The Chinese dynastic cycle – historical and quantitative overview

Pavel Stoynov
Sofia University "St. Kliment Ohridski"

Abstract.

The traditional Chinese historiography divides the history of China into dynastic periods and explains this division by the dynastic cycle theory. According to this theory, the dynasties are founded by strong leaders but the next generations of emperors can't keep the high level of the ruler competence needed and, because of this, the dynasties gradually decay and die.

This paper considers the durations of the most typical Chinese imperial dynasties. In the context of the dynastic cycle theory, a brief historical overview of the Chinese dynasties is performed and some statistical measures and distribution fits are applied to obtain general conclusions about the Chinese dynastic cycle.

Key words: dynastic cycle, China, Chinese dynasties

Introduction

The traditional Chinese historiography divides the history of China into dynastic periods and explains this division by the dynastic cycle theory. According to this theory, the dynasties are founded by strong leaders but the next generations of emperors can't keep the high level of the ruler competence needed and, because of this, the dynasties gradually decay and die.

This paper considers the durations of the most typical Chinese imperial dynasties. In the context of the dynastic cycle theory, a brief historical overview of the Chinese dynasties is performed and some statistical measures and distribution fits are applied to obtain general conclusions about the Chinese dynastic cycle.

Dynastic cycle is an important political theory in Chinese history. According to this theory, each dynasty rises to a political, cultural, and economic peak and then, because of moral corruption, declines, loses the Mandate of Heaven, and falls, only to be replaced by a new dynasty. The cycle then repeats under a surface pattern of repetitive motifs (Dillon, 1998).

It sees a continuity in Chinese history from early times to the present by looking at the succession of empires or dynasties, implying that there is little basic development or change in social or economic structures (Reischauer, 1965). Some historians expressed their doubts that "the concept of the dynastic cycle... has been a major block to the understanding of the fundamental dynamics of Chinese history" (Fairbank and Reischauer, 1960).

The cycle appears as follows:

1. A new ruler unites China, founds a new dynasty, and gains the Mandate of Heaven.
2. China, under the new dynasty, achieves prosperity.
3. The population increases.
4. Corruption becomes rampant in the imperial court, and the empire begins to enter decline and instability.
5. A natural disaster wipes out farm land. The disaster normally would not have been a problem, but together with the corruption and overpopulation, it causes famine.
6. The famine causes the population to rebel and a civil war ensues.
7. The ruler loses the Mandate of Heaven.
8. The population decreases because of the violence.
9. China goes through a warring states period.
10. One state emerges victorious.
11. The state starts a new empire.
12. The empire gains the Mandate of Heaven.

The Mandate of Heaven was the idea that the Emperor was favored by Heaven to rule over China. The Mandate of Heaven explanation was championed by the Chinese philosopher Mencius during the Warring States period. It has 3 main phases:

1. The beginning of the dynasty.
2. The middle of the dynasty's life and the peak of the dynasty.
3. The decline of the dynasty, both politically and economically, until it finally collapses (Reischauer, 1965).

The Chinese dynasties – short historical overview

The main dynasties in the Chinese history are presented in Table 1. It may be seen that some dynasties have overlapping periods, due to the fact that they existed in parallel. In other cases, there are gaps between two consecutive dynasties in the list due to the fact that there were periods of decentralization.

Here we present brief historical overview of the dynasties.

Xia dynasty is the most powerful among several small states in the valley of Huang He. Its founder is the legendary Yu. It exists 550 years, between 1900 and 1350 BC.

Shang dynasty existed in parallel with Xia. After, Shang conquered Xia. From 1766 till 1122 BC, Shang period lasts 644 years – the longest dynastic period in Chinese history.

Chou dynasty coexisted with Shang for a long period. It was located to the west of Shang. After Chou conquered Shang, the dynasty extended its territory in North China. Chou is divided into two periods – Western (Early) Chou and Eastern (Late) Chou. Eastern Chou receives its name because the dynasty moved its capital to east, to Luoyang as the Jouanjouan tribe invaded Chou. Western Chou lasted 351 years. Eastern Chou is divided into two periods Spring and Autumn (771-481 BC) and Warring Kingdoms (481-221 BC). This dynasty existed 195 years.

The Qin dynasty lasted only 15 years but it initiated a series of campaigns leading to the end of Warring Kingdoms period and unification of China.

The Han dynasty is divided into Early (Western) and Late (Eastern) Han. Between them for a short time the dynasty Sin came to power which is the shortest dynasty in our list. The capital of Early Han is Changan, about 480 km to the west of Luoyang, the capital of Late Han, from where the name.

The Sui dynasty is created in 589 year by Wan (589-604). The successor of Wan, his second son Yang (604-618) starts catastrophic wars against Korea, and finally is killed by the creator of Tang – Li Yuan.

Tang dynasty (626-907) is one of the longest Chinese dynasties. It lasted 281 years.

Sung Dynasty includes North and South Sung. North Sung (960-1115) is created by Taizu. It may be said that North Sung existed till 1115 when the dynasty Jin was announced, but also we may consider that North Sung formally existed till 1141 when a peace contract was signed between Jin and Sung according to which Jin rules North China and Sung, called already South Sung, rules South China.

The dynasty Jin (1115-1234) was created by the Jurchen tribes of Manchu-Tungus group. It was defeated by Mongols. Under the pressure of Genghis khan, Jurchens move their capital from Yanjing (Beijing) to Kaifeng. After, Ogedei khan conquered Kaifeng. The last Jin emperor tried to obtain help from South Sun, but he did not receive it and killed himself.

South Sun (1127-1279) is destroyed by Kublai khan who created in 1260 year the Mongol dynasty Yuan (1260 -1368).

Yuan was succeeded by Ming (1368 -1634) which in its tern was conquered by the Manchurian dynasty Qing (1634-1911) – the last dynasty of the imperial China.

Table 1. The main Chinese dynasties – modeling with ST distributions.

Dynasty name	Period	Length of the period	D_i^n for ST1(46,228)	D_i^n for ST1(2,28)
Xia	1900-1350 BC	550	39	1
Shang	1766-1122 BC	644	46	1
Western Chou	1122-771 BC	351	25	2
Eastern Chou	771-221 BC	290	21	1
Qin	221-206 BC	15	1	2
Western Han	206 BC – 9	215	15	1
Sin	9-23	14	1	1
Eastern Han	25-220	195	14	2
Sui	589-618	29	2	1
Tang	626-907	281	20	1
North Sung	960- 1115	155	11	1
Jin	1115-1234	119	9	1

South Sung	1127-1279	152	11	1
Yuan	1260 -1368	108	8	1
Ming	1368 -1634	266	19	2
Qing	1634-1911	277	20	1

The Chinese dynasties – statistics about the dynastic cycle

The data in Table 1 shows that the shortest dynasty is Sin dynasty with a period of 14 years. The longest dynasty is Shang dynasty with a period of 644 years. The average duration of a dynasty is 228 years. The standard deviation is 177 years.

If we consider separately Chinese dynasties in the period BC and Chinese dynasties in the period AD, calling the dynasties of the first period Old dynasties and the dynasties of the second period New dynasties, and considering Western Han as belonging of both dynastic types, then we may consider the basic statistics for these two types of dynastic cycles.

The Old dynasties have shortest and largest periods again equal to 15 years and 644 years correspondingly. The average dynastic period is 344 years. The standard deviation is 228 years.

The New dynasties have shortest period 14 years (Sin dynasty) and longest period 281 years (Tang dynasty). The average dynastic period is 164 years and the standard deviation is 93 years.

If we consider the dynastic period as a random variable, it is natural to try to find reasonable probabilistic distribution of this variable.

One possibility is to consider the dynastic cycle as exponentially distributed random variable, i.e. random variable $\xi \in Exp(\lambda)$ with probability density function

$$f_\xi(x) = \begin{cases} \frac{1}{\lambda} e^{-\frac{x}{\lambda}}, \ x \ge 0 \\ 0, \ x < 0. \end{cases}$$

In this case $E\xi = \lambda = 228$ for the whole Chinese history and the standard deviation is $\sqrt{D\xi} = \lambda = 228$ from one side (if we suppose exponential distribution) and $\sqrt{D\xi} = \lambda = 177$ (as estimated) from other. Generally, as 228 and 177 are relatively close (but with small precision), we may accept the hypothesis that dynastic cycle is exponentially distributed, i. e. $\xi \in Exp(228)$.

A more realistic hypothesis could be that the dynastic cycle has gamma distribution, i. e. the distribution of random variable $\xi \in \Gamma(\alpha, \beta)$ with probability density function

$$f_\xi(x) = \begin{cases} \frac{1}{\beta^\alpha \Gamma(\alpha)} x^{\alpha-1} e^{-\frac{x}{\beta}}, \ x \ge 0 \\ 0, \ x < 0 \end{cases}.$$

Here $\Gamma(\alpha)$ is defined by $\Gamma(\alpha) = \int_0^\infty x^{\alpha-1} e^{-x} dx.$ In the case of gamma distribution, the mean is $E\xi = \alpha\beta = 228$ and the standard deviation is $\sqrt{D\xi} = \sqrt{\alpha\beta^2} = 177.$ By solving the system of equations

$$\begin{vmatrix} \alpha\beta = 228 \\ \sqrt{\alpha\beta^2} = 177, \end{vmatrix}$$

we obtain $\alpha = \left(\frac{228}{177}\right)^2 = 1{,}66$ and $\beta = \frac{228}{\alpha} = 137.$ So, the dynastic cycle is approximated by a random variable $\xi \in \Gamma(1{,}66;137).$

Another suitable distribution for modeling dynastic cycles is so called ST distribution (Stoynov, 2013) . We say that a random variable ξ with probability mass function $f_\xi(x)$ has distribution of $ST(n, \beta)$ family and denote this fact $\xi \in ST(n, \beta),$ if the probability mass function of ξ is given by the formula

$$f_\xi(x) = \begin{cases} \sum_{k=1}^{n+1} P(D^n = k) f_\xi(x \mid D^n = k) = \sum_{k=1}^{n+1} P(D^n = k) f_{G^k}(x), x \ge 0 \\ 0, x < 0. \end{cases}$$

where G^k are random variables with probability mass function $f_{G^k}(x) = f(k,\beta)$ and D^n are positive integer mixing random variables.

Here for G^k we may adopt different families of distribution.

In this article, the case of ST family of first kind is considered where

$$G^k \in \Gamma(k, \frac{1}{\beta}) \equiv Erlang(k, \frac{1}{\beta}),$$

i. e. $\xi \mid D^n \equiv Erlang(D^n, \frac{1}{\beta}).$ Correspondingly, D^n is a random variable, taking values $k = 1,\dots,(n+1)$ with probabilities $P(D^n = k) = \frac{C(n,\beta)n!}{\beta^k (n-k+1)!}, k = 1,\dots,(n+1)$ where the coefficients $C(n,\beta)$ are given by the formulas:

$$C(n,\beta) = \frac{1}{I(n,\beta)},$$

$$I(0,\beta) = \frac{1}{\beta},$$

$$I(n,\beta) = \frac{1}{\beta} + \frac{n}{\beta} I(n-1,\beta), n = 1,2,\dots$$

If a random variable has ST distribution of first kind, we will denote this fact $\xi \in ST1(n,\beta).$ For such a variable, the probability density is density of Erlang distribution with first parameter being another integer-valued random variable with a specific distribution..

If in $ST1(n,\beta)$ we enforce $D^n = k,$ i. e.

$$P(D^n = k) = 1, P(D^n = i) = 0, 1 \le i \le k-1 < k+1 \le i \le n+1,$$

which may be considered as degenerate ST distribution of first kind, we actually obtain Erlang distribution, i. e. $\xi \in Erlang(k, \frac{1}{\beta}).$

The exponential distribution is a special kind of $ST1(n,\beta)$ distribution are $ST1(0,\beta) \equiv Exp(\beta)$.

The case $n = 2$ leads to $ST1(2,\beta)$ distribution which can be defined as weighted exponential distribution by the weight function $w(x) = (1+x)^2$.

We say that the random variable ξ has $ST1(2,\beta)$ distribution and denote $\xi \in ST1(2,\beta)$, if its probability mass function is given by

$$f_\xi(x) = \begin{cases} \frac{\beta^3}{\beta^2 + 2\beta + 2} e^{-\beta x} (1+x)^2, \ x \ge 0 \\ 0, \ x < 0. \end{cases}$$

Let us suppose that there are two types of events related to dynasty change. The first type is “condition for change of the dynasty”. Intervals between two conditions for change are exponentially distributed. The second kind of events we call “real change of dynasty”. The interval between two real changes of the dynasty – the dynastic cycle – can be modeled by $ST1(n = [\frac{t_{\max}}{t_{\min}}], \beta)$ distribution where $t_{\max}$ is the maximal and $t_{\min}$ - the minimal observed dynastic period and $[.]$ is the integer part of a number.

For Chinese dynasties we may estimate that $\frac{1}{\beta}=228$. Also, $n=[\frac{t_{\max}}{t_{\min}}]=\frac{644}{14}=46$ and the realizations of the random variables D_i^n are as shown in Table 1, forth column.

Another approach for estimating the distribution of the dynastic cycle with ST distribution is based on the observation that some of the dynasties have two subperiods. For example, Chou and Han have Eastern and Western periods and Sung has North and South periods. Such sub-periods appear when some risk event for the dynasty happened and the dynasty changed its characteristics – moved to another territory, changed rulers and/or ruling ethnos, changed its capital etc. This usually happens when the dynasty survives after big danger and obtains the chance for a second cycle.

In this case, we estimate the distribution of the dynastic cycle with $ST1(2,\beta)$ distribution. We suppose that there are two types of events: "change to new dynasty" and "change of dynasty or sub-period of a dynasty". The interval between changes of a dynasty or sub-period of a dynasty is exponentially distributed. The interval between changes to new dynasties is with $ST1(2,\beta)$ distribution

Then we have $\frac{1}{\beta}=228$ and also $n=2$ and the realizations of the random variables D_i^n are as shown in Table 2, fifth column.

Natural disasters (mainly floods of Huang He river) are included in the theory of the dynastic cycle. The ST-distribution can also be used to model inter-arrival times between two consecutive floods of this river (Stoynov, Zlateva, Velev, 2015).

Conclusion

There are different ways for estimating the distribution of the dynastic cycle. One flexible way is to use ST distribution. Further development could be to compare in formal way different ways of distribution fitting. Also, more complete list of dynasties may be used or list of dynasties can be replaced by list of rulers.

References:

Dillon, M. (1998). China: A Historical and Cultural Dictionary. Richmond, Surrey: Curzon. ISBN 978-0700704392., p. 87

Fairbank, J. and E. Reischauer (1960) East Asia: The Great Tradition. Boston, p. 115.

Reischauer, E. (1965). The Dynastic Cycle, in John Meskill, The Pattern of Chinese History, Boston: D.C. Heath and Company, pp. 31-33.

Stoynov, P. (2013) Stoynov Process – Definition and Simulations. – Proceedings of the Sixth International Conference Financial and Actuarial Mathematics, Sofia, Bulgaria, 97-104.

Stoynov, P., Zlateva, P, Velev, D. (2015) An Approach for Modelling Inter-arrival Time of Floods. – International Journal of Innovation, Management and Technology, vol. 6, no. 4, 267-271. http://www.ijimt.org/vol6/613-S014.pdf