



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Are china's grain trade policies effective in the stabilization of domestic food prices? An investigation based on a structural break regime switching model

Jie Lu, Xinkai Zhu and Zhonghua Yu

School of Agricultural Economics and Rural Development, Renmin University of China, Beijing,
100872, P. R. China

Jie Lu is an assistant professor of School of Agricultural Economics and Rural Development, Renmin University of China (RUC). He got his Ph.D. from Cornell University in 2009. His current research areas cover macroeconomics, China studies and food policies.

Xinkai Zhu is a professor of School of Agricultural Economics and Rural Development, RUC. His current research areas cover the international trade of agricultural products and rural markets.

Zhonghua Yu is a graduate student of School of Agricultural Economics and Rural Development, RUC.

Selected Paper prepared for presentation at the Agricultural & Applied Economics Association's 2013 AAEA & CAES Joint Annual Meeting, Washington, DC, August 4-6, 2013.

Copyright 2013 by Jie Lu. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

Abstract

As the base price, grain prices have played considerably important role in China's macro-economy and social price level. In this study we investigate the fluctuation characteristics of some main crops of China's grain during the past two decades by using Structural Break Regime Switching Model. We find that China's grain price growth has become more stable since 2004 with narrowing low and high growth regimes. The implementation of minimum grain purchase price policy, improvement of market structure and diversification of acquisitions which improve farmers' overall earning expectation and stabilize food price, are the most important motivating factors.

Key Words- Food Price; Stabilizing Point; Structural Break Regime Switching

JEL Classification: Q11, Q18, E3

1. Introduction

The grain problem, determined by China's basic national conditions, is a strategic problem closely related to the social and economic development. As the basic products related to people's survival needs and the social order, food prices and the balance between supply and demand have been the important field to which the academia and government departments both attach attention. With 7% of the world's cultivated land, China undertakes the burden of supporting 22% of the world's population. In the next 10 to 20 years, it will be a basic question related to the construction of socialism with Chinese characteristics whether China can keep a balance between grain supply and demand and stabilize the smooth development of grain prices. Along with the accelerating process of economic development centering around urbanization and the improvement of people's income level, the aggregate demand of grain will continue to rise, so does the pressure to realize the balance between supply and demand of grain. Since the founding of new China, agriculture has made tremendous contributions to the industrial primitive accumulation for tens of years. Now, industry should nurture the agriculture. As a consequence, the restorative rising of grain as a representative of agricultural products will be a long-term trend. However, due to the particularity of the food itself, as the foundation of prices of all products, the stability of the grain price is extremely significant to national overall price level and the stability of the macro-economy. In order to maintain the stabilize China's macro-economy and the improvement of living standards of urban citizens, we need a relatively stable and reasonable price level. Therefore grain prices also must be kept in a "moderate" growth rate.

Before the reform and opening up, China adopts the policy of "state monopoly for purchase and marketing" toward grain. The government tightens the control over grain price. After 1985, our country has cancelled the policy, established the system of contract ordering in which grain that has not been ordered can be accessed in the market at liberty. Grain prices in China gradually move onto the marketization track. However, with the deepening marketization, owing to influence of many kinds of factors such as the market supply and the policy intervention, food prices also fluctuation severely. Especially in the recent years, international food prices have fluctuated more frequently, coupled with wider fluctuation range. The Chinese food market is increasingly susceptible to the international market impact, fluctuation characteristics and rules being more complicated. This requests us to further understand China's grain price fluctuation rules and fluctuation characteristics, reasonably establish the grain reserve mechanism, forge macroeconomic regulation and control policy of food prices, and ensure the country's food security and social stability. In contrast to the fluctuation mechanism of traditional commodity, our food price has long been driven by the dual system of market mechanism and government control. Fundamentally, the main factor influencing the food price fluctuation is the food supply and demand. Behaviors of market's main body determine the formation of food prices. However, due to China's special transition stage of development, the government is also an important main body participating in food market. The constraints of government's

behaviors mainly are government's financial ability and the judgment on food supply and demand. The target set is about the combination of the two different targets, stabilizing food price and increasing farmers' income in different stages. Decision mentality is on understanding and tolerating the food security and price fluctuation (Gong Fang, Gao Fan, 2012). In the past twenty years, Chinese government has undertaken various means to intervene in the food market price, which directly leads to different fluctuation characteristics in the different stages. Firstly, this paper will analyze food price fluctuation characteristics in the recent twenty years. Through the traditional Regime Switching Model and Structural Break Regime Switching Model, three major food prices will be analyzed. From the historical price fluctuation, this paper will extract the proper fluctuation range. With fluctuation variance of different growth regimes, this paper will also explore whether China's grain price growth tends to be stable. Based on the empirical research, this paper will further analyze the policy mechanism behind the transformation of fluctuation characteristics and explore how the government can exert its stabilizing function instead of adding fuel to the fire in the process of the price regulation.

2. Literature Review

In general, agricultural cyclical fluctuation is a common phenomenon which surpasses the system and development stage. In order to conduct the effective macroeconomic regulation and control over agriculture, we must have the accurate warning analysis whose premise is correct understanding the agricultural cycle. Song Hongyuan (1995) analyzes the agricultural prices cycle from the perspective of food production cycle and the supply fluctuation of agricultural products. Luo Jianguo (1996) thinks that China's agricultural products market fluctuation mainly features leading fluctuations of production supply, frequent fluctuations, wide range, stronger cycle fluctuation, four years cycle presented by the main agricultural products. Wu Guoxing (1997) argues that the fluctuation of agricultural products market price manifest as the periodic fluctuation featured by the same step-by-step-jump ups and downs. The general price level showcases ascendant trend, and the rise and fall of agricultural products price coincides with the overheated economy and economic adjustment in terms of time. Its fluctuation cycle agrees with the variation cycle of industrial growth speed against agricultural growth speed, and the two cycles have the same direction. The fluctuation of agricultural product price doesn't have a clear negative relation with the increase and decrease of total agricultural product. Cheng Guojiang (2010) thinks that there exist two kinds of situations of agricultural products price fluctuations: one kind is normal cyclical fluctuation determined by the relationship between agricultural product supply and demand. Another kind is abnormal fluctuations, which is not determined by the relation between market supply and demand, but other factors, such as sudden natural disasters, government regulation policy, speculative hype, improper public opinion adding fuel to the fire.

For a long time, it has been a strategic target for China's food security to maintain China's grain's balance between supply and demand and the stability of grain markets. Therefore, the balance between food supply and demand and food price fluctuation has already been intensely discussed by the academia. Food is an industry where natural reproduction and economic reproduction are twisted. As a consequence of the widespread layout of the producing space, intensity of time distribution and hysteresis of market signal influence, the cyclical fluctuation of grain prices and other agricultural products is an inevitable phenomenon. In the long run, food prices will present a cyclical fluctuation, with the overall rising. It will become an inevitable trend in the process of economic growth that grain and other agricultural prices continue to stay high. (Cheng Guojiang, 2011; Li Guoxiang, 2011). China's grain price fluctuation features pretty strong regularity and period (Leng Chongxin, 2008; Meng Fanxin et al., 2008), Liu Ximing (2009) finds that with respect to the grain price fluctuations of spot market and future market, price fluctuation ranges of basic food of are substantially consistent. And Gu Guoda, et al. (2010) believe that China's agricultural price fluctuation has the characteristics of obvious situation transfer. Its fluctuation is influenced by unobservable variables of situation transfer. This fluctuation is not only long-term and

stable but asymmetrical to a certain degree.

Fundamentally, the food price stability depends on the balance between food supply and demand. Since the 1990's, Chinese scholars have begun to estimate and forecast the grain demand in the coming decades of China, and done some researches on the influence upon supply and demand of China's grain by international food market after China's entry into the WHO (Liu Jingyi et al., 1996; Lv Xinye et al., 1997; Huang Peimin et al., 1997; Gao Guoqing et al., 2000). Research findings generally show that there still exists the food structural surplus and deficiency, but contents of surplus and deficiency will change. After the entry into WHO, China should adopt the following channels to keep the balance between supply and demand: control of food import and export, transformation of domestic food production layout, structural adjustment as the priority supplemented by grain reserve adjustment. The three channels should complement each other. After the 21st century, with China's entry to the WTO and further reform of domestic grain production and circulation system, researches of China's grain balance have spread from the deep research of production and supply system, reserve and stimulation system, market and circulation system to cohesion of food production and marketing, interregional grain circulation, regional grain balance of the national grain balance, domestic grain balance and the international grain market fluctuation and a lot of valuable research results have been reached.(Dong Quanhai, 2000; Yang Minghong, 2000; Xiao Guoan, 2002; Li Xinjian et al., 2005; Jiang Changyun, 2006; Ran Ruiren, Deng Hao, 2007; 2009; Huang Jikun et al., Yang Lei, 2009).Most studies forecast a quite long period of time in the future where China's grain total demand is increasing. The tense situation of food supply and demand will continue in the coming years. (Liu Xiaomei, 2004; Chen Yongfu 2005; Li Bo, et al., 2008; Shao Lu, 2009; Yang Lei, 2009) Therefore, food prices overall will keep an upward trend in the long run. And in the process of rising food prices, how to deal with the relationship between the government regulation and market regulation has become a hot spot studied by many scholars (Wang Xiaolu, 2001; Wang Dewen et al., 2001; Wang Yisong, 2004; Wang Zhibin, 2007; Feng Yun, 2008; Yang Ju, 2008).

Comprehensively speaking, although there are a lot researches about China's grain price fluctuation and its influence on economic social life, few study food prices fluctuation rules and the characteristics. In addition, several researches on characteristics of food price fluctuation are carried out mostly by the means of traditional filtering, or the method called "wave trough, wave crest" to differentiate fluctuation cycle. With China's food fluctuation form and rule being more complicated, this kind of means has shown some limitations. The Structural Breaking Regime Switching Model adopted by this paper is based on the extension of Classical Hamilton (1989) Regime Switching Model. Classical Regime Switching Model has been widely developed and applied in recent twenty years. Hansen (1992) first put forward a testing theory of Hamilton Regime Switching Model. Albert and Chib (1993) used Gibbs Sampling Method to simplify the calculating process. Then, this method is widely used in researches on many countries' economic growth and the business cycle by scholars of all countries (Albert,1993; McConnell, 2000; Krolzig, 2001; Mills,2003; Lam,2004; Girardin,2005; Marmer, 2008; Sugita, 2008). Meanwhile, Chinese scholars also apply this method to China's macro data analysis and research. Shi Zhuxian et al. (2007) apply multivariable dynamic Markov Transfer Factor Model to researches on China's economic cyclical fluctuation since 1991.Guo Qingwang, et al. (2007) used Gibbs sampling method to estimate the multivariable dynamic Markov switching factor model of Chinese economic cycle, identifying China's economic cyclical inflection point and analyzing synchronous index. This paper will extract the characteristics of China's grain price fluctuation by means of Nonlinear Regime Switching Model, with the focus on China's twenty years' grain price fluctuation rules and characteristics. Based on the new classification of fluctuation stages, this paper will analyze the policy mechanism before and after fluctuation point of China's grain market.

3. Theoretical Model

There still exist some flaws in terms of studying methods and perspectives in spite of a number of researches on

grain price fluctuations emerging amongst the academics. Firstly, grain price fluctuations are not influenced by the short-term factors but the long-term structural factors with complicated fluctuation formalities. The fluctuations frequently appear in two different fluctuations or growth situations and switch between the both, with random switching probabilities instead of periodical or fixed ones. Therefore, the conventional method featuring “big cycle and small cycle” doesn’t fit the grain price fluctuations characterized by short term and intricate influencing factors. If the conventional method similar to “wave crest and wave trough” featuring classifications of grain price is used to describe the situation, the characteristics of short-term grain price fluctuation can’t be presented exactly due to the difficulty to find crest and trough resulting from complicated fluctuations and vague cycles of grain price fluctuations. As a consequence, the conventional cyclical methods are not desirable.

Owing to the dual influencing factors of short-term impact and long-term structural changes for grain price fluctuations, this paper will select Structural Break Regime Switching Model. Firstly, we will classify price growth into high-growth regime and low-growth regime, with different potential growth rates and fluctuation variances corresponding to different regimes. And grain prices will jump randomly between different regimes so that we can relatively precisely depict the fluctuations impacted by short-term factors. Secondly, in the long term, due to the possible changes of exterior macro-economy and overall operating mechanism of grain markets, macro-breaks may take place in fluctuation characteristics accordingly. Therefore, based on the Classical Regime Switching Model, we introduce the Structural Switching Mechanism (Fluctuation variances and potential growth rates of two regimes will break at some point). By those changes, we can find the structural breaking point of China’s grain price fluctuations in order to analyze the reasons before and after breakings and attain objective and scientific results entirely based on data rather than the conventional subjective way to detect still breaking point.

3.1 Classical Regime Switching Model

According to the classical Markov Regime Switching Model theory, an economic index or price index growth can be divided into two kinds of regimes, namely high-growth regime and low-growth regime. The two regimes have different asymmetries. That is to say there exist various potential average growth rates and fluctuation variances in each regime, where the average duration lengths are different. Use state variables to describe two growth regimes, low-growth regime corresponding to $S_t = 0$, high-growth regime corresponding to $S_t = 1$. In each regime, time sequence obeys q order regression process,

$$y_t = \mu_{S_t} + \phi(L)(y_{t-1} - \mu_{S_{t-1}}) + u_t, \quad u_t \sim NID(0, \sigma_{S_t}^2)$$

$$\phi(L) = \phi_1 L + \phi_2 L^2 + \dots + \phi_q L^q$$

L is lag operator. In this study, choices of the best lag order numbers comply with AIC (Akaike Info Criterion) Criterion (Simpson, 2001).

The potential growth rates and fluctuation variances corresponding to respective every growth regimes can be presented:

$$\mu_{S_t} = \mu_0(1 - S_t) + \mu_1 S_t$$

$$\sigma_{S_t} = \sigma_0(1 - S_t) + \sigma_1 S_t \quad S_t = 0 \text{ or } 1$$

μ_0 and μ_1 represent two regimes’ potential growth rates. σ_0 and σ_1 are fluctuation variances used to describe fluctuation range of every regime

Probabilitis of transformations following time of economies in two regimes can be expressed as

$$\begin{pmatrix} P(S_t = 0) \\ P(S_t = 1) \end{pmatrix} = \begin{pmatrix} p_{00} & p_{10} \\ p_{01} & p_{11} \end{pmatrix} \begin{pmatrix} P(S_{t-1} = 0) \\ P(S_{t-1} = 1) \end{pmatrix}$$

And $\begin{pmatrix} p_{00} & p_{10} \\ p_{01} & p_{11} \end{pmatrix}$ is Conversion probability matrix, and every element of matrix is

$$\begin{cases} p_{00} = \Pr(S_t = 0 | S_{t-1} = 0) \\ p_{10} = \Pr(S_t = 0 | S_{t-1} = 1) \\ p_{01} = \Pr(S_t = 1 | S_{t-1} = 0) \\ p_{11} = \Pr(S_t = 1 | S_{t-1} = 1) \end{cases}, p_{00} \text{ and } p_{11} \text{ representing duration probability of two regimes, and}$$

$$p_{10} = (1 - p_{11}), p_{01} = (1 - p_{00})$$

3.2 Structural Break Regime Switching Model

In classical regime switching model, we assume that the switching mechanism, fluctuation variance and two regimes' potential growth rates are not changeable. But, in many cases, due to break of external economic operation mechanism, economic growth or price index fluctuation characteristics will change. The two regimes' potential growth rates and fluctuation ranges will also change accordingly (Kim and Nelson, 1999). At this time, we will introduce structural break mechanism. Use the setting structural break index D_t (0 or 1) to represent two fluctuation mechanisms before and after, 1 - d standing for break probability.

$$\mu_{S_t} = \begin{cases} \mu_0(1 - S_t) + \mu_1 S_t, & \text{if } D_t = 0 \\ \mu_0^*(1 - S_t) + \mu_1^* S_t, & \text{if } D_t = 1 \end{cases}$$

$$\begin{cases} \Pr[D_t = 1 | D_{t-1} = 1] = 1 \\ \Pr[D_t = 0 | D_{t-1} = 1] = 0 \\ \Pr[D_t = 0 | D_{t-1} = 0] = d \\ \Pr[D_t = 1 | D_{t-1} = 0] = 1 - d \end{cases} \text{ and } \begin{cases} D_0 = 0 \\ D_T = 1 \end{cases}$$

Due to the large numerous of undetermined coefficients and computational complexity, we adopt Gibbs sampling method in the concrete operation process. First of all we set joint probability density as:

$$g(S_1, \dots, S_T, D_1, \dots, D_T, \varphi, \mu_0, \mu_1, \mu_0^*, \mu_1^*, \sigma_0, \sigma_1, p, q, d | Y_1, \dots, Y_T)$$

Concrete sampling method process are shown as :^①

1) Based on $S_{\neq t}, D_1, \dots, D_T, \theta$ to S_t sampling:

Posterior probability density of S_t can be shown as

$$g(S_t | Y_T, S_{\neq t}, D_1, \dots, D_T, \theta) \propto g(S_t | S_{t-1})g(S_{t+1} | S_t)g(y_t | S_t, S_{t-1}, D_1, \dots, D_T, \theta)g(y_{t+1} | S_{t+1}, S_t, D_1, \dots, D_T, \theta)$$

2) Based on $D_{\neq t}, S_1, \dots, S_T, \theta$ to D_t sampling:

Posterior probability density can be shown as

$$\Pr[D_t = j | Y_T, D_{\neq t}, S_1, \dots, S_T, \theta] = \frac{g(D_t = j | Y_T, D_{\neq t}, S_1, \dots, S_T, \theta)}{\sum_{j=0}^1 g(D_t = j | Y_T, D_{\neq t}, S_1, \dots, S_T, \theta)}$$

3) Based on $D_1, \dots, D_T, S_1, \dots, S_T, \theta_{(-\varphi)}$ to φ sampling:

Posterior probability density can be shown as

① the sampling process has circulated for 20000 times in which 5000 times before are discarded.

$$g(\varphi | S_1, \dots, S_T, D_1, \dots, D_T, \theta_{(-\varphi)}) \propto \prod_{t=2}^T \frac{1}{\sigma_{D_t}} \exp \left[-\frac{(y_t - \mu_{S_t, D_t} - \varphi(y_{t-1} - \mu_{S_{t-1}, D_{t-1}}))^2}{2\sigma_{D_t}^2} \right].$$

4) Based on $D_1, \dots, D_T, S_1, \dots, S_T, \theta_{(-\mu)}$: to $\mu_0, \mu_1, \mu_0^*, \mu_1^*$ sampling:

5) Based on $D_1, \dots, D_T, S_1, \dots, S_T, \theta_{(-\sigma)}$ to σ_0, σ_1 sampling:

$$g(\sigma_0^2 | S_1, \dots, S_T, D_1, \dots, D_T, \theta_{(-\sigma_0)}) \propto \left(\frac{1}{\sigma_0^2}\right)^{\frac{u}{2}} \prod_{t(D_t=0)} \exp \left(-\frac{[y_t - \mu_{S_t, 0} - \phi(y_{t-1} - \mu_{S_{t-1}, D_{t-1}})]^2}{2\sigma_0^2} \right).$$

6) Based on $D_1, \dots, D_T, S_1, \dots, S_T, \theta_{(-p, -q)}$ to p, q sampling:

$$g(p, q | S_1, \dots, S_T, D_1, \dots, D_T, \theta_{(-p, q)}) \propto p^{(u_{00}+1)-1} (1-p)^{(u_{01}+1)-1} q^{(u_{11}+1)-1} (1-q)^{(u_{10}+1)-1}, \text{ and } u_{00}, u_{11}, u_{10}, u_{01} \text{ are}$$

observable switching times

$$g(p | S_1, \dots, S_T, D_1, \dots, D_T, \theta_{(-p)}) \sim \text{beta}(u_{00} + 1, u_{01} + 1)$$

$$g(q | S_1, \dots, S_T, D_1, \dots, D_T, \theta_{(-q)}) \sim \text{beta}(u_{11} + 1, u_{10} + 1)$$

7) Based on $D_1, \dots, D_T, S_1, \dots, S_T, \theta_{(-d)}$ to d sampling

4. Empirical Analysis

Data used in this research are derived from market and economic information department of the agricultural ministry of the People's Republic of China, as well as national bureau of statistics calendar year *China Statistical Yearbook*. Selected representatives are wheat, rice, corn. All data are monthly data time series, spanning from 1987 to 2010. Before the measurement test, all the time sequences go through the seasonal adjustment by X - 12 Adjustment Method, then monthly price sequences are transformed into link growth rate.

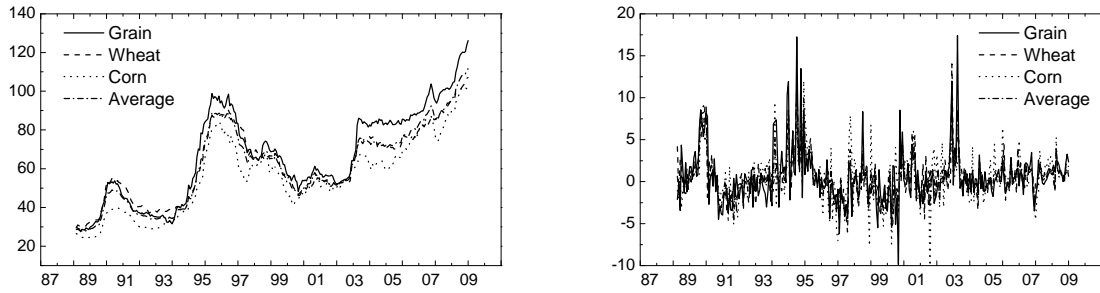


Figure 1 Monthly Price and Growth Rate of Three Kinds of Grain

Note: 1. The left figure shows the average price for rice, wheat, corn, unit RMB/50kg;

2. The right figure shows monthly quarter-on-quarter growth rate after seasonal adjustment.

In the empirical analysis, we first use classical regime switching to analyze three grain prices separately in order to extract fluctuation characteristics as well as the growth cyclical stages of different periods in the past twenty years. Second, through Structural Break Regime Switching Model, we classify different fluctuation stages of average prices so as to discover inflection point of fluctuation characteristic switching.

4.1 The Analysis Of Fluctuation Characteristics Of Three Crops' Prices Based On The Classical Regime Switching Model

The empirical results are as shown in figure 2, 3, 4, 5, and table 1, 2, 3, 4. Take rice for example. The curve below

the left of figure 2 represents its monthly growth rate, while the blue curve above the left shows the probability when prices belong to the high-growth regime. We can see in the year of 1988, 1993 -1994, 2000, 2003-2004, the price of wheat belongs to high-growth regime. From table 1, we can come to the conclusion that the monthly average growth rate of rice belonging to the low-growth regime is 0.16%, with 1.32% to high-growth regime, but the fluctuation variance of high-growth regime is bigger than that of low-growth regime, showing the characteristics of “high growth, high fluctuation” .

The analysis of the two remaining grain prices is similar. In addition, from overall average price fluctuations of the three kinds of grain, in the year of 1988,1994, 1997, 2000, 2003-2004, the high-growth regime belongs to high-growth regime. Potential growth rates of low and high growth regime are 0.05% and 2.7%, and fluctuation variances are 1.36%, 3.82%.

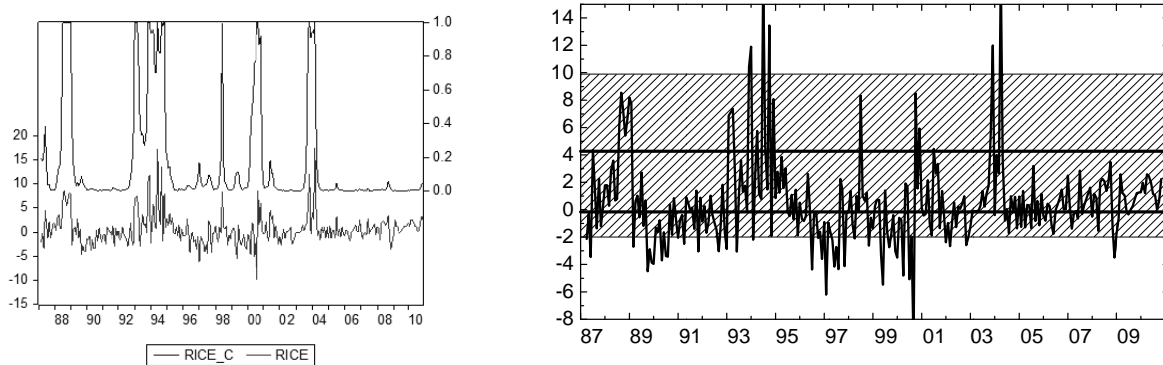


Figure 2 Rice's Traditional Model

Note: 1. The curve below the left figure shows the monthly growth rate while the curve above the figure shows the probability of the high-growth regime;

2. Two thwartwise solid line of the right figure shows the potential growth rate of low and high regime with the shade representing the range of fluctuation variance.

3. Figure 3, figure 4, figure 5 are similar.

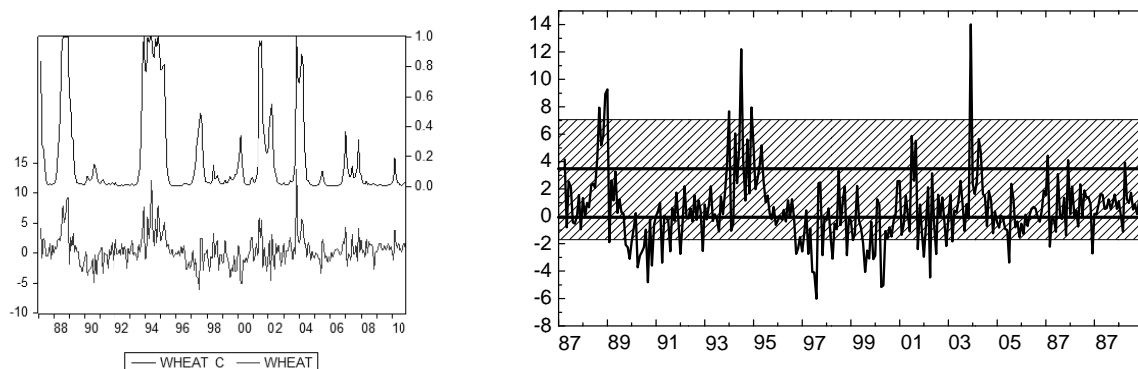


Figure 3 Wheat's Traditional Model

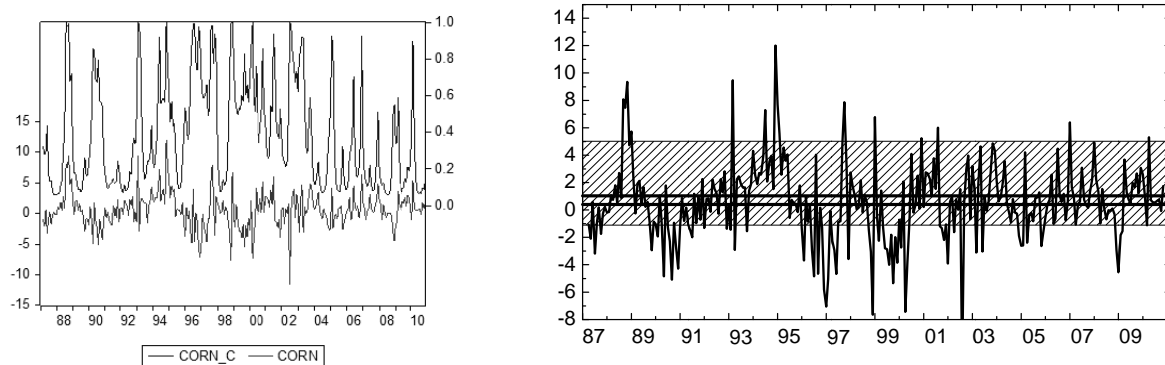


Figure 4 Corn's Traditional Model

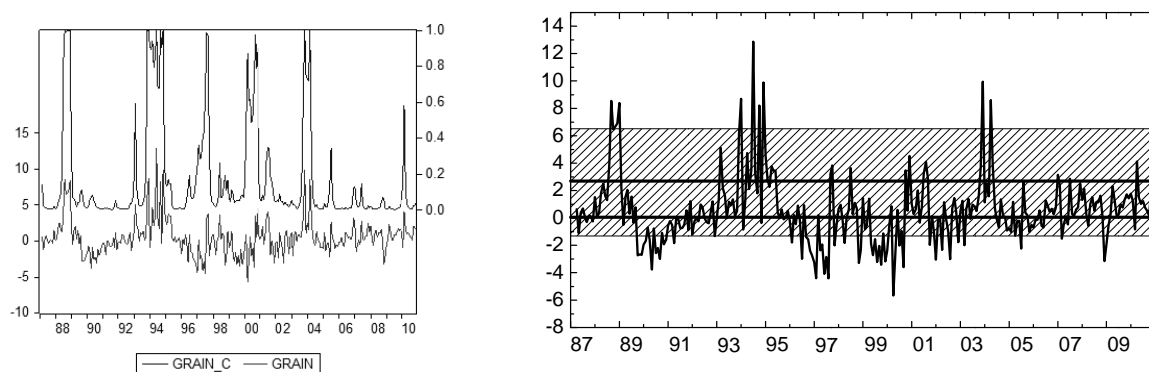


Figure 5 Average Traditional Model of the Three Kinds of Grain

Table 1 The Analysis Result of Classic Markov Regime Switching Model of Rice Price (1987-2010)

	Average	Standard variance	Median	5%quantile	10%quantile	95%quantile
φ	0.059	0.243	0.144	0.167	0.337	0.059
μ_0	0.163	0.156	0.421	-0.362	-0.107	0.163
μ_1	1.317	4.230	2.167	2.615	6.496	1.317
σ_0	0.098	1.792	1.627	1.662	1.952	0.098
σ_1	0.656	5.582	4.675	4.862	6.806	0.656
p	0.017	0.962	0.927	0.936	0.982	0.017
q	0.082	0.804	0.637	0.679	0.906	0.082

Note: 1. μ_0 and μ_1 stand for potential growth rates of high and low growth regimes.

2. σ_0 and σ_1 stand for the fluctuation variance of high and low growth regimes. Table 2, table3 and table 4 are similar.

Table 2 The Analysis Result of Classic Markov Regime Switching Model of Wheat Price (1987-2010)

	Average	Standard variance	Median	5%quantile	10%quantile	95%quantile
φ	0.243	0.084	0.244	0.108	0.136	0.382
μ_0	0.064	0.163	0.069	-0.323	-0.269	0.225
μ_1	3.478	1.337	3.548	1.189	1.576	5.570
σ_0	1.643	0.142	1.658	1.361	1.430	1.851

σ_1	3.585	0.490	3.555	2.824	2.978	4.427
p	0.956	0.028	0.963	0.892	0.914	0.986
q	0.789	0.093	0.804	0.613	0.663	0.911

Note: similar to table 1

Table 3 The Analysis Result of Classic Markov Regime Switching Model of Corn Price (1987-2010)

	Average	Standard variance	Median	5%quantile	10%quantile	95%quantile
φ	0.383	0.073	0.383	0.264	0.290	0.498
μ_0	0.401	0.227	0.406	0.017	0.112	0.773
μ_1	1.039	0.523	0.926	0.386	0.493	2.038
σ_0	1.523	0.233	1.520	1.156	1.226	1.910
σ_1	3.980	0.556	3.869	3.290	3.385	5.010
p	0.832	0.071	0.841	0.698	0.734	0.928
q	0.724	0.123	0.746	0.508	0.566	0.888

Note: similar to table 1

Table 4 The Analysis Result of Classic Markov Regime Switching Model of Average Price (1987-2010)

	Average	Standard variance	Median	5% quantile	10%quantile	95%quantile
φ	0.475	0.057	0.476	0.386	0.405	0.572
μ_0	0.046	0.182	0.041	-0.248	-0.185	0.355
μ_1	2.694	1.227	2.575	1.004	1.303	5.882
σ_0	1.356	0.096	1.357	1.183	1.226	1.524
σ_1	3.824	0.565	3.819	2.681	3.123	4.684
p	0.943	0.027	0.948	0.885	0.901	0.978
q	0.725	0.123	0.748	0.442	0.534	0.882

Note: similar to table 1

Between 1987 and 2010, China's grain price has undergone several rising fluctuations (similar to Table 1). That is to say, price fluctuations stay in the high-growth regime. As regards the results of three main grain crops, the high-growth regime took place in the second half of 1988, in 1994, in the second half of 1997, in 2000 and from the end of 2003 to the beginning of 2004, with each rising period spanning from six months to a year. During the 24 years, high-growth regime took up 13% of the total time span. Therefore, despite several big fluctuations occurring in the past two decades, low-growth regime has occupied 85% and above of time span. Moreover, the three crops all present features of "high growth, high fluctuation", namely, higher growth rate, bigger fluctuation variance leading to more volatile market. We can see that the potential growth rate of wheat, rice and corn is below 0.5% in the low-growth regime and between 1%-3% in high-growth regime, among which wheat's potential growth rate can top 3.4% and corn's can reach the lowest 0.4%. After the analysis of the average price of the three crops, we can see that potential growth rates of two growth regimes are 0.05% and 2.7% respectively with respective fluctuation variances of 1.36% and 3.8%.

Table 5 Fluctuation Range of China'S Grain Prices (1987-2000)

Kind	Potential Growth Rates of Low Growth (%)	Potential Growth Rates of High Growth(%)	Fluctuation Variance of Low Growth (%)	Fluctuation Variance of High Growth (%)
Rice	0.16	1.32	0.10	0.66

Wheat	0.06	3.48	1.64	3.59
Corn	0.40	1.04	1.52	3.98
Average	0.05	2.69	1.36	3.82

4.2 The Stage Classification of Food Price Fluctuation Based on the Structural Break Model

In order to further analyze the overall transformation of fluctuation characteristics, we have discussed the structural break on the average price growth rates of three kinds of grain. Results of parameters sampling for potential growth rate and fluctuation variance are shown in figure 6 from which we can see that the parameter sampling process tends to be stable after 2000 times.

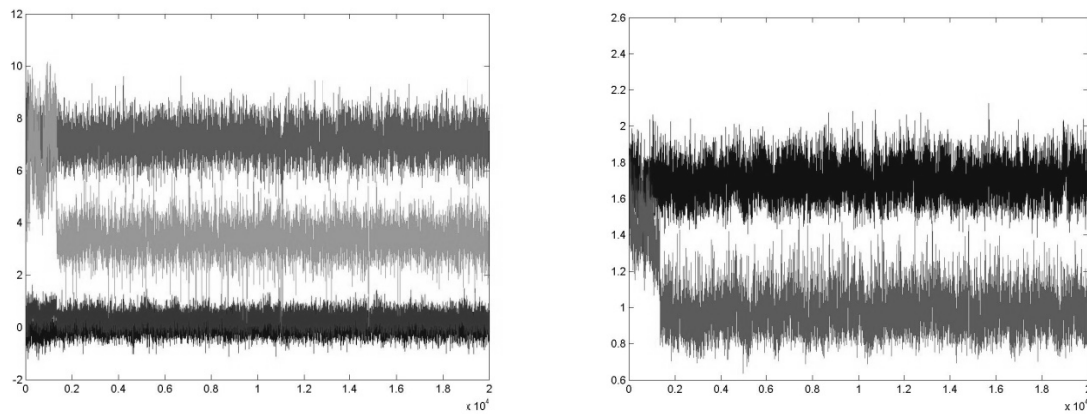


Figure 6 The Parameter Sampling Process of Structural Breaking Model

Note:the sampling process of the potential growth rate parameters μ_0 , μ_1 , μ_0^* , μ_1^* are on the left; the sampling process of the fluctuation variance σ_0 , σ_1 are on the right; the sampling process has lasted for 20000 times and 5000 times before are discarded in parameter statistics to ensure the stability of the results.

The empirical results are shown in figure 7 and table 5. The empirical results show that the price experiences a break in early 2004 and the potential growth rates of its two regimes shrink. The potential growth range shrinks from (0.01%, 7.71%) to (0.36%, 3.37%), with fluctuation variance dropping dramatically, from 1.7% to 0.98%. It shows that after 2004, China's grain price market has entered a period of "low growth, low volatility", which is closely linked to China's continuous grain harvest and the food price protection policy undertaken by government.

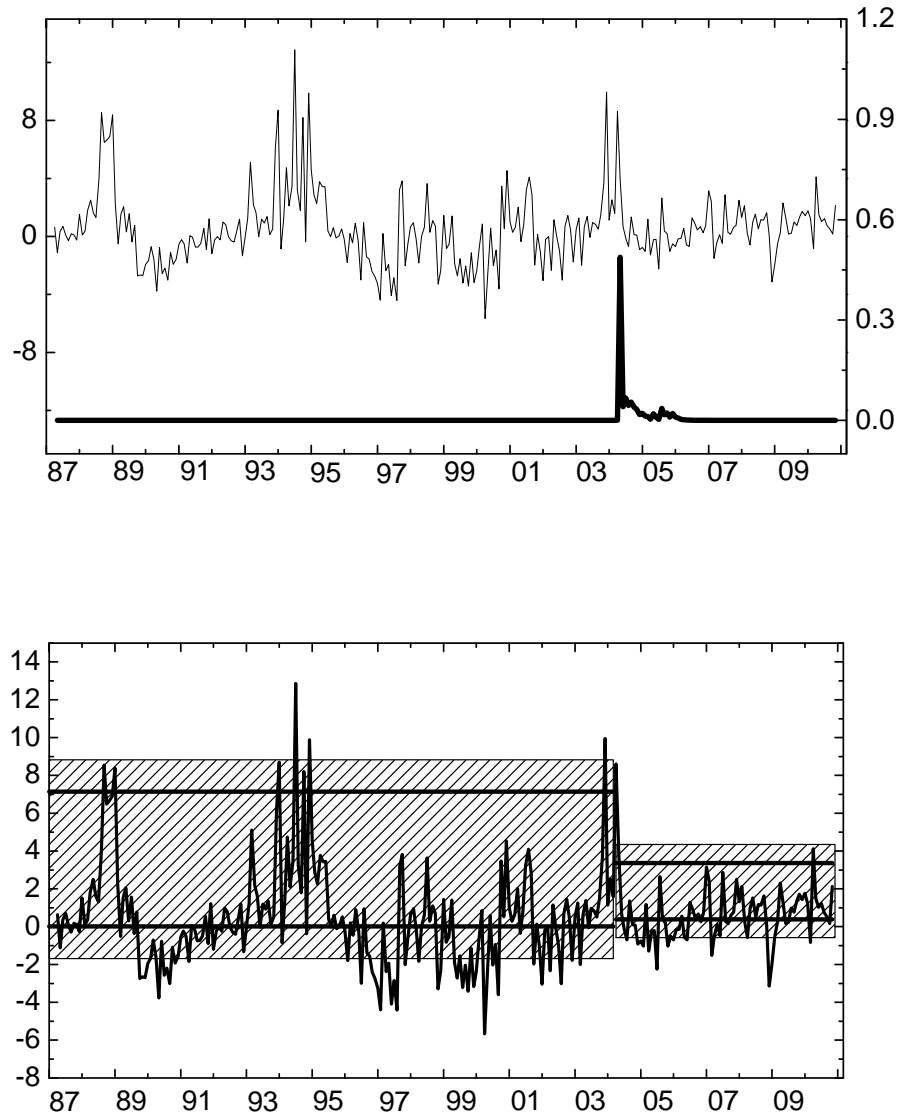


Figure 7 The Structural Breaking Model of the Kinds Of Grain

Note: The above figure shows the probability of stabilizing breaking. The following figure shows that the thwartwise solid lines stand for the potential growth rate of high and low growth regime in different fluctuation stages. The shady represents the fluctuation variance range.

Table 6 The Analysis Result of Classic Markov Regime Switching Model of Average Price (1987-2010)

	Average	Standard variance	Median	5%quantile	10%quantile	95%quantile
φ	0.551	0.058	0.552	0.450	0.473	0.647
μ_0	0.008	0.274	0.006	-0.452	-0.350	0.447
μ_1	7.173	0.597	7.171	6.186	6.406	8.161
μ_0^*	0.361	0.268	0.358	-0.068	0.032	0.834
μ_1^*	3.365	0.590	3.376	2.474	2.701	5.829
σ_0	1.700	0.094	1.695	1.546	1.575	1.860
σ_1	0.976	0.107	0.965	0.823	0.851	1.345
p	0.947	0.015	0.948	0.921	0.928	0.971
q	0.385	0.108	0.381	0.213	0.246	0.571

d	0.991	0.007	0.992	0.977	0.981	0.998
---	-------	-------	-------	-------	-------	-------

Note: 1. μ_0 and μ_1 stand for potential growth rates of high and low growth regimes before the breaking point

2. μ^*_0 and μ^*_1 stand for potential growth rates of high and low growth regimes after breaking point

Moreover, in order to test the stability of the model in our study, we have altered the conditions on variable before and after the structural breaking point. For one thing, the potential growth rate will not change before and after break point; for another, the fluctuation variance will not change before and after break point (Kim and Nelson,1999). The testing results are shows in Table 7 and Table 8, in which the potential growth rate and fluctuation variance are in consistent with the original model presenting sound stability.

Table 7 Testing Results of Stability
(Same Potential Growth Rate and Different Fluctuation Variances)

	Average	Standard variance	Median	5%quantile	10%quantile	95%quantile
φ	0.515	0.058	0.516	0.418	0.441	0.609
μ_0	0.248	0.196	0.250	-0.071	0.000	0.567
μ_1	7.219	0.634	7.251	6.146	6.404	8.227
μ_0^* ($=\mu_0$)	0.248	0.196	0.250	-0.071	0.000	0.567
μ_1^* ($=\mu_1$)	7.219	0.634	7.251	6.146	6.404	8.227
σ_0	1.672	0.093	1.667	1.530	1.559	1.837
σ_1	1.255	0.133	1.249	1.053	1.096	1.482
p	0.964	0.012	0.965	0.941	0.947	0.981
q	0.420	0.121	0.416	0.224	0.263	0.625
d	0.991	0.007	0.992	0.977	0.981	0.998

Table 8 Testing Results of Stability
(Different Growth Rates and Same Fluctuation Variance)

	Average	Standard variance	Median	5%quantile	10%quantile	95%quantile
φ	0.522	0.086	0.522	0.385	0.416	0.676
μ_0	0.224	0.516	0.185	-0.552	-0.389	1.232
μ_1	6.770	2.812	7.493	0.934	1.773	10.616
μ_0^*	0.466	0.528	0.466	-0.405	-0.187	1.386
μ_1^*	3.987	3.170	3.193	0.101	0.431	9.731
σ_0	2.579	0.417	2.495	2.060	2.133	3.405
σ_1 ($=\sigma_0$)	2.579	0.417	2.495	2.060	2.133	3.405
p	0.960	0.066	0.972	0.916	0.943	0.994
q	0.333	0.205	0.322	0.034	0.063	0.692
d	0.987	0.009	0.989	0.969	0.975	0.998

5. Policy analysis and suggestion

From the empirical analysis we can see that China's grain price fluctuations can be divided into short-term fluctuations and long-term structural transformation. Short-term fluctuations mainly result from all kinds of random and non-controllable shocks, while long-term fluctuations are determined by some macro-factors such as China's grain marketing system and price policy. The empirical results show that China's grain price has started to rise stably after 2004 with substantially narrowing high-and-low-growth regimes and plummeting fluctuations. China's grain market is relatively stable compared with the international grain market in the same period. What

factors contribute to breaking point of grain price fluctuations in 2004 and how did China's grain price protection policy and grain market's structure influence that?

5.1 The Evolution of Grain Purchase and Marketing System and Price Mechanism in China

Since the reform and opening up, although China's food marketing circulation system has gradually transformed from the planned economy to the market one, the food trading mechanism of China's long-term planning system influences food fluctuations profoundly. Huge systematic inertia and path dependence determine a long and zigzag path to food marketization.

Since 1953, China has begun to carry out the "state monopoly for purchase and marketing system", namely the state-owned grain enterprises monopolizing operation. The basic contents of policy are:

1) set unified purchase prices for farmers with surplus grain; 2) quota plan supply for city and breadless farmers; 3) strict control over food market, strictly supervising private food industry and commerce, banning free selling and buying food; 4) implementation unified management by the central government and governments at all levels. Among them, the purchase price and grain quota are set by the state. This system has been working until the early period of reform and opening up when trading system is slightly different from price system, with no fundamental changes. The reason for issuing state monopoly for purchase and marketing system are various. First, relying on free trading of food cannot stabilize the market. People are not willing to sell grain and the fever for purchasing prevails. The price fluctuation is difficult to be controlled. Second, food purchasing number increases slow but sales number grows rapidly. Channels for levying grain are impeded. Third, the demand for food increases sharply with year-on-year increase of urban population of 6.63 million in 1953 compared with that of last year, nearly 10% increase, and the food supply required by Korean War places heavy burden on the weak economy. After state monopoly for purchase and marketing system issued, the source of grain controlled by government increases rapidly. In 1954 the purchase number increases by nearly 30% compared with last year, which stabilizes the grain market to a certain extent. Although these factors are reasons for state monopoly for purchase and marketing, its system's purpose should be more than that. Due to the existence of the system, the state can extract agricultural surplus on a large scale to support the national industrialization process. The existence of the system target leads to the low purchase price for a long time. Therefore, prices in this period won't have a great fluctuation. Grain as residual extracted by nation on a large scale, becomes the primitive accumulation of capital for national industrialization.

In December 1978, with the convention of the 3rd Plenary Session of the 11th Party Congress, our country begins to move towards the reform and opening up. With the economic system reform, state monopoly for grain purchase and marketing system begins to fall. The first is the household contract responsibility system, and increased food prices. Average prices of 6 kinds of food increase from 10.76 RMB / 50 kg in 1978 to 12.99RMB /50 kg in 1978. Secondly, the grain circulation is gradually open. Fair trades and negotiating business of surplus grain after national purchase are allowed. Double tracks appear. The grain bargaining business increases year by year. During this period, the raise of monopoly purchase price is bigger than the stable sales price, thus leading a second time for subsidies of grain price with large growth. In the mid 80's, our country has the comprehensive excess of food for the first time. Lacking purchase capacity of State-own grain purchase department, the farmers have difficulty selling grain, so the non state-own business is granted. Since April 1985, grain monopoly purchase is officially cancelled, changing into contract ordering, with monopoly marketing unchanged, which creates the double track of price. In 1993, monopoly purchase, marketing, distribution and storage are comprehensively open, which symbolizes the end of the system of monopoly for purchase and marketing. Gradual collapse of state monopoly for purchase and marketing is the main content of food policy during this period. In this period, the continuous rising of the ordering prices leads to burden on financial subsidies. Each year, subsidies of food price are more than 20 billion, and in 1992 and 1993 respectively purchase and sale prices are raised. From 1993 to 1994, grain purchasing and selling prices rise considerably synchronously with CPI. These phenomena means that,

as the government eases regulation and control policy, food prices grain prices begins to fluctuate.

In 1998, a great reform takes place in the area of China's grain circulation system as a result of the big financial pressure. From April of 1992 to May of 1998, there is more than 20 billion RMB unpaid, averaging almost 100 million RMB a month (Miao Fuchun, et al., 1998). The main reasons for the loss are poor management of state-owned grain enterprises, indistinction between government and enterprise, so the basic principle of reform is "4 separations, 1 perfection", namely a separate government functions from enterprise management, reserve from experience, the central from local liability, the old from new food financial credit and perfection of food price formation mechanism. In the grain purchase, food prices are controlled by market regulation. The protective purchasing prices of main kinds of grain are set by the government to protect the farmers' income. The central government sets the principle of protective purchasing prices while the provincial governments set the level of protective purchasing prices. In the grain sales, the price caps of main kinds are determined by the government to maintain a relatively stable price. When food prices are close to price caps, the government will intervene in the market to purchase grain to stabilize prices. From 1998 to 1999, it is a period when food prices are relatively stable. In fact, however, the situation where the state-owned grain enterprises monopolize the food market hasn't changed. After a few years, food prices without the influence of price level are falling at least showing that reforms are not effective in raising farmers' income level. Beginning from 1998, food production has been declining, while our prices are not rising but dropping, which greatly dampens the enthusiasm of farmers' grain. Meanwhile, because of the enlargement of purchasing food by government, the burden on inventory and finance increases. After 2000, parts of China start marketization reform. By 2003, more than half of the provinces, autonomous regions, municipalities directly under the central government have loosened the control over food prices completely. China's grain marketing system enters into a new stage.

5.2 Driving Factors behind Rising China's Grain Prices: Grain Production, Price Policy and Market Structure

In 1985, China officially ends the policy of state monopoly for purchase and marketing system lasting for 30 years. However, the Chinese government haven't suddenly liberalized market completely, but experienced a long time transition of double-track system. In this period, China food price fluctuates greatly. Farmers are not sensitive to the price fluctuation with lack of stable expectations of future earnings. Yield fluctuates frequently, which forms the alternate cycle between price and yield. From the price fluctuation characteristics, we can see that China's grain market experiences the transformation from "high fluctuation, drastic ups and downs" to "low volatility, steady growth". Through the Structural Breaking Model, we can see that a stabilizing point cropped up in China's grain market in 2004 with various driving forces forming joint power, of which are grain production, upgrading policy system, market structure transformation and the separation between domestic and overseas markets, which is shown in Figure 8.

Generally speaking, among a number of driving forces, continuous grain harvest and production improvement in China after 2004 are the most direct reasons for stabilizing point of grain prices. In the process of marketization of grain purchase and sales system, without the guarantee of stable grain production (expectation for stable production improvement), it's nearly impossible to appease grain price fluctuation no matter what policy is taken or used timely. In the 1990's of last century, the acreage sown in grain crops maintained around 110 million hectares with grain production of 450- 500 million tons. After 2000, both the acreage and grain production were on steady declining, reaching the bottom of 99 million hectares in acreage and 430 million tons in grain production in 2003. Despite China's grain import's increase, domestic market price anticipation and its fluctuation are mostly decided by the domestic self-supply. Consequently, before 2004, due to the violent fluctuation of China's grain prices, China's grain market price may fluctuate within a period of limited time but the fluctuation can't persist. After 2004, the steady increase in grain production and the expectation for production improvement resulting from the former tend to iron out the grain price fluctuations.

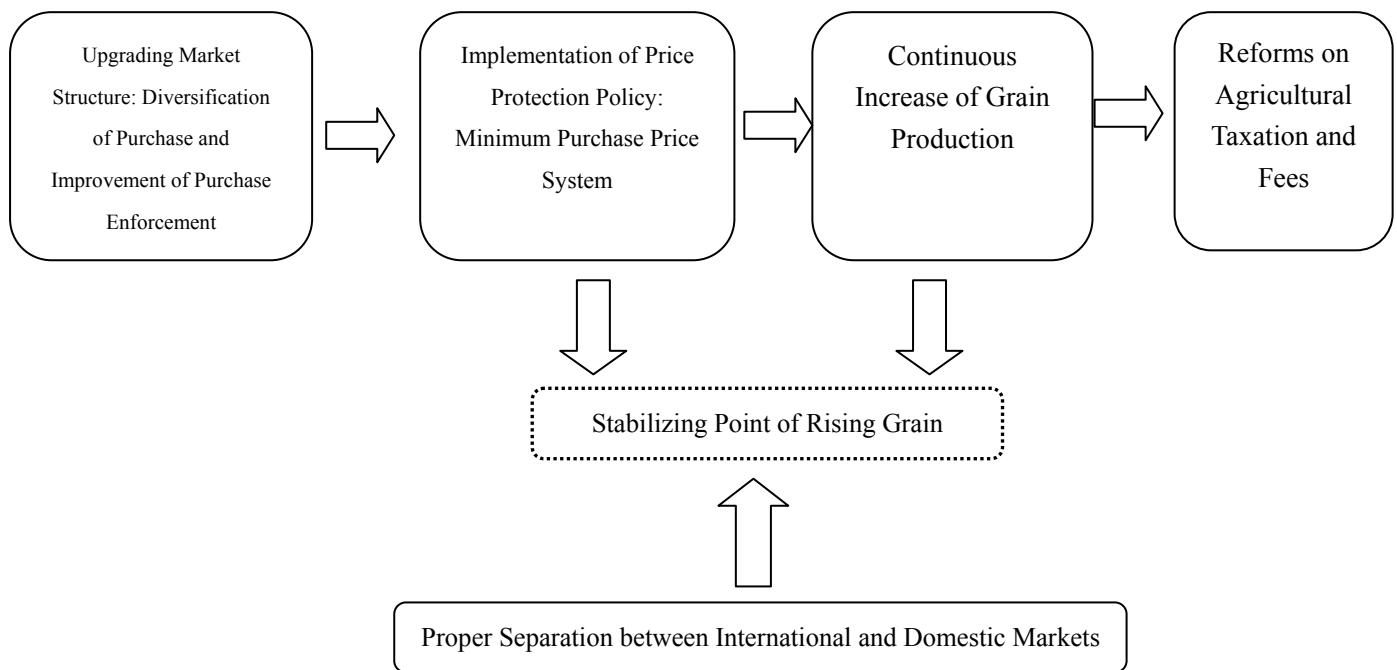


Figure 8 Driving Forces behind Stabilizing Point of Grain Prices

Moreover, although the continuous rising grain production has directly influenced the stability of grain prices, the deep-seated driving factors are the strengthened grain price protection mechanism and implementation of grain subsidy for protection, which has fundamental inspired and safeguarded the producing zeal of farmers and push China's grain output continuously. Since reform and opening up, China has gradually improved the food price regulation mechanism and protection policy. From "Ten Policies to Further Activate Rural Economic" issued in 1985 to "The Decision to Promote Food Marketing by the State Council" in 1990, the country gradually has carried out the policy of grain monopoly purchasing price, but monopoly price and directive negotiation price are generally lower than the market price, so the above two files certain don't really play a "protective" role (Wang Shihai, 2011). In the mid and late 90's, the protective price set by government begins to surpass the market price and the price mechanism starts to influence market regulation and control. After 2000, the country gradually advances marketization reform of grain. In 2004, the state council issues the regulations on the administration and circulation of grain, first proposing "the minimum purchase price", which marks that China's food market has changed from the state monopoly for purchase and marketing system to food market mechanism based on minimum purchase price of grain for basic guarantee. In 2004, the national development and reform commission and other departments issue a policy plan on minimum purchase price of rice. But due to market prices remaining at high levels, rice prices skyrocketing, the national minimum purchase price is obviously lower than the market price of purchase. Therefore, executive plan rice of minimum purchase price never starts, and policy is always in the preparatory stage. In 2005, the country first starts the plan on indica rice minimum purchase price, and in 2006 the plan of wheat minimum purchase price also begins. From 2004 to 2007, rice minimum purchase price plan is implemented in Jilin, Heilongjiang, Anhui, Jiangxi, Hubei, Hunan, Sichuan. In 2008, it expands to 11 provinces (area), including Liaoning, Jiangsu, Henan, Guangxi. Since 2006, the wheat execution areas of minimum purchase price are not changed, including Hebei, Jiangsu, Anhui, Shandong, Henan and Hubei. After 2008, the country implements national temporary storage acquisition in the areas of main production of corn rice, soybean and rapeseed production with the policy control over corn soybean again. (Wang Shihai, 2011).

We can say that since the reform and opening up, formation mechanisms of China's grain price are diversified. Before the minimum purchase price policy issued, the food price system has already included market

price, price protection, order price, the maximum price, leveling price, and so on, which cooperate with each other in order to ensure the smooth running of grain market. Among all, the protective price is similar to the minimum price. In quite long period of time, China has kept food protective price open, which plays a positive role in reform process of food trading market to protect the farmers' income, avoid loss for cheap prices of grain, but in the long term, effect is not satisfactory, "fertility dilemma" happening from time to time. Studies have shown that the control over grain market by Chinese government by the means of price controls, bargaining control over food import and export in 90's don't stabilize the market, but rather aggravate the market fluctuation (Wang Xialu, 2001). Due to lack of consistency in designing grain protective policy target, each main body of real political and economic interests deviating from the policy targets, many policy targets are not reached, for instance, protecting the interests of farmers, stabilizing grain production, reducing the financial burden, stabilizing grain market price.(Xu Bin, 2003) Overlooking the interest relationship, between administrative departments and state-owned grain purchasing enterprises, the central government and local financial benefit in the designing and implementation of purchasing policy of grain protective price, leads to great losses of state-owned grain enterprises with difficult to sell grain, much burden on local governments, especially on the provinces with main production areas. The direct consequences are that the interests of farmers cannot be effectively protected, fluctuations of food production cycle increase, protective prices play a role in aggravating the market fluctuation, leaving food prices ups and downs.

Table 9 The Contrast Between Grain Minimum Purchase Price and Traditional Protective Price

	Grain Minimum Purchase Price	Grain Protective Price
the essence of price	free purchasing price, diversifying purchasing bodies, perfectly competitive purchasing market	government setting prices and monopoly of state-own purchasing enterprises
main executive body of price implementation	According to price executive plans, governments ask state-own purchasing enterprises that exert the influence of main channels	All state-own enterprises and other grain enterprises with the purchase qualification
the scope and time of implementation	When the price of rice in main producing areas is lower than the minimum purchase price issued by government, several enterprises entrusted by government purchase grain in markets	Without the limit of time and place, purchasing must be free in the protective ranges
the efficiency of price supporting policy	Grain price mechanism is formed by market. Use markets to allocate grain resource. Guide farmers to plant grain by price and subsidize farmers directly	Extreme asymmetry between government subsidies and farmers' rising income, serious losses of government efficiency

Material Source: Zhou Xuezhong (2005), "The difference between grain minimum purchase price and protective price", *Grain Issues Research*, Vol.1

Compared with the traditional food price system, the minimum purchase price policy stabilizes grain markets more effectively. Firstly, the downward range through the limit of food prices (namely "TuoDi") stops food price from falling. In addition, more importantly, the minimum purchase price policy can greatly improve the production income expectation. Through increasing food production, increasing food supply, it fundamentally reaches supply and demand balance, which leads to the coexistence of rising grain output and rising food prices. Farmers' grain production decision influences the market price expectation significantly. Even without financial subsidies, if the market prices are rising and farmers believe that the price is getting higher in the future, the farmers will plant more grain to increase the supply. (Lu Feng, 2008) The stability of food production growth and food prices complement each other. Food price is an important factor determining food production. Higher food prices lead to higher grain yield, and the influence upon price fluctuation by yield fluctuation is more significant than the influence on yield fluctuation by price fluctuation. Yield fluctuation has a hysteresis effect on price

fluctuation. (He Puming et al., 2010; Wei Hong et al., 2011) Before 2004, an important reason for food price fluctuating frequently is the instability of food production. Since 1998, China's total grain output has continued to decline to the bottom in 2003. Although food protection price mechanism guarantees the farmers' income to a certain extent, but the unexpected fluctuation of market prices directly influence the overall expectation of future income of the framers. From the fact of food production falling in consecutive years, we still can see the confidence and enthusiasm of grain production waning. The main factor is low food prices, as well as drop in production income. The protective price policy implemented before 2004 is still working within the framework of food prices double-track system, with limited function of the market regulation mechanism. Even if the protective price is higher than the market price, it only guarantees food income ordered, with lack of protection for excessive part (namely the part which is free to enter the market part). Food producers focus more on the market price rather than ordering price, and determine the future production investment according to market prices. Therefore, income expectation of whole grain of producers is unstable in the long run. This is the main reason for the flowing of China's grain output before 2004. After the implementation of the policy of minimum grain price protection, although on the surface it belongs to government intervention in the market price, because at this time "the price TuoDe" has covered all food, so the future income expectation of food producers is more stable. Food production in the next few years maintains a continuous growth. Until 2012, China has kept the growth in food production consecutively for 9 years. At the same time, food price market also experiences stable development.

Meanwhile, in the process of marketization of China's grain and better enforcement of grain protective price, the structure of grain market has undergone significant changes mainly represented by the diversification of purchase body and improvement of grain purchase enforcement. Before 2004, although China consistently promoted grain protective price, in the reality it was difficult to cover scattered grain producers due to unitary purchasing body mainly few national grain administrative departments and purchase enterprises. Therefore, even when the policy of protective price was put in place, the mass rural households couldn't get the benefits. After 2004, with China's grain purchase market opening wider and many grain purchase agents emerging, the market structure of grain purchase showed some fundamental changes, from the unitary purchase body represented by national grain departments to diversified system with China Grain Reserves Corporation and national purchasing enterprises as the core, coupled with a large number of grain purchase agents. Therefore, the minimum purchase price policy was implemented, with strengthened purchasing power and extensive coverage of rural households. At the time, after 2004, the agricultural tax was abolished in China and the subsidy for grain was also altered, from subsidizing distributing process to grain production, which, to some extent, galvanized producing zeal of farmers and enhanced grain production.

Besides, the effective separation of China's grain market from internal market is an important guarantee for China's grain prices to avert the impact from international market. Before accession to WHO in 2001, although import quota of some agricultural products were relaxed, the mainly crops, such as wheat and rice, were basically separated from international market, thus leading to limited influence from international market upon domestic markets. In particularly, when international grain price was experiencing violent fluctuations before and after international financial crisis in 2008, the prices of China's major crops were relatively stable. This semi-separation mechanism provides a vital exterior guarantee for China's grain price stability.

5.3 How to Safeguard Stability of China's Grain Market and Maintain Grain Supply and Demand

The raise of China's grain prices in the past few years maintains a relatively stable trend. However, we must also see that the considerable uncertainty and instability hides below the surface. Behind the stable grain market are China's years of production's increase and increasing reserves investment. Grain prices in China market have a considerable potential fluctuation. Some problems exist in China's grain purchase and reserve system, such as unbalance of grain reserve structure. Conflicts of interest of decision-making bodies of different levels may easily pop up due to different goals. There is lack of transparency in information of aggregate grain reserve and

supervision and inspection mechanism for grain purchase and reserve needs implementation. All factors mentioned above will lead to unstabilities in future China's grain market operations. Despite China's grain market reform advancing step by step, with the complete opening of the grain purchasing market since 2004, because of the excessive political intervention formed under the traditional planned purchase system, the inertia is difficult to be eliminated in a short time. The deformed cycle of the grain market cannot be resolved in a short time. Once in the future, China is impacted by internal and external environments (such as the impact of disasters, international food fluctuation), it is more likely that larger crisis will take place. Therefore, China can't lower our ground for the short-term food prices stability, and besides speeding marketization, improving mechanism of grain purchase and reserved as well as price mechanism, the government should make full use of social forces tailored to national grain purchase and reserve enterprises, enlarge purchase and reserve channels, accelerate and improve the market-oriented grain reserve mechanism capable of dealing with all kinds of internal and external impact, form complementary multi-level security system, realize compatibility and consistency of policy goal and means.

In the future, China's grain total demand is increasing for a long period of time. The stability of the grain supply and demand will directly determine the stability of grain markets. Many studies show that in the future national food demand will experience a rigid growth, with the overall in tight state of equilibrium. By 2020, China's grain total demand will increase from 530 million tons in 2007 to 570-600 million tons. Therefore, in terms of the long-term growth of demand for food or inflationary pressure confronting China, China's grain prices in quite long period of time will keep a rising trend. As a consequence, China's macroeconomic regulation and control goal should be the stable moderate growth of food prices, avoiding dramatic ups and downs. Despite the current stability of China's food prices and small fluctuation, the price guarantee system should be improved, without too much dependence on the state and the government's administrative power. Food, as national strategic resource products, shall be addressed by different means from other agricultural special policy in certain conditions, for example, regulating the total supply by specific grain reserve policies and import and export adjustment. (Ke Bingsheng, 1998). But the government macro-control cannot simply be understood as government intervention in market. We shouldn't try to intervene in market when it comes to agricultural macroeconomic regulation and control. We should control the government's improper intervention, because frequent government interventions lead to further amplification of market fluctuation. In the area of macroeconomic regulation and control, we should distinguish grain control from that of other kinds of agricultural products, namely the policy that corresponding price intervention and price guide policy should be taken according to the specific species. In the past, the classification of China's agricultural products is made only according to the natural attributes, not economic attributes. Therefore, when some agricultural prices are fluctuating, frequent price control escalates the fluctuation to some extent. The governments' measures or intervention policy don't fundamentally level the fluctuation, causing the market "fluctuation expectation", attracting more social idle funds to hype, thus leaving the market more unstable

6. Summery and Conclusion

China's grain prices have experienced many ups and downs in the past twenty years, presenting different variation rule and fluctuation characteristics in different period. In the long run, prices of rice, wheat, corn will long belong to low-growth regime, with the time span less than 15% in high-growth regime. However, the price fluctuation variance in high-growth regime is bigger, namely the bigger and more unstable fluctuation of grain price in high-growth regime. In addition, after 2004, the grain's overall price growth level tends to be stable. The minimum price system plays a crucial role in leveling grain price fluctuation. On the one hand, it directly influences the grain fluctuation range through limiting price downward range; on the other hand, the government can expand the grain purchasing body and change market structure to influence farmers' production expectation and improve the food production, thus fundamentally increasing the food supply, stabilizing grain market. But in

recent years, with tendency of rising food prices stabilized, the unsustainability of regulation and control of unsustainable is also very significant. Therefore, the government should further speed up the reform of grain circulation system, expand the range for grain purchasing, speed up the legislation of grain circulation and market, finally ensure healthy steady development through the institutionalization, marketization, coupled with the government's moderate supervision and control.

References

- Albert, James H. and Chib, Siddhartha (1993), "Bayes inference via gibbs sampling of autoregressive time series subject to markov mean and variance shifts", *Journal of Business & Economic Statistics*, Vol.11 No.1 pp.1-15
- Chen Yongfu (2005) , "Supply and Demand of Grain in China: A Projection", *Problem of Agricultural Economy*, Vol.4
- Cheng Guoqiang (2011), "Rising prices is the tendency of economic growth", *China reform*, 26 June
- Cheng Guoqiang, Hu Bingchuan and Xu Xuegao (2008), "An Analysis of the Impact of the New Round of Rise in the Prices of Agricultural Produce", *Management World*, Vol.1
- Dong Quanhai (2000), *China's food market: fluctuation and control*, Beijing, China Price Press
- Feng Yun (2008), " The empirical analysis of price fluctuation of China's grain", *Prices Monthly*, Vol.2
- Gao Fan(2008), " The rising international grain prices and food security of China", *Wenweipo*, 28 April, p. 10
- Gao Guoqing and Song Jianhui (2000), "The research on the balance between food supply and demand after China's entry into WTO", *International Trade Journal*, Vol.11
- Girardin, Eric (2005) "Growth cycle features of east Asian countries: are they similar?", *International Journal of Finance and Economics*, Vol.10, pp.143-156
- Gong Fang and Gao Fan (2012), "The fluctuation trend and inner mechanism of China's grain prices: based on the comparative analysis of dual prices", *Economist*, Vol.2
- Gu Guoda and Fang Chenying (2010), "The analysis on fluctuation characteristics of China's agricultural products-based on sectional transfer model under the influence of international markets", *Chinese Rural Economy*, Vol.6
- Guo Qingwang , Jia Junxue and Yang Yunjie (2007), "Identifying the Turning Points and Its Characteristics of Business Cycles in China", *Finance & Trade Economics* ,Vol.6
- Hamilton, James D.(1989), "A new approach to the economic analysis of nonstationary time series and the business cycle", *Econometrica*, Vol.57 No.2, pp.357-384
- Hang Changfu (2011), "Basic thoughts of developing grain production of twelfth five-year-plan", *Qiushi*, Vol.3 :
- Hansen, B. E.(1992), "The likelihood ratio test under nonstandard conditions: testing the Markov switching model of GNP", *Journal of Applied Economics*, Vol.7, pp. S61-S82
- He Puming, Li Dongsheng and Wang Yapeng (2010), "Research on the Interrelation between Grain Output and Price Fluctuation", *Economic Survey*, Vol.1
- Huang Peimin and Yu Jiabao (1997), "The research on the balance between China's food supply and demand and solutions in the year from 2000 to 2030", *Management World*, Vol.2
- Huang, Yangjun, Qiu Huanguang and Xu Zhigang (2009), "Ups and downs of food prices:main reasons and tendency", *Management World*, Vol.1
- Jiang Changyun (2006), "The forecast of the balance between China's food supply and demand before 2020", *Scientific Decision-Making*, Vol.1
- Kim, Chang-Jin and Nelson, Charles R. (1999), "Has the u.s. economy become more stable? A bayesian approach based on a markov-switching model of the business cycle", *The Review of Economics and Statistics*, Vol. 81 No. 4, pp.608-616
- Krolzig, Hans Martin (2001), "Business cycle measurement in the presence of structural change: international

- evidence”, *International Journal of Forecasting* Vol.17, pp.349–368
- Lam, Pok-sang (2004), “A Markov-Switching Model of GNP Growth with Duration Dependence”, *International Economic Review*, Vol. 45 No.1, pp.175-204
- Leng Chongzong (2008), “Researches on fluctuations of China’s food prices”, *Price and Market*, Vol.3
- Li Bo, Zhang Junbiao and Li Haipeng (2008), “Analysis and forecast of China’s grain demand in the medium and long term period”, *China Rice*, Vol.3
- Li Guoxiang (2011), “Why do China’s grain production growth consecutively but prices continue to rise?”, *Farmers’ daily*, 17 October
- Li Xinjian and Yang Bo (2005), “The Deep Causes of Chinese Grain Price Rising in Recent Years”, *Journal of Jiangxi Science & Technology Teachers’ College*, Vol.2
- Liu Jingyi, Wen Tianchun and Wang Mingjun (1996), “A Study on the Future Grain Demand in China”, *Journal of Northwest A & F University (Natural Science Edition)*, Vol.3
- Liu Xiaomei (2004), “The security strategy of China’s food and import scale”, *Macroeconomics*, Vol.9
- Liu Ximing (2009), “International Grain Price Fluctuation’s Impacts on China’s Economy”, Master’s thesis of Zhejiang University
- Lu Feng (2008), “Grain prices with cyclical changes manifest the best tool for regulation”, *China business journal*, 21 July
- Lu Xiaodong (2010), “Contemplations of the minimum purchase prices of China’s food”, *China Grain Economy*, Vol.6
- Lu Xinye and Wang Jimin (1997), “Forecast of China’s food balance of supply and demand”, *Research of agricultural modernization*, Vol.1
- Luo Jianguo (1996), “The analysis of fluctuations of China’s agricultural products”, *Statistic research*, Vol.5
- Marmer, Vadim (2008), “Testing the null hypothesis of no regime switching with an application to GDP growth rates”, *Empirical Economics*, Vol.35, pp.101-122
- McConnell M. Margaret and Gabriel Perez Quiros (2000), “Output fluctuations in the United States: What has changed since the early 1980s?”, *American Economic Review*, Vol.90 No.5, pp.1464-1476
- Meng Fanxin, Dong Pengtao and Lin Xiaolan (2008), “Fluctuation rules, reasons and solutions of grain market prices”, *Price: Theory & Practice*, Vol.9
- Miao Fuchun et al.(1998), “Food as the priority for China- exploration and reform of China’s food problem”, Guangxi Normal University Press
- Mills, Terence C. and Ping Wang (2003), “Have output growth rates stabilized? Evidence from the G-7 economies”, *Scottish Journal of Political Economy*, Vol. 50 No.3, pp.232-246
- Ran Guoan (2002), “The forecast of supply and demand of China’s grain in the coming ten years”, *Chinese Rural Economy*, Vol.7
- Ran Runen and Deng Hao (2007), “The analysis of supply and demand of China’s food security”, *Journal of Hubei University of Economics(Humanities and Social Sciences)*, Vol.6
- Shao Lu (2009), “The Empirical Analysis of China’s Grain Supply and Demand, Price Volatility and Security”, doctoral dissertation of Jinlin University
- Shi Zhuxian, Liu Junsheng and Wu Taiyue (2007), “The Empirical Research for Business Cycle In China Using the Multivariate Markov Regime-switching Model”, *Application of Statistics and Management*, Vol.5
- Simpson, Paul W., Denise R. Osborn, and Marianne Sensier (2001), “Modeling business cycle movements in the UK economy”, *Economica*, Vol.68, pp.243-267
- Song Hongyuan (1995), “Demand fluctuation and rising price of agricultural products”, *China Rural Survey*, Vol.3
- Sugita, Katsuhiko (2008), “Bayesian analysis of a Markov switching temporal cointegration model”, *Japan and the World Economy*, Vol.20, pp.257-274
- Wang Dewen and Huang Jikun (2001), “The influence upon China’s food market stability by dual tracks” ,

Management World, Vol.3

Wang Shihai (2011), “Economic Effect of China’s Grain Price Regulation Policy”, doctoral dissertation of The Chinese Academy of Agricultural Sciences

Wang Xiaolu (2001), “Grain Market Fluctuations and Government Intervention in China”, *China Economic Quarterly*, Vol.1

Wang Yisong (2004), “Analysis on Agricultural Economic Cycles of China and Early-warning”, *Problem of Agricultural Economy*, Vol.1

Wang Zhibin (2007), “A Study of Fluctuation and Stable Mechanism of Grain Price in China”, doctoral dissertation of Huazhong University of Science & Technology

Wei Hong and Wang Lei (2011), “The analysis of influence on grain output by grain price, farmers’ income”, *Journal of Agrotechnical Economics*, Vol.6

Wu Guoxing (1997), “The analysis of the prices fluctuation of China’s agricultural products”, *Problems of agricultural economy*, Vol.6

Xu Bin (2003), “The Core and Evaluation on Chinese Grain Protective Price Policy”, *The Theory and Practice of Finance and Economics*, Vol.3

Yang Ju, Wang Xinkui and Keng Hongzhou (2008), “A study on the Effectiveness of Government Regulation of China’s Grain Market:a Case Study of Wheat”, *Economic Research Journal*, Vol.8

Yang Lei (2009), “Research of China’s Grain Supply-Demand Balance”, Master’s thesis of Shandong University of Technology

Yang Minghong (2000), “WTO and China’s food security”, *On Economic Problems*, Vol.1

Zhou Xuezhong (2005), “The difference between grain minimum purchase price and protective price”, *Grain Issues Research*, Vol.1