

# An Empirical Study on the Discounting Rate of Pharmacoeconomic Evaluations in China

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## BACKGROUND

- Pharmacoeconomic evaluations aim to maximize health outcomes from limited healthcare resources
- When the time horizon exceeds one year, current guidelines recommend discounting future costs and outcomes to present values. The discounting rate (DR) may significantly influence the cost-effectiveness of health technology.
- The recommended value of the official DR ranges from 1.5~7% worldwide and is highly related to the economic development levels of countries. For China, the guidance fixed the base case rate of 8% in 2011 and 2015, and recommends 5% currently<sup>[1-3]</sup>.
- However, against the backdrop of a deteriorating global economic environment, the most common practice in guidelines has been to lower DR<sup>[1,4]</sup>. To keep pace with China's rapid economic evolution, the current DR requires urgent review and updating.

## OBJECTIVE

- After reviewing the literatures, establish the theoretical framework of empirical estimation.
- Then reassess and update the DR in pharmacoeconomic evaluations using the current economic data in China.

## METHODS

There are three main approaches to estimate a DR<sup>[2,3]</sup>:

- Social opportunity cost of capital approach (SOC) states that public investments are withdrawn from private investments.
- Social rate of time preference (SRTTP) approach states that public investments are withdrawn from private savings.
- Weighted average approach states that DR is a weighted average of SOC and SRTTP, which means the investments are withdrawn from both private investments and savings.

The first two basic methods are widely applied. But the weighted average approach was more comprehensive, and it was adopted in China's 2011 and 2015 guidelines.

Considering the theoretical integrity in addition to empirical experience from past applications, the DR is calculated using both the SOC method and the SRTTP method, then a final rate is derived by weighting them by specific weights.

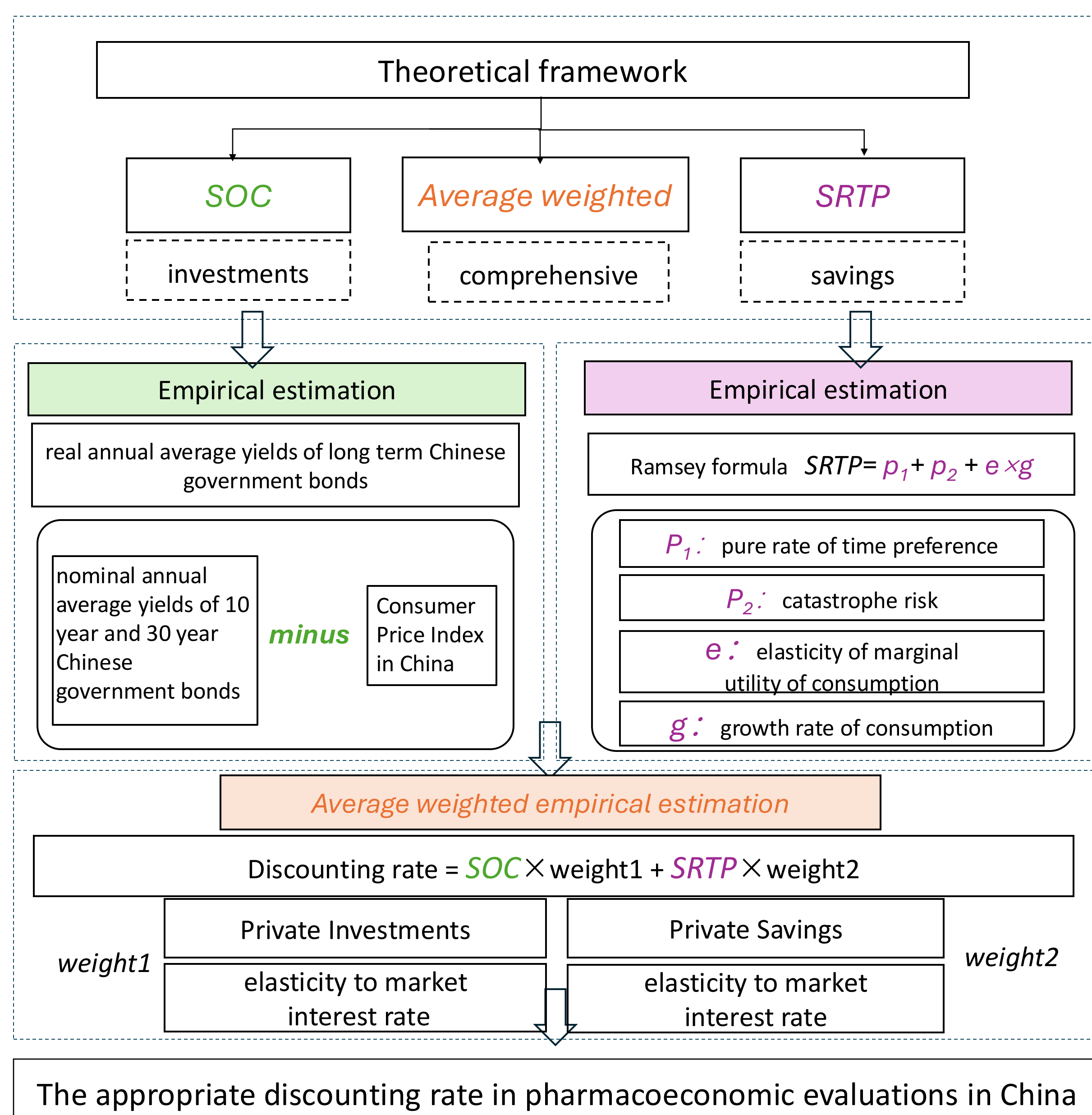


Figure 1. Theoretical structure of discounting rate estimation

## ESTIMATION AND RESULTS

For the **SOC** method, we use the real annual average yields of long-term Chinese government bonds in 2006-2025, where the inflation rate is from the compound annual growth rate of the Consumer Price Index (CPI) in 2006-2024. The empirical result is **1.24% (3.50%-2.26%)**, shown in Table 1).

For the **SRTTP** method, we apply the Ramsey equation using Chinese economic data from 2001 to 2024. The result is **9.00%**.

We get the key component, the elasticity of marginal utility of consumption  $e$  from the following equation<sup>[5]</sup>:

$$e = \frac{e_1(1-s * e_1)}{e_2}$$

- with  $e_1$  being the income elasticity of the demand for the want-independent good,  $s$  being the budget share of total consumption expenditures falling on the want-independent good, and  $e_2$  being the compensated price elasticity of demand. We estimate  $e$  by considering the product group food as a want-independent good by a suitable model of demand behavior for food as follows<sup>[5]</sup>:

$$\ln D = A + e_1 \ln Y + e_2 \ln PF + e_3 \ln PNF + \epsilon$$

- where  $D$  indicates the food expenditure per capita, and  $Y$  stands for the consumption expenditure per capita in prices of the base year 2001. The price indices for food and non-food are given by  $PF$  and  $PNF$ , respectively. Results are in table 2 and 3.

Table 2. OLS regression results, demand for food, China 2001–2024

Variable	Constant	Ln Y	Ln P <sub>1</sub>	Ln P <sub>2</sub>	Adjusted R <sup>2</sup>
Parameter value	10.863***	0.697**	-0.435	-1.575***	0.812

Table 3. Estimated elasticities and derived  $e$  values

Income elasticity, $e_1$	Compensated own-price elasticity, $e_2$	budget share of food, $s$	Elasticity of marginal utility of consumption, $e$
0.697	-0.435	0.311	<b>1.25</b>

Finally, we compute **weighted average rate** of **1.24%** and **9.00%**, where the weight of SOC is determined from the 2006-2024 historical average private fixed-asset investment, and SRTTP weight is based on the 2001-2024 historical average of private savings within total savings from the Flow of Funds Accounts, as well as the elasticities of them to market interest rates respectively, which are  $\eta$  and  $\epsilon$ . The elasticities are obtained from the similar research of South Africa<sup>[8]</sup>, see the table 4. The weights of SOC and SRTTP are **0.59** and **0.41**, then weighted discounting rate is **4.43%**.

Table 4. Estimated weights in weighted average approach

Variable	$I_0$ (100 million yuan)	$S_0$ (100 million yuan)	$\eta$	$\epsilon$	Weight for SOC	Weight for SRTTP
Parameter value	17189.492	24011.545	-1	0.5	0.59	0.41

Table 1. nominal annual average yields of long-term Chinese government bonds and CPI

Year	10-year (%)	30-year (%)	CPI(last year = 100)
2006	3.06	3.66	101.5
2007	3.99	4.36	104.8
2008	3.92	4.39	105.9
2009	3.34	4.03	99.3
2010	3.47	4.10	103.3
2011	3.86	4.33	105.4
2012	3.46	4.15	102.6
2013	3.83	4.40	102.6
2014	4.16	4.69	102
2015	3.37	3.96	101.4
2016	2.86	3.41	102
2017	3.58	4.04	101.6
2018	3.62	4.11	102.1
2019	3.18	3.79	102.9
2020	2.94	3.63	102.5
2021	3.03	3.57	100.9
2022	2.77	3.25	102
2023	2.72	3.07	100.2
2024	2.22	2.42	100.2
2025	1.62	1.84	-
Average	3.25	3.76	
	<b>3.50%</b>	<b>2.26%</b>	

- Other components of Ramsey equation are the pure rate of time preference  $P_1$ , catastrophe risk  $P_2$  and the growth rate of consumption  $g$ . We set the  $P_1$  to **zero** on the ethical ground like many empirical studies did<sup>[6,7]</sup>, take the average mortality rate **0.70%** for  $P_2$  in China during 2001-2024, and use the growth rate **6.61%** of China's retail sales of consumer goods as a measure of  $g$ .

## CONCLUSIONS

- This study provides important references for updating the discount rate in pharmacoeconomic evaluations in China. Based on the final average weighted result of 4.43%, the The empirical findings of this study **suggests a moderate reduction** of the current 5% discount rate for costs and health outcomes in pharmacoeconomic guidelines.

## REFERENCE

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