

2014

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 10(8), 2014 [2616-2623]

Time series analysis-based Chinese volleyball event scientific research development status study

Yuming Li

College of Physical Education, Baicheng Normal University, Baicheng 137000, Jilin, (CHINA)

ABSTRACT

Volleyball as a sports event that participates by forming a team, it mainly tests sports athletes' technique, cooperation, comprehensiveness, collectivity, antagonism, and duality and so on. Relative volleyball scientific researches papers are crystallization of volleyball enthusiasts, volleyball scientific researchers' brain works, are understanding and summary of volleyball from these people in learning and working. Especially for these articles that published in relative sports periodicals, they have more forwardness and authority. With respect to this, the paper makes time series analysis by analyzing, sorting and making statistics of relative volleyball scientific research papers from 2008 to 2013 as well as summarizing their amount and corresponding institutions. Among them, it indicates Chinese volleyball development status, and then optimizes volleyball management, let China to cultivate more high-level volleyball top players.

KEYWORDS

Time series; Optimization management; Volleyball scientific research; Model optimization; Mathematical model.



INTRODUCTION

Volleyball is a sport event that is widely spread in the world, its charm lies in volleyball passions and artistic appreciation. In each country delegation, playing styles are very different; Europeans and Americans mainly display strength and speed; while each country in Asia displays rapidly changes and comprehensiveness. Completely different playing styles collision sparks fiercely and wonderfully.

Volleyball as one of Chinese developed “Three big balls” events, its development status always attracts broadly masses attentions, in international range, “Volleyball, football, basketball” are rapidly moving forward, compare with international advanced countries, Chinese volleyball development speed is relative slower, although there are some historical reasons, mainly is still that masses lack of recognition of volleyball.

In Chinese volleyball development process, it has ever got certain achievements, from which glorious ones include Chinese women volleyball obtained “five consecutive championships”, it propelled Chinese volleyball competitive level to a higher level. But in Sydney Olympic Games, Chinese women volleyball team lost top three, while Chinese men’s volleyball team even hadn’t qualified to competition, which let Chinese volleyball to come to trough. We analyze its causes that mainly because Chinese present volleyball population declines sharply, no qualified reserve talent to inherit volleyball undertakings development. Relative volleyball scientific research papers are crystallization of volleyball enthusiasts, volleyball scientific researchers’ brain works, are understanding and summary of volleyball from these people in learning and working. Mainly these articles that published in relative sports periodicals, they have more forwardness and authority. Relative Chinese sports type core journal, it started to introduce and develop in China since 1992, “A Guide of the Core Journal of China” (published in 1992). In the book, many sports events are defined as “Chinese sports type core journals”, from which it includes volleyball. Up to now, Chinese many universities have published many relative sports event especially volleyball relevant scientific research papers for readers studying. It also can be supposed that China relative sports core journals are important media in Chinese experiences and academic exchanging, are also important parts to spread volleyball relative knowledge and thrive and exploit sports science.

With respect to this, the paper makes time series analysis by analyzing, sorting and making statistics of relative volleyball scientific research papers (in Chinese sports type core journals) from 2008 to 2013 as well as summarizing their amount and corresponding institutions. Among them, it indicates Chinese volleyball development status and features and rules of published relative volleyball scientific papers, well summarizes them in the hope of providing good theoretical support for Chinese future developing volleyball event.

MODEL ESTABLISHMENT

The paper’s analysis of time series is listing events change situations according to chronological orders and then constructing an analytical time series. We make effective observation and researches on time series, find out its corresponding change and development rules, predict its future trend that is corresponding time series analysis.

For time series analysis, first understand following model:

(1)AR (p) model:

$$\begin{cases} x_t = \Phi_0 + \Phi_1 x_{t-1} + \Phi_2 x_{t-2} + \dots + \Phi_p x_{t-p} + \varepsilon_t \\ \Phi_p \neq 0 \\ E(\varepsilon_t) = 0, \text{Var}(\varepsilon_t) = \sigma_s^2, E(\varepsilon_t \varepsilon_s) = 0, s \neq t \\ E x_s \varepsilon_t = 0, \forall s < t \end{cases}$$

Model with above structure is called p order auto regression model, we record it as AR (p) here.

(2)MA (q) model:

$$\begin{cases} x_t = u + \varepsilon_t - \theta_1 \varepsilon_{t-1} - \theta_2 \varepsilon_{t-2} - \dots - \theta_q \varepsilon_{t-q} \\ \theta_q \neq 0 \\ E(\varepsilon_t) = 0, Var(\varepsilon_t) = \sigma_\varepsilon^2, E(\varepsilon_t \varepsilon_s) = 0, s \neq t \end{cases}$$

Model with above is called q order auto regression model, record it as MA (q) here.

(3)ARMA (p,q) model:

$$\begin{cases} x_t = \Phi_0 + \Phi_1 x_{t-1} + \Phi_2 x_{t-2} + \dots + \Phi_p x_{t-p} + \varepsilon_t - \theta_1 \varepsilon_{t-1} - \theta_2 \varepsilon_{t-2} - \dots - \theta_q \varepsilon_{t-q} \\ \Phi_p \neq 0, \theta_q \neq 0 \\ E(\varepsilon_t) = 0, Var(\varepsilon_t) = \sigma_\varepsilon^2, E(\varepsilon_t \varepsilon_s) = 0, s \neq t \\ E x_s \varepsilon_t = 0, \forall s < t \end{cases}$$

Time series analysis of the model with above structure is called p q order auto regression model,record it as ARMA (p,q).

Stationary sequence modeling

(1) Modeling steps:

According to Chinese relative volleyball papers number in sports core journals in six years from 2008 to 2013 as initial data, it lists following flow:The correlation coefficient calculation sample, The model is not, And number of estimates, Model test, model optimizing, Series Forecast as Figure 1 Model of the process.

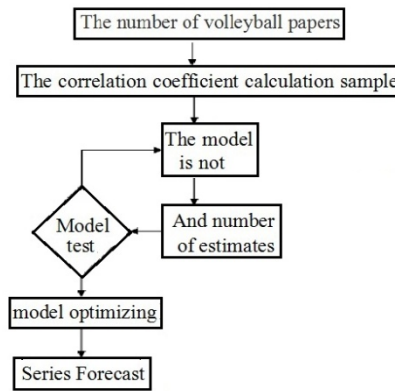


Figure 1 : Model of the process

(2) Calculate sample correlation coefficient:

Sample autocorrelation coefficient:

$$\hat{\rho}_k = \frac{\sum_{t=1}^{n-k} (x_t - \bar{x})(x_{t+k} - \bar{x})}{\sum_{t=1}^n (x_t - \bar{x})^2}$$

Partial correlation coefficient (sample):

$$\hat{\Phi}_{kk} = \frac{\hat{D}_k}{\hat{D}}$$

(3) Model recognition: as TABLE 1.

TABLE 1 : Basic principle

$\hat{\rho}_k$	$\hat{\Phi}_{kk}$	Select model
Tailing	P order tailing	AR (p)
q order tailing	Tailing	MA (q)
Tailing	Tailing	ARMA (p,q)

(4) Sample correlation coefficient approximate distribution:

Barlett: $\hat{\rho}_k \sim N(0, \frac{1}{n}), n \rightarrow \infty$

Quenouille: $\hat{\Phi}_{kk} \sim N(0, \frac{1}{n}), n \rightarrow \infty$

(5) Parameter estimation:

Parameters to be estimated have $p + q + 2$ pieces unknown parameters, and the common used estimation methods are : moment estimation, maximum likelihood estimation, 6 models significance testing:

Purpose: test model's validness (whether sufficiently extract information or not)

Test objects: Residual sequence

Evaluation principle: A good fitting model should be able to extract observed value sequence samples correlation information that residual sequence should be the data that needs to discuss, on the contrary, it needs to distinguish according to cases.

Hypothesis condition:

Null hypothesis: The number of volleyball papers in sports core journals

$$H_0 : \rho_1 = \rho_2 = \dots = \rho_m = 0, \forall m \geq 1$$

Alternative hypothesis: Corresponding residual sequence is data that needs to discuss

$$H_1 : \text{At least it has one } \rho_k \neq 0, \forall m \geq 1, k \leq m$$

Test statistics:

LB statistics:

$$LB = n(n + 2) \sum_{k=1}^m \left(\frac{\hat{\rho}_k^2}{n - k} \right) \sim \chi^2(m)$$

Parameters significance testing:

Purpose: Test corresponding every unknown parameter value is zero or not. Delete these insignificant parameters.

$$H_0 : \beta_j = 0 \quad H_1 : \beta_j \neq 0$$

Test statistics:

$$T = \sqrt{n - m} \frac{\hat{\beta}_j - \beta_j}{\sqrt{a_{jj} Q(\tilde{\beta})}} \sim t(n - m)$$

Model optimization:

Problem posing: Here, we assume that model passes corresponding tests, which shows data is in certain feasible intervals, the model can effective get corresponding results.

Optimization purpose: Select relative optimal model

Sequence forecasting:

Linear prediction function

$$x_t = \sum_{i=0}^{\infty} C_i x_{t-1-i}$$

Minimum forecasting variance principle

$$Var_{\hat{x}_t(l)} [e_t(l)] = \min\{Var[e_t(l)]\}$$

Take it as factor in next model analysis.

Non-stationary sequence modeling

Firstly, it needs to do stationary operation on data, and furthermore we establish ARIMA (p, q) model to solve the process, model structure usage occasion is difference stationary sequence fitting:

$$\begin{cases} \Phi(B)\nabla^d x_t = \Theta(B)\varepsilon_t \\ E(\varepsilon_t) = 0, Var(\varepsilon_t) = \sigma_\varepsilon^2, E(\varepsilon_t, \varepsilon_s) = 0, s \neq t \\ Ex_s \varepsilon_t = 0, \forall s < t \end{cases}$$

Modeling steps: The observed sequence value obtained, Stationary test, Difference operation, Variables test, Fitting ARMA model, Analysis result as Figure 2 Non stationary sequence modeling flowchart.

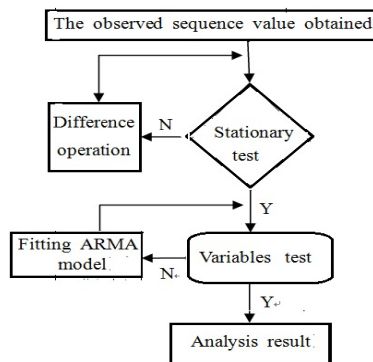


Figure 2 : Non stationary sequence modeling flowchart

MODEL APPLICATION AND CORRESPONDING DATA PROCESSING

According to China published single authored, co-authored papers published numbers in six years from 2008 to 2013; it makes statistics and lists following TABLE 2.

Correspond to above data; it draws “black-white bar chart” as Figure 3.

Correspond to above Figure 3, horizontal coordinate 1 represents data in 2008, 2 represents data in 2009, 3 represents data in 2010, represents data in 2011, 5 represents data in 2013. Due to data statistics missing, it cannot make statistics of papers writing status in 2012, so it doesn’t make statistics of 2012 this time, but it has little impacts on final analysis, we can ignore its data.

To sum up, it can get following conclusion: single authored relative volleyball scientific researching papers numbers are obviously higher than that of co-authored, and it belongs to fluctuate

and rising trend, while co-authored relative volleyball scientific research papers numbers are in steady rising. Then according to China's data in six years from 2008 to 2013, it sorts out as TABLE 3.

TABLE 2 : During 2008-2013 single authored and co-authored published volleyball relevant papers numbers

Year	Independence from	Percentage	2 people in writing	Percentage	3 people in writing	Percentage	4 people and above in writing	Percentage
2008	47	16.97	31	13.19	17	16.67	2	6.45
2009	51	18.41	43	18.30	18	17.65	5	16.13
2010	46	16.61	47	20.00	20	19.61	8	25.81
2011	58	20.94	52	22.13	21	20.59	6	19.35
2013	75	27.08	62	26.38	26	25.49	10	32.26
Sum Total	277	100	235	100	102	100	31	100
Average	55.4	20	47	20	20.4	20	6.2	20

(Data source: During 2008-2013, Chinese sports type core journals published volleyball relevant scientific papers statistical result.)

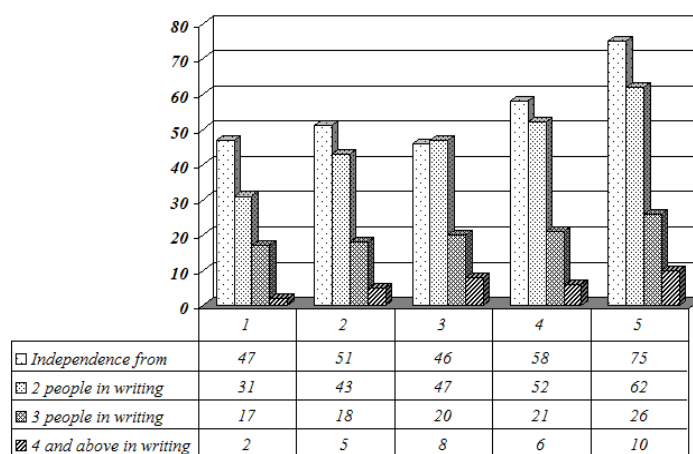


Figure 3 : From alone in writing published papers about volleyball

TABLE 3 : During 08-13sports core journals relative volleyball papers numbers

Name of core journals	2008	2009	2010	2011	2012	2013	Sum Total	Percentage
Journal of Beijing University of Physical Education	8	19	21	7	7	4	66	18.03
Chinese sports science and technology	9	11	7	12	2	13	54	14.75
Journal of Xi'an Physical Education University	5	10	6	2	0	17	40	10.93
Journal of Physical Education	8	3	8	3	7	6	35	9.56
Journal of Wuhan Institute of Physical Education	7	7	9	4	0	9	36	9.84
Journal of Guangzhou Institute of Physical Education	5	11	4	3	2	3	28	7.65
Journal of Chengdu Sports University	4	4	4	4	4	2	22	6.01
Journal of Shanghai Institute of Physical Education	5	5	3	2	0	3	18	4.92
Journal of Tianjin sports college	3	6	3	1	1	2	16	4.37
Sports science	3	4	2	2	1	4	16	4.37
Sports culture guide	1	3	1	2	0	2	9	2.46
Sports and Health Science	1	2	0	1	0	0	4	1.09
Journal of sports medicine	2	0	0	0	0	0	2	0.55
Journal of Shandong Physical Education College	0		7	7	5	1	20	5.46
Sum total	61	85	75	50	29	66	366	100.00
Percentage	16.67	23.22	20.49	13.66	7.92	18.03	100.00	

(Data source: During 2008-2013, Chinese sports type core journals published volleyball relevant scientific papers statistical result.)

Correspond to above each journal or magazine corresponding time changes, it gets following Figure 4.

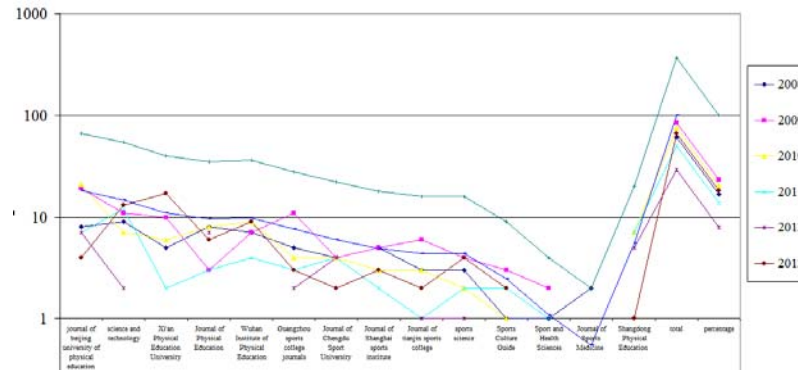


Figure 4 : The number of sports core journals about volleyball papers

From above data, we can see that maximum proportion in volleyball event published numbers of sports core journals is “Journal of Beijing University of Physical Education that is 18.03%. Secondly is “Chinese sports science and technology” that occupies 14.75% of totality. Least proportion is “Journal of sports medicine” only occupies 0.55% of totality.

Decompose time series data; it is clear tendency pink line, circulation or seasonal green line, stochastic blue line, as following Figure 5: The decomposition of the time series data contrast figure.

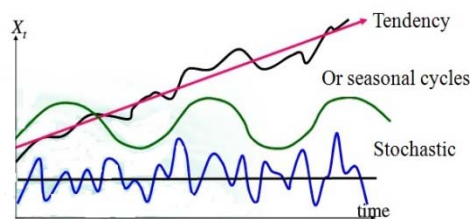


Figure 5 : The decomposition of the time series data contrast figure

According to Figure 5 and combine with Figure 4, we can see China’s each core journals published relative volleyball event scientific papers are mostly in the declining tendency.

CONCLUSION

By above time series analysis result, we can see that China’s each core journals published relative volleyball event scientific papers are mostly in the declining tendency. With respect to this, we summarize Chinese volleyball system sustainable system result optimization and get Figure 6 System structure for the sustainable development of volleyball in our country, from which it corresponds to Development level, Coordination degree, Last degree, Competitive volleyball, The volleyball, Volleyball industry development, The sustainable development of volleyball sports in our country.

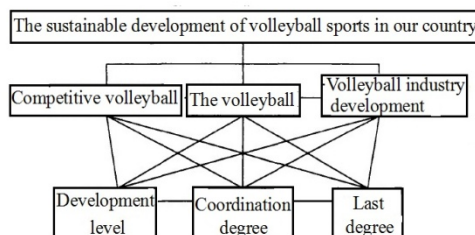


Figure 6 : System structure for the sustainable development of volleyball in our country

By practical series analysis of Chinese sports core journals published relative volleyball scientific papers, it gets presently Chinese volleyball development is not going well, is entirely in the declining tendency. Correspond to Chinese volleyball development status, it summarizes Chinese volleyball system sustainable development system, optimizes management structure, vigorously publishes relevant volleyball event core papers, cultivates reserve talents with attainments, let national people to understand volleyball and like volleyball so that can promote Chinese volleyball overall level.

REFERENCES

- [1] Sun Chun-feng, Yang Xiao-yun; The Principles of Mechanics for Spin Service and Non-spin Service. *Journal Of Xiaogan University*, **23(3)**, 36-39 (2003).
- [2] Feng Hong-xin, Huang Yu-chen; Analysis on Tennis Forehand Drive on Footline at the Angle of Kinetics. *Journal of Nanjing Institute of Physical Education: Natural Science*, **6(4)**, 23-25 (2007).
- [3] Cao Shihuan; The Flying of Spinning Sphere. *Journal of Beijing Union University*, **5(2)**, 75-80 (1991).
- [4] Ren Xiping; A study of mechanical mechanism in tennis serve effect. *Journal of Zhejiang Normal University Natural Sciences*, **35(2)**, 226-230 (2012).
- [5] Yi Jing-Qian; Victorious Women's Tennis Singles Player Analysis. *Journal of Nanjing Institute of Physical Education: Natural Science*, **9(3)**, (2010).
- [6] Jiang Wei; Technical Analysis of Tennis Single Match's Serving for Top Chinese Young Men's Players. *Journal of Nanjing Institute of Physical Education: Natural Science*, **10(1)**, 48-51 (2011).
- [7] Xue Xin; Reason of Quick Development of Tennis in Universities. *Journal of Changchun Teachers College*, **4**, (2006).