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How does Agricultural Input Price Effect on Farmers' Income: Experimental Study from Sugarcane Sector

Yongtian Guo[1] Jin Gong[2] Huijie Zhang[2]

1) Information Center, China MOA, Beijing, 100125 2) Agricultural Information Institute, CAAS, Beijing, 100081

Introduction

China is one of the world's major sugar production and consumption countries.Since the 1990s, the government has implemented many effective policies andmeasures to stimulate the development of sugar industry. The sugar industry has madeconsiderable progress and development. However, in recent years, the agricultural input price rose, which affects the income offarmers. Thus, the increasing cost of planting sugarcane seriously affectedthe farmers planting initiative.

Objective

The study attempts to address the following questions:

1. Whether there's a relationship between agricultural input price and farmer's income?
2. How does agricultural input price effect on farmers' income?
3. How does farmers' income effect on agricultural input price?
4. What should we do to control the negative effects?

Data Source and Research Method

We make the net profit of per mu on sugarcane planting as the representative of farmers' earnings, and calculated the index of sugarcane farmers' income with the retail price index (we take 1980 as the base year), then marked as RI. We make the index of agricultural input price as the representative of agricultural input price, marked as PI. We take the natural logarithm on RI and PI respectively, marked as $LnRI$ and $LnPI$, the first difference of $LnRI$ and $LnPI$ marked as $\Delta LnRI$ and $\Delta LnPI$.

This paper establishes vector autoregressive model to analyze the dynamic relation between the rise of agricultural input price and the income of sugarcane farmers. Before presenting the VAR model, we first test unit roots. Based on Residuals test and stability test in the VAR model, we explain the model of response path and the value of the disturbance of variable by using impulse response function and variance decomposition approach.

The regression equation is as follows:

$$\Delta \ln RI_t = 3.4425\Delta \ln PI_{t-1} - 2.5354\Delta \ln PI_{t-2} - 0.3557\Delta \ln RI_{t-1} - 0.1042\Delta \ln RI_{t-2} - 0.0598 \quad (1)$$

(3.3745) (-1.9163) (0.6908) (0.3456) (2.2889)

$R^2 = 0.3499$ $F = 3.0955$ $AIC = -2.4263$ $SC = -2.1884$

$$\Delta \ln PI_t = 0.7337\Delta \ln PI_{t-1} - 0.4479\Delta \ln PI_{t-2} + 0.0163\Delta \ln RI_{t-1} + 0.0085\Delta \ln RI_{t-2} + 0.0395 \quad (2)$$

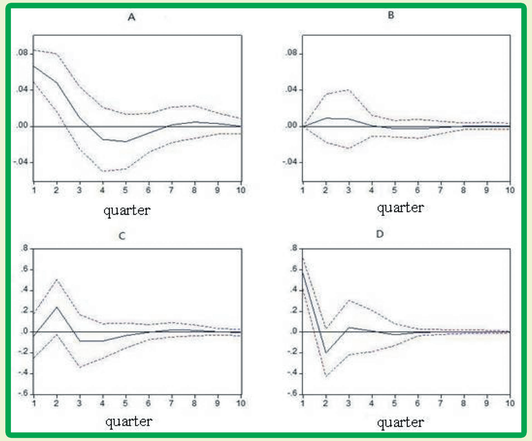
(1.8689) (-1.2805) (-1.7841) (-0.5010) (-0.4092)

$R^2 = 0.2225$ $F = 1.6459$ $AIC = 1.8472$ $SC = 2.0851$

The significance level of the equation and goodness of fit can explain the problem. Therefore, the regression results are reliable. The VAR model also has been passed residuals test and stability test.

The Explanation from Impulse Response Function

Figure 2:the Path Curve of Impulse Response Function



Note: A represents response of $\Delta LnPI$ to $\Delta LnPI$; B represents response of $\Delta LnPI$ to $\Delta LnRI$; C represents response of $\Delta LnRI$ to $\Delta LnPI$; D represents response of $\Delta LnRI$ to $\Delta LnRI$.

Figure 2 (C) shows that sugarcane farmers' income responds negatively to a shock to agricultural input price during the first quarter when agricultural input price increase. The positive impact begins to appear during the second quarter and it reaches the maximum value, and then rapidly decreases. It turns to negative impact during the third quarter. However, the impact has been negative since the fifth quarter, which alternates between positive and negative impact.

Figure 2 (B) shows that the impact is zero during the first quarter when sugarcane farmers' incomes grow, but it's positive during the second and last for the fourth quarter. The impact becomes negative and has a trend of convergence from the fifth quarter. Although the sugarcane farmers' income has an impact on changes of agricultural input price, the impact is still very weak.

From Figure 2 (A), we know that a shock in standard deviation of agricultural input price stimulates the large fluctuations during the previous six quarters. It has been both positive and negative impacts, then from the seventh quarter it has a trend of convergence. The response curve shows that it has an alternating positive and negative impact.

From Figure 2 (D), we find that a shock in standard deviation of sugarcane farmers' income produces the greatest positive response during the first quarter. The impact turns to negative, and then it's positive during the third quarter. After that, it has an alternating positive and negative impact. The impact is zero during the sixth quarter and tends to be a positive response. This shows that the current sugarcane farmers' income has some correlation with its own lagged value.

Variance Decompositions

Table 3 Variance Decompositions for $\Delta LnPI$ and $\Delta LnRI$

Period	S.E	Variance Decompositions		S.E.	Variance Decompositions	
		$\Delta LnPI$	$\Delta LnRI$		$\Delta LnPI$	$\Delta LnRI$
1	0.0664	100	0	0.5624	0.3780	99.6221
2	0.0825	98.7766	1.2234	0.6436	14.2912	85.7088
3	0.0834	97.8348	2.1652	0.6506	15.6768	84.3232
4	0.0846	97.8827	2.1173	0.6562	17.0984	82.9016
5	0.0863	97.8831	2.1169	0.6576	17.2790	82.7210
6	0.0866	97.8128	2.1872	0.6576	17.2788	82.7212
7	0.0866	97.7997	2.2003	0.6579	17.3655	82.6345
8	0.0868	97.8051	2.1949	0.6582	17.4214	82.5786
9	0.0868	97.7999	2.2001	0.6582	17.4238	82.5762
10	0.0868	97.7969	2.2031	0.6582	17.4278	82.5722

Table 3 shows that agricultural input price is influenced by itself during the first period. However, sugarcane farmers' income has an impact on it during the second period and the impact increases gradually, the value of $\Delta LnRI$ have been 2.20%, but the influence of agricultural input price are very small. From the beginning, Sugarcane farmers' income is mainly influenced by its own fluctuations. However, agricultural input price also has an impact on Sugarcane farmers' income, what' more, this impact increases gradually and continuously. The value of $\Delta LnPI$ have been 17.42% since the eighth period. This shows that the conclusion is the same with the explanation from impulse response function.

Conclusions and Recommendations

Conclusions

1. The results indicate that sugarcane farmers' net income shows negative response to the increase of agricultural input price, which tends to be stable.

2. Agricultural input price shows faint response to the sugarcane farmers' net income.

Recommendations

1. Strengthen the supervision of the agricultural input market and improve the regulation mechanism of prices.

2. Increase the intensity and scope of the direct subsidies to the users of agricultural input, and reduce (even remove) the subsidies for production and circulation.

3.Establish and improve the modern circulation system of agricultural input. Develop the leading enterprises that run agricultural input business to reduce the distribution costs.

4.Improve the agricultural extension services to enhance the sugarcane farmers' ability to use production means efficiently.

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