on 23 December 2008.
- Berman, G., R. Brooks & S. Davidson (2000). The Sydney Olympic Games announcement and Australian stock market reaction. *Applied Economics Letters*, 7, 781-784.
- Bloomberg World Indexes at <http://www.bloomberg.com/markets/stocks/wei.ht/ml>, accessed on 23 December 2008.
- Fayos-Sola, E. (1998). The impact of mega events. *Annals of Tourism Research* 25, 241-245. GamesBids.com at <http://www.gamesbids.com/eng/past.html>, accessed 28 November 2008.
- Getz, D. (1997). *Event management & event tourism*. New York: Cognizant Communication Corp.
- Girginov, V. & J. Parry (2005). *The Olympic Games explained: a student guide to the evolution of the modern Olympic Games*. New York: Routledge.
- Gratton, C., N. Dobson & S. Shibli (2000). The economic importance of major sports events: a case-study of six events. *Managing Leisure* 5, 17-28.
- Gratton, C. & I.P. Henry (2001). *Sport in the city: the role of sport in economic and social regeneration*. London: Routledge
- Hall, C.M. (1992). *Hallmark tourist events : impacts, management, and planning*. London: Belhaven Press.
- IOC Official Website of the Olympic Movement at http://www.olympic.org/uk/games/index_uk.asp, accessed 28 November 2008.
- IOC Vote History at <http://www.aldaver.com/votes.html>, accessed 28 November 2008.
- Krueger, T.M. & W.F. Kennedy (1990). An Examination of the super bowl stock market predictor. *Journal of Finance*, 45, 691-697.
- MacKinlay, A.C. (1997). Event Studies in Economics and Finance. *Journal of Economic Literature*, 35, 13-39.
- Malfas, M., E. Theodoraki & B. Houlihan. (2004). Impacts of the Olympic Games as mega-events. *Municipal Engineer*, 157, 209-220.
- Meek, A. (1997). An Estimate of the Size and Supported Economic Activity of the Sports Industry in the United States. *Sport Marketing Quarterly*, 6, 15-22.
- Preuss, H. (2004). *The economics of staging the Olympics : a comparison of the games, 1972-2008*. Cheltenham, UK: Edward Elgar.
- Reuters Limited. (1999). *An introduction to equity markets*. Singapore: Wiley.
- Roche, M. (2000). *Mega-events and Modernity: Olympics and expos in the growth of global culture*, New York: Routledge.
- Seiler, M.J. (2004). *Performing financial studies: a methodological cookbook*. Upper Saddle River, NJ: Prentice Hall.
- Teweles, R.J. & Bradley, E.S. (1998). *The Stock Market*. New York: Wiley.
- Veraros, N., E. Kasimati & P. Dawson (2004). The 2004 Olympic Games announcement and its effect on the Athens and Milan stock exchanges. *Applied Economics Letters*, 11, 749-753.
- World Federation of Exchange at <http://www.world-exchanges.org/WFE/home.Asp?nav=ie>, accessed 18 December 2008.