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Nontechnical Summary

The Olympic Games usually involve substantial infrastructure investment and boost tourism to the host country. Therefore, the economic impact of the Olympic Games usually receives broad public alertness. However, a full evaluation of this economic impact is rather difficult, since such a mega event has short term and long term, as well as direct and indirect effects, which complicates the estimation of its costs and benefits.

Stock market provides an alternative way of evaluating the economic impact of Olympic Games. The stock market, a barometer of the economy, is commonly believed to reflect the expectations for the economic outlook. Mega sports events are usually perceived to positively affect the host countries' economy. Hence, the announcement of the host city by the International Olympic Committee should result in a positive reaction of the stock market of the country which is awarded the sports event ("winner country") and in a negative one in those of their unsuccessful competitors ("losing countries").

This paper studies the stock market reactions to the announcement of the Olympic Games host cities during the last three decades. We find a significant and positive announcement effect of hosting the Summer Games which is reflected in the returns (additional 2 percent cumulated over the following days). We do not find any significant results for the Winter Games. Neither do we detect a significant impact when bidders lose the competition. Our results differ from those of a similar study by Mirman and Sharma (2008), who find that the Winter Games are subject to a significantly negative announcement impact, while the Summer Games are not. Our results, however, rely on a larger sample of 15 Olympic events and are obtained by assessing the observed returns after the announcement against a "business–as–usual" situation (instead of testing the difference between the winner group and the loser group).

Our findings are in line with economic intuition, since the Summer Games are larger than the Winter Games and are thus more likely to have a significant impact. We also find that among the winners, small economies tend to have greater cumulative abnormal returns than their large peers.

Nichttechnische Zusammenfassung

Üblicherweise führen die Olympischen Spiele zu maßgeblichen Infrastrukturinvestitionen wie auch zu erhöhtem Tourismus im Gastgeberland. Nicht zuletzt deshalb wird den ökonomischen Auswirkungen der Olympiade in der Öffentlichkeit breite Beachtung geschenkt. Eine vollständige Bewertung des wirtschaftlichen Einflusses von Olympischen Spielen ist jedoch recht kompliziert, da ein solches Großereignis kurzfristige sowie langfristige direkte und indirekte Effekte mit sich bringt.

Der Aktienmarkt bietet eine Alternative, um die ökonomischen Auswirkungen von Olympischen Spielen zu bewerten. Er gilt als Barometer der Volkswirtschaft, der die Geschäftserwartungen eines Landes reflektiert. Große Sportereignisse scheinen oft die Wirtschaft der Gastgeberländer positiv zu beeinflussen. Entsprechend sollte die Ankündigung des Internationalen Olympischen Kommitees, welche Stadt die Spiele ausrichten darf, positive Reaktionen auf dem Aktienmarkt des betreffenden Landes ("Gewinner") sowie negative Reaktionen auf denen der unterlegenen Konkurrenten ("Verlierer") auslösen. Dieser Beitrag untersucht die Aktienmarktreaktionen auf die Ankündigung der olympischen Gastgeberstädte in den letzten drei Jahrzehnten. Wir finden signifikante und positive Ankündigungseffekte für die Gastgeberländer der Sommerspiele, welche sich in den Renditen (über die Folgetage kumuliert etwa zusätzliche 2 Prozent) bemerkbar machen. Für die Winterspiele finden wir ebenso wenig signifikante Ergebnisse wie für die unterlegenen Kandidaten des Wettbewerbs um die Ausrichtung. Unsere Ergebnisse unterscheiden sich von denen einer ähnlichen Studie von Mirman and Sharma (2008), die für die Winterspiele einen signifikant negativen Effekt sowie keinen Effekt für die Sommerspiele entdecken. Unsere Ergebnisse stützen sich mit 15 Olympiaden auf eine größere Grundgesamtheit und beurteilen die beobachteten Renditen im Vergleich zu der Situation gewöhnlicher Marktaktivität (statt den Unterschied zwischen Gewinnern und Verlierern zu testen). Unsere Ergebnisse entsprechen der ökonomischen Intuition, da die Sommerspiele größer als die Winterspiele sind und deswegen ein merklicher Effekt wahrscheinlicher ist. Wir stellen ebenfalls fest, dass innerhalb der Gewinnerländer kleine Volkswirtschaften eher höhere kumulierte abnormale Renditen haben als größere.

The Economic Impact of Olympic Games: Evidence from Stock Markets *

Christian D. Dick§ and Qingwei Wang‡

Abstract

By means of an event study of stock market reactions to the announcement of the Olympic Games host cities, we find a significant and positive announcement effect of hosting the Summer Games, with a cumulative abnormal return of about 2% within a few days. We do not find any significant results for the Winter Games. Neither do we detect a significant impact when bidders lose the competition. Our results differ from those of a similar study by Mirman and Sharma (2008), who find that the Winter Games are subject to a significantly negative announcement impact, while the Summer Games are not. Our results, however, rely on a larger sample of 15 Olympic events and are obtained by assessing the abnormal returns after the announcement against a "business–as–usual" situation (instead of testing the difference between winner group and loser group). Our findings are in line with economic intuition, since the Summer Games represent a larger event and are thus more likely to have a significant impact. We also find that among the winners, small economies tend to have greater cumulative abnormal returns than their large peers.

Keywords: Olympic Games, economic impact, event study, stock markets.

JEL Classification: L83, G14

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1 Introduction

This paper studies the stock market reaction to the International Olympic Committee (IOC) announcement of the host cities of the Olympic Games in the past three decades by means of an event study. Mega sports events are usually perceived to positively affect the host countries' economy. Since stock markets are assumed to reflect the expectations for the economic outlook, the announcement of the host city should result in a positive reaction in the winner's stock market and in a negative one in those of their losing competitors[1].

Different studies are devoted to identifying the direct, indirect and induced economic impacts of the Olympic Games (for a survey, see Kasimati 2003). Instead of discussing the effects on various macroeconomic variables, our study focuses on stock prices, which presumably reflect the business expectations for the respective countries. The reaction of stock markets to the Olympic Games announcement has been investigated in single-event case studies by Berman, Brooks, and Davidson (2000) and Veraros, Kasimati, and Dawson (2004). The former contribution focuses on the announcement of the 2000 Olympic Summer Games and its impact on the Australian stock market, whereas the latter discusses stock price movements in Greece and Italy after the IOC decision in favor of Athens (instead of Rome) for 2004. Statistical analysis which applies event study methodology makes it possible to go beyond the scope of investigating single events and to draw inference on different observations. Martins and Serra (2007) perform a broad study on mega events, including Olympic Games, to discuss hypotheses about rational and behavioral asset pricing theories.[2] Mirman and Sharma (2008) investigate the stock market impact for the 1996 to 2010 Olympic Games, comparing the stock market reaction of winners and losers around the announcement date. They find that, for the Winter Games announcement, stock markets in winning countries perform significantly worse than in losing countries, while there are insignificant results

[1] "Winner" refers to the country/ the city that is awarded the Olympic Games, whereas "loser" refers to a bidding country which does not succeed with its candidacy

[2] Their reported results for the individual events, however, substantially differ from Mirman and Sharma's (2008) findings as well as the ones from our analysis.

for the Summer Games.

To assess the economic impact of the Olympic Games expected by market participants, Mirman and Sharma (2008) test for the difference between winners and losers. That methodology depends on the chosen group of losers. Indeed, stock market reactions are expected to differ across losing countries with respect to the ex-ante probability of winning the announcement. For example, no negative announcement effects should be expected for those ex-post losers who have very low ex-ante probabilities of winning the competition. Therefore, there will presumably be a difference in the results when comparing the group of the winners to the one of the losers if the latter is composed by all losing cities or only by those with the highest ex-ante winning probability. We circumvent this difficulty by testing the abnormal returns of winning and losing countries separately. That is, we assess the economic impact by comparing the market reactions after a (positive or negative) IOC announcement with the "business–as–usual" situation. We also consider a group of "first losers" (those ranked in the second place in the last round of the competition). The ex-post ranking of IOC voting results are used as a proxy for the ex-ante probability of winning the competition. First losers are expected to be affected by the negative news of the IOC decision in a stronger way than the other losers.

On the basis of a more comprehensive data set than used before (15 Summer Games or Winter Games), we find insignificant overall results for the Winter Games. In contrast, for the successful applicant for the Summer Games, we find positive and significant results. Yet we do not find significant results for the losers of the competition. These results also hold true when only the first losers are considered. Our results are in line with economic intuition: The Summer Games are bigger and therefore more likely to have a significantly positive impact; since the Winter Games have a smaller scale[3], markets might not react clearly enough to indicate a significant impact. Based on a cross sectional analysis of all Olympic host cities, the abnormal returns after the announcement tend to be higher in small economies.

The remainder of this paper is structured as follows. Section 2 briefly describes the event study methodology applied in our paper. Section 3 reports the empirical results of our investigation.

[3]For example, the 2004 Summer Games had 10,500 participants, as opposed to the 2006 Winter Games with only 2,633.

Section 4 concludes.

2 Methodology

MacKinlay's (1997) event study methodology provides a frequently applied framework to identify abnormal returns which are triggered by surprising upcoming information in the stock market. In order to disentangle abnormal returns from usual fluctuations in the stock market, the market model makes use of the statistical relationship between a market portfolio (represented by, e.g., a national stock market index) and the considered security. The present analysis uses a market model given by

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}, \quad E(\epsilon_{it}) = 0, \quad Var(\epsilon_{it}) = \sigma^2_{\epsilon_i} \tag{1}$$

where R_{it} represents the log- return of market i (measured by the national stock indices) and R_{mt} the log- return of the world portfolio.[4] The parameters $\hat{\alpha}_i$, $\hat{\beta}_i$ and $\hat{\sigma}^2_{\epsilon_i}$ are estimated for the estimation window from $T_0 = -241$ to $T_1 = -41$ days before the respective announcement of the IOC decision.

Assuming that these coefficients are stable over time, the abnormal returns for the event window can be computed by $AR_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau}$, where $AR_{i\tau}$ denotes the abnormal returns of market i at point τ during the event window.

The assessment of overall market reactions to an IOC decision announcement needs to be based on several observations. First the observations are grouped according to their properties (e.g. winning/loosing cities). Within each group of interest, the average cumulated abnormal returns can be computed by

$$\overline{CAR}(\tau_1, \tau_2) = \frac{1}{N} \sum_{i=1}^{N} CAR_i(\tau_1, \tau_2) = \frac{1}{N} \sum_{i=1}^{N} \sum_{\tau=\tau_1}^{\tau_2} AR_{i\tau}, \tag{2}$$

[4]Mirman and Sharma (2008) propose the inclusion of an AR(1) term as well as of day-of-the-week dummy variables. The Durbin Watson statistic indicates that the errors do not exhibit high autocorrelation. Even if an AR–term is included, we find the results for small event windows to be qualitatively similar. Since event windows larger than [0,1] include different days, day-of-the-week dummies are redundant if the results for different event windows are in line.

where $CAR_i(\tau_1, \tau_2)$ is the cumulated abnormal returns of a single event. Since these have the asymptotic variance $\sigma_i^2(\tau_1, \tau_2) = (\tau_2 - \tau_1 + 1)\sigma_{\epsilon_i}^2$, the total variance of the average cumulated abnormal returns can be computed by

$$var(\overline{CAR}(\tau_1, \tau_2)) = \frac{1}{N^2} \sum_{i=1}^{N} \sigma_i^2(\tau_1, \tau_2). \tag{3}$$

The null hypothesis that the cumulated abnormal returns are equal to zero can then be tested by the test statistic

$$\frac{\overline{CAR}(\tau_1, \tau_2)}{\sqrt{var(\overline{CAR}(\tau_1, \tau_2))}} \sim N(0, 1). \tag{4}$$

3 Empirical Results

Information about candidacies for hosting the Olympic Games can be obtained from www.olympic.org. It is important to note that this source only includes the countries which were still participating in the competition at the announcement date. Since it is unlikely that the stock market is affected in countries which have had to leave the selection process at an earlier stage, they are excluded from the analysis. We also exclude Yugoslavia (announcement in 1986 and 1990), Bulgaria (1986,1988) and Sweden (1981), whose stock market indices were unavailable in the announcement year. The ex-post information about the IOC voting results is used as a proxy for the ex-ante probability of winning the competition, creating a subgroup of “first losers". These countries are assumed to be affected by the negative news of the IOC decision in a stronger way than the other losers. For each country in the sample, we take the main stock market index as a measure for the entire domestic market. If the common major indices do not have a sufficiently long history, the respective Datastream Index is used[5]. The world market portfolio is represented by the MSCI World Index. To obtain a solid base for this analysis, we include the Olympic Games from 1988 to 2014. Consequently, the results are based on 15 events. This series could not be extended further to the past due to either the lack of competition (one single applicant in Summer 1984 and Winter 1980) or the lack of existing stock exchanges in the winning communist countries (Summer 1980, Winter 1984). For

[5]The considered indices are available from the authors upon request.

a cross-country analysis of cumulative abnormal return, we collect data on the percentage of the individual country GDP relative to the world GDP from the International Macroeconomic Data Set of the Economic Research Service[6].

Our analysis reveals that, on average, the stock markets of the countries which are awarded the Olympic Games (Summer Games and Winter Games jointly) tend to exhibit significantly positive abnormal returns in the days following the announcement[7]. This is especially true for the Olympic Summer Games, whereas the effect cannot be found to be significant if only the Olympic Winter Games are considered. As Table I shows, these results apply irrespective of whether the event window is chosen to be $[\tau_1 = 0, \tau_2 = 1]$,$[\tau_1 = 0, \tau_2 = 2]$ or $[\tau_1 = 0, \tau_2 = 5]$[8]. Our results are in line with economic intuition: Domestic corporations in the host country are expected to take advantage of the substantial public and private spending in the years prior to a mega sports event. Since the budget and public interest for the Olympic Summer Games typically exceed that for the Winter Games, the stock market reaction is expected to be stronger for Summer Games.

An opposite reasoning can be made for the unsuccessful candidate cities. Before the IOC has announced its decision, the impact of the Olympic Games was incorporated (weighted with a probability) in the stock prices. Since the final IOC decision means for these countries that public spending on infrastructure due to Olympics will not occur, investors have to reassess the value of the domestic corporations. This effect might be particularly large if the loosing city was attributed a high ex-ante probability of being awarded the Olympic Games. Therefore, besides the entire group of losers, we consider a group of “first losers" of each announcement[9]. The computation for the entire group of losers brings an additional complication: multiple losers of the same announcement create cross correlation in returns which violates the underlying zero covariance assumption in

[6]See http://www.ers.usda.gov/Data/Macroeconomics/ for details.

[7]The event window included the day when the IOC announcement was first absorbed by the market as well as the subsequent $n = \tau_2 - \tau_1$ trading days. Since the IOC announcement is typically made in the evening (local time), we accounted for the trading hours of the respective stock exchanges by starting the event window at the subsequent trading day unless time zone effects allowed the information to enter the stock exchange on the announcement day itself.

[8]For larger event windows up to $[\tau_1 = 0, \tau_2 = 9]$, the impact continues to be positive on average. Beyond $[\tau_1 = 0, \tau_2 = 5]$, however, the results are not significant any more.

[9]To measure which losing candidate was attributed the highest winning probability (ex ante), we use the number of votes in the committee as a proxy (which is an ex-post measure). Accordingly, the city with the second highest number is chosen as the “first loser". Source: http://www.aldaver.com/votes.html, accessed on July 28th, 2008.

Equation (3) (see MacKinlay 1997). Therefore we build portfolios of losers for each event to perform the test over the sample of portfolios[10]. Both for all losers as well as for the first losers, we cannot reject the null hypothesis of zero abnormal returns for all considered event windows.

Intuitively, the variation in the cumulative abnormal return at the announcement date might partly be explained by the size of the economy of the candidates. To test this hypothesis, we regress cumulative abnormal returns (CAR_i) on the size of the economy (with OLS, using heteroscedasticity robust standard errors). The size variable is taken as the percentage of the individual country GDP relative to the world GDP in the announcement year. Since only winners have significant abnormal returns, we restrict our regression analysis to this subgroup. Table II reports the results. The size of the winner negatively and significantly relates to its cumulative abnormal return. This is consistent with the intuition that winning the bid to host the Olympic Games is expected to have a relatively larger economic impact for small economies than for large ones. This result continues to hold true if we include a dummy variable for the Summer Games.

4 Conclusion

We investigate stock market reactions to the IOC announcement of the city hosting the Olympic Games. Based on an event-study methodology, the abnormal returns after the announcements indicate a significantly positive effect of hosting the Olympic Summer Games. This effect is negatively related to the size of the economy of the winning country. Since stock markets are assumed to reflect the expectations about the economic outlook, the Olympic Summer Games are considered to have a positive impact on the economy of the host countries.

[10]Ignoring the cross correlation among losers and basing the results on the individual countries instead of on portfolio yield qualitatively similar results.

Table I
Cumulative abnormal returns for various event windows:

Note: This table reports the average cumulated abnormal returns $\overline{CAR}$, the corresponding standard errors and the t-statistics for the subgroups of the winners, the losers and the first losers. The analysis is performed for the Winter Games, the Summer Games, and both jointly. Abnormal returns are computed on the basis of the market model $R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}$, where the parameters are obtained from the estimation window $[-241, -41]$. Various event windows are reported. The average cumulated abnormal returns across all observations is computed by $\overline{CAR}(\tau_1, \tau_2) = \frac{1}{N}\sum_{i=1}^{N} CAR_i(\tau_1, \tau_2) = \frac{1}{N}\sum_{i=1}^{N}\sum_{\tau=\tau_1}^{\tau_2} AR_{i\tau}$.

Panel A

		Event window [0,1]			Event window [0,2]		
		$\overline{CAR}$	Std_CAR	t_Stat	$\overline{CAR}$	Std_CAR	t_Stat
All Games							
	Winner	0.011	0.004	2.443	0.014	0.005	2.594
	Loser	-0.000	0.004	-0.038	0.002	0.005	0.432
	First_loser	0.002	0.008	0.179	0.008	0.010	0.811
Summer Game							
	Winner	0.019	0.006	3.434	0.024	0.007	3.407
	Loser	-0.003	0.005	-0.671	0.002	0.006	0.301
	First_loser	-0.000	0.013	-0.029	0.007	0.016	0.449
Winter Game							
	Winner	0.003	0.006	0.428	0.005	0.008	0.639
	Loser	0.002	0.006	0.386	0.002	0.008	0.321
	First_loser	0.004	0.009	0.480	0.010	0.011	0.947

Panel B

		Event window [0,5]			Event window [0,9]		
		$\overline{CAR}$	Std_CAR	t_Stat	$\overline{CAR}$	Std_CAR	t_Stat
All Games							
	Winner	0.016	0.007	2.098	0.005	0.010	0.488
	Loser	-0.002	0.007	-0.226	-0.005	0.009	-0.524
	First_loser	-0.004	0.015	-0.254	-0.006	0.019	-0.338
Summer Game							
	Winner	0.024	0.010	2.438	0.012	0.013	0.946
	Loser	-0.003	0.008	-0.410	-0.007	0.010	-0.661
	First_loser	-0.016	0.023	-0.725	-0.025	0.029	-0.845
Winter Game							
	Winner	0.008	0.011	0.763	-0.002	0.014	-0.116
	Loser	-0.000	0.011	-0.005	-0.003	0.014	-0.199
	First_loser	0.014	0.015	0.937	0.019	0.019	0.988

Table II
Regression results (event window [0, 5])

Note: The equation $CAR_i = a + b_1 ShareGDP_i + \epsilon_i$ corresponds to Model(1), whereas an additional dummy for the Summer Games is included into Model(2). The estimates are obtained with OLS, and the heteroscedasticity-robust standard errors are given in parentheses below. Significance levels: $* = 10\%$, $** = 5\%$, $*** = 1\%$.

Variable	Model (1)	Model (2)
Share of GDP	-0.001	-0.001
	(0.000)**	(0.000)*
Summer Game		0.014
		(0.012)
Constant	0.023	0.016
	(0.008)**	(0.010)
R-squared	0.19	0.26

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