Time Series Analysis of the Consumer Expenditure on Sport in Japan

Kenji Niina
Ochanomizu University

Although sport is recognized as an important sector of economy, few studies were conducted of consumer expenditure on sport in Japan. In this study it was intended to reveal the characteristics of the chronological changes of consumer expenditure on sport. There are a number of methods for analysing the time series economic data. Lacking in preceding studies, we should adopt the basic method rather than a complicated one. Thus we fitted autoregressive integrated moving average (ARIMA) model to the data, according to the Box-Jenkins approach.

The data of consumer expenditure on sport was cited from the *Family Income and Expenditure Survey*. There are four sport-related items in the survey: "Sports equipment" (EQ), "Sports monthly tuition" (MT), "Sports admission" (AD), "Sports facility charges" (FC). Surveying the annual average of the data, we have found that the current trend of sport-related expenditure has begun in 1997. Thus the monthly data of those items was analysed from January 1997 to December 2003. The influence of the price fluctuations was adjusted by dividing the Consumer Price Index. A particular ARIMA model was selected for each item by observing the sample autocorrelation function (SACF) and the sample partial autocorrelation function (SPACF). SPSS (Ver. 10.0) was used to calculate SACFs and SPACFs, and to estimate the parameters of ARIMA models.

The results are summarized in table 1. It was impossible to select a proper model for FC by observing the SACF and the SPACF. Though ARIMA $(0,1,1)$ $(0,1,0)_{12}$ was selected for EQ and AD, the estimated value of MA1 was almost equal to 1 in each equation. It contradicts the hypothesis that MA1 should be lower than 1 in its absolute value. These results indicate that FC, EQ, or AD is not on the ARIMA process. However, there were two outliers in AD: the value of January 1998 and that of June 2002. The former was supposedly influenced by the Olympic Games in Nagano, while the latter by the FIFA world cup 2002. ARIMA $(1,1,0)$ $(0,1,0)_{12}$ model was fitted well for AD over the period from February 1998 to May 2002. It leads to a conclusion that AD is on the ARIMA process, as well as MT is.

Table 1 The result of ARIMA analysis.

Item	Model	Parameters	AIC
EQ	ARIMA(0,1,1)(0,1,0)$_{12}$	MA1 = 0.999, CON = -1.837	928.8
MT	ARIMA(2,1,0)(0,1,0)$_{12}$	AR1 = -0.522, AR2 = -0.218, CON = 0.989	819.3
AD	ARIMA(0,1,1)(0,1,0)$_{12}$	MA1 = 1.000, CON = 0.048	665.4
FC	-	-	-
AD *	ARIMA(0,1,1)(0,1,0)$_{12}$ - ARIMA(1,1,0)(0,1,0)$_{12}$	AR1 = -0.630, CON = -0.129	336.9

* In this case, the period of analysis was restricted to that from February 1998 to May 2002.

Contact co-ordinates author
Kenji Niina, e-mail: niina@cc.ocha.ac.jp