ON THE FINANCE SUPPORT SYSTEM FOR AQUACULTURE DEVELOPMENT IN CHINA

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ABSTRACT

In recently years, the finance sector had focused their attention on commerce operation in China. When fisheries farmers decide to increase invent to promote production, they also can't get enough loans because aquaculture is a highest risk sector in agriculture and the commercial banks would prefer others sector in agriculture to aquaculture. In this paper firstly we build a model based on the concept of inverse supply and estimated via cointegration and error correction model on China panel data. It shows that the capital price has no impact on aquatic product price and the labor price has positive impact in the long-run model. This result shows because of shortage of capital, the farmers have to invest more labors, but not capital. As the result the expected output can't be obtained due to saturation of labor evermore the output is down and the farmer price is up. Secondly we analyzed the problem the present finance system had, th en put forward a finance support system for aquaculture development, which consists of three layers.

Keywords: aquaculture; finance support system; inverse supply; cointegration and error correction model

Introduction

In china, the fishery has been the fastest growing sector within China's agricultural economy over the past two decades, enjoying an average annual growth rate of about 10%, and had grown in importance in agricultural structure adjustment, generating farmers' income and protect of food security in China [1].

Alongside the fishery economics is booming, there need more funds to support. But in recently years, the finance sector had focused their attention on commerce operation and shrinking their business for rural area in China. On the other hand, much capital had flowed out from fishery sector via many channels, for example, finance system and post-office savings system. So when fisheries farmers decide to increase invent to promote production, they also can't get enough loans because aquaculture is a highest risk sector in agriculture and the commercial banks would prefer others sector in agriculture to aquaculture [2,3]. As the result the capital had becoming the limited factor for fishery development. It is very important to how to restructure the finance support system for fishery development in China.

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In this paper, we firstly build a model based on the concept of inverse supply and estimated via cointegration and error correction model on China panel data to analyze the relationship between fund price and farmer price. Then we put forward a finance support system for aquaculture development.

Theoretical model, data and the estimation

Theoretical model

Zhang Xiaoshuan [4] assumed that production of fishery in China could be represented by a Cobb-Douglas function including labor, capital as inputs, and allowing for technical change and not system change:

$$Q_t = \alpha_0 e^{\theta_t} K_t^{\alpha_k} L_t^{\alpha_L}$$ Eq. (1)

Where Q_t is the output of fishery product in year t, K_t, L_t are respectively labor, capital used in making this output, are respectively the elasticity of labor, capital, θ is the rate of technological change。

Total industrial cost TC is related directly to quantity and price of inputs:

$$TC = W_L \times L + W_K \times K$$ Eq. (2)

Where W_L, W_K are the prices of labor, capital, respectively.

Cost minimization, subject to the production technology described by (1) and to exogenous factor prices, leads to the marginal productivity conditions,

$$\frac{W_L \times L}{\alpha_L} = \frac{W_K \times K}{\alpha_K}$$ Eq. (3)

The reduced form of (1) and (3) is:

$$TC = \beta_0 e^{-\theta t/r} Q^{1/r} W_L^{\alpha_L/r} W_K^{\alpha_K/r}$$ Eq. (4)

Where $\beta_0 = r\left(\alpha_0 \alpha_L^{\alpha_L} \alpha_K^{\alpha_K}\right)^{-1/r}$, $r = \alpha_L + \alpha_K$.

When the output is constant, the average coast function can be derived from (4)

$$\overline{TC} = \frac{TC}{Q} = \beta_0 e^{-\theta t/r} Q^{1/r-1} W_L^{\alpha_L/r} W_K^{\alpha_K/r}$$ Eq. (5)

At present the fishery industry concentration is low and there are different with product from factory to factory. Furthermore, there have the obstacle of entrance and quit of fishery due that the fishery equipment can't use by other industries and the skill of labor is special. According to Mrs. Robinson, the market structure of fishery in China has the characteristic with monopolistic competition. So the profit of

fishery tend to zero in the long-run and the price of Aquatic products equal average cost. This, then, lead to the equation of price formation.

$$\ln P = \beta_0 - \frac{\theta}{r}t + \left(\frac{1}{r} - 1\right)\ln Q + \frac{\alpha_L}{r}\ln W_L + \frac{\alpha_K}{r}\ln W_K \qquad\qquad \text{Eq. (6)}$$

According Zhang Xiaoshuan(2003), the expected price is introduced to the model as the demand factor. Then the end model is

$$\ln P = \beta_0 + \beta_1 t + \eta_Q \ln Q + \eta_{WL} \ln W_L + \eta_{WK} \ln W_K + \eta_{\overline{PR}} \ln \overline{PR} + \mu \qquad\qquad \text{Eq. (7)}$$

Where η_i is respectively the elasticity of output, the price of capital, labor and expectation.

The data

All data are collected from *Zhongguo Tongji Nianjian* (China statistical yearbook) and *Zhongguo Nonye Tongji Nianjian* (China Agricultural statistical yearbook), published by China statistical publishing press annually. All data is by RMB and deflated by the price deflator.

Fishery labour price

Fishery labor is one part of cost of aquatic products, which is labor value in making the output by money. But In static system in china, there is no index, which can figure the Fishery labor price. There only have input of fishery labor and income by laborer. According the theory of price, the salary is a kind of representation for fishery labor price, which figures that the government allocates the profit for laborer. So the income by laborer is used as the index of fishery labor price.

Fishery capital price

Fishery capital is another part of cost of aquatic products, which is capital value in making the output by money. Fishery capital price often consists of par value and interest of capital. But the par value always is stale, so the rate of interest is used to express as the capital price. But in china, the rate of interest doesn't form by market, and it tends to stable between 1978 and 2000. In addition, the Determinants of rate of interest formation are the rate of average profit, the demand and supply of capital, the aggregate price, and the national economical. All of them are not quantitative calculation except the aggregate price. So we substitute the aggregate price for fishery capital price.

The expectation price

The expectation price is a kind of price the fishery farmer predicts the future market price before they decide the input. There are three methods about the expectation price: the expectation price is the function of the past price, the future price and the rational expectation price. The first kind also is divided into three sub-kinds: native expectation, adaptive expectation and ARIMA (Auto Regression Integrated with Moving Averages) expectation. The best expectation is the future one theoretically. But in China there is no the future market and doesn't exist the future price. Furthermore the fishery farmer can't make the rational expectation decision due that the complexity of price formation and the shortage of knowledge. The adaptive expectation needs more samples. So the naïve expectation is an experienced expectation

price, which means that when fishery farmer makes decision, he also consider the price of t is the same as the last price.

$$\overline{PR}_t = PR_{t-1} \qquad\qquad \text{Eq. (8)}$$

The Estimation

The model was estimated by co-integration and error correction model(ECM). The process is following. A test for unit roots was initially conducted and is shown in Table 1.

Table I the Unit root test by ADF(Augmented Dickey-Fuller)

Var.	The type of test		The critical	Var	The type of test		The critica
	(c,t,n)	ADF			(c,t,n)	ADF	
ln (pf)	(c,0,0)	-1.6910	-3.0114	$\triangle$ln (fa)	(c,t,3)	-3.8416	-3.7119
ln($\overline{pr}$)	(c,0,1)	-1.7870	-3.029	$\triangle$ln($\overline{pr}$)	(c,t,5)	-4.0357	-3.7921
ln(Q)	(0,0,0)	10.8238	-1.9583	$\triangle$ln(Q)	(c,t,3)	-3.9025	-3.7119
ln(W_L)	(c,0,0)	-1.3485	-3.0114	$\triangle$ln(W_L)	(c,0,0)	-4.6208	-3.0199
ln(W_K)	(c,t,1)	-2.8736	-3.6591	$\triangle$ln(W_K)	(c,0,1)	-2.8609	-2.6552[2)]

Note:The samples decrease one due to the expectation price, so we adjusted the sample between 1978 and 1999；2）the significance level is 10%。

Secondly a Johansen test to determine the number of co-integrating relations was performed (Table II)

Table II the co-integration by Johansen test

The hypothesis	The value	Likelihood ratio	critical	
			5%	1%
$r > 0$ **	0.921253	144.61	87.31	96.58
$r > 1$ **	0.882990	96.33	62.99	70.05
$r > 2$ **	0.822931	55.56	42.44	48.45
$r > 3$	0.501497	22.67	25.32	30.45

Table II shows that there are two co-integrating relationships amongst all of the variables. The first one is useful for us. It shows that all of variables have a long-run causal relationship. The estimated co-integrating vector is given in Equation 9

$$LnPF_t = -5.229 + 0.169t - 0.07LnWK_t - 1.303LnQ_t + 0.346LnWL_t + 0.617Ln\overline{PR}_t \qquad \text{Eq. (9)}$$
$$\begin{array}{cccccc}
(1.154) & (0.029) & (0.263) & (0.339) & (0.099) & (0.185) \\
[-4.533] & [-5.766] & [-0.267] & [3.845] & [3.497] & [3.337]
\end{array}$$

Thirdly the ECM model can be deduced.

$$\Delta LnPF_t = 0.306\Delta LnW_{L_t} - 0.846\Delta LnQ_t + 0.369\,\Delta Ln\overline{PR}_t - 1.287\,ECM_{t-1}$$
$$\underset{[3.413]}{(0.090)} \qquad \underset{[3.692]}{(0.500)} \qquad \underset{[1.573]}{(0.235)} \qquad \underset{[-3.586]}{(0.359)}$$

Eq. (10)

$$R^2 = 0.788, D.W = 1.912$$

The discussion and a proposal System for the Finance Support

The discussion

Table 1 reveals that all of the variables are I(1) at the 5% significance level, except for the price of capital. There maybe two reasons, one is that the substituted variable is not accurate. The other is that fishery growth depends more labor input, not capital. In fact, the growth rate of capital is 12.41% per year between 1978 and 2000 (see Fig1), but it didn't meet the fund need of fishery, due that fishery is higher risk sector than agriculture based on land.
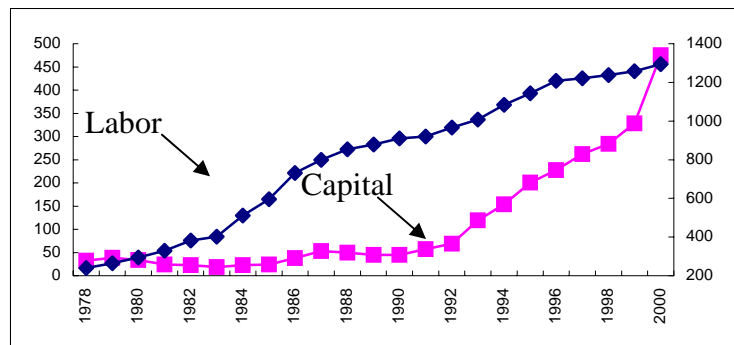

Fig 1 the capital and labor input between 1978 and 2000 (billion Yuan)

The flexibility of the price of capital for the farmer price is negative in the model 9. It shows when the farmer increases the fund, the output of fish grows and the price of aquatic products is down. The flexibility of the price of labor for the farmer price is positive in the model 9. It shows when the farmer increases the labor, the output of fish grows negatively and the price of aquatic products is up. On second thoughts, it shows that labor in fishery is saturated. The flexibility of the expectation for the farmer price is positive in the model 9. It shows when the farmer considers the price will be up in next year, he will make decision to increase the input of labor and/or fund. But due to limitation of financing, he had to increase more labors. As the result, the output grows negatively in next year and the price is down.

The model 10 shows that there is no casual relationship between the price of capital and the price of aquatic products in short-run term.

A proposal System for the Finance Support

It summarized that the capital had becoming the limited factor for fishery development. It is important to structure fishery finance support system and expanding the financing channels for resolving the shortage of capital. So we put forward a finance system for supporting the fishery development (See Fig 2). The architectures of the system consists of three layers, the first layer is loan based on commercial bank,

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which is the main body of the system, the second is supplementary one, mainly including loan based on policy bank and the cooperated fund, the last layer is the co-assistant one, mainly including fishery insurance, trust and capital market [5,6].
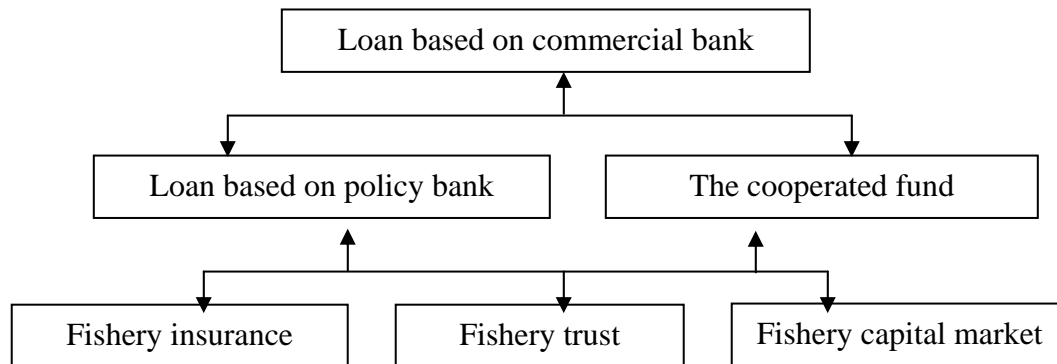
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              ┌─────────────────────────────────┐
              │  Loan based on commercial bank  │
              └─────────────────────────────────┘
       ┌─────────────────────────┐     ┌─────────────────────────┐
       │ Loan based on policy bank│     │   The cooperated fund   │
       └─────────────────────────┘     └─────────────────────────┘
  ┌──────────────────┐  ┌──────────────────┐  ┌──────────────────────┐
  │ Fishery insurance│  │  Fishery trust   │  │ Fishery capital market│
  └──────────────────┘  └──────────────────┘  └──────────────────────┘
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Fig2 the architecture of fishery finance support system

The first layer: the loan based on commercial bank

The loan based on commercial is the main body of the finance support system. But fishery loan has the character with long-circle, seasonally, high-risk. After 1996, the stated-owned banks had been commercialized. They want the loan be revoked in time, due that its own profit, circulation and safety. But at present the prospect of the fishery company is not very well. This causes more risk for fishery loan on the basis of innate risk of fishery. As the result, the bank wouldn't loan to the fishery enterprise. The fishery enterprise can't get enough funds to yield and worse the profit. So it is a dilemma that the bank not only insures its profits and safety, but also helps fishery business to boom again. The following is some of proposal advices for resolving the dilemma.

- Insist on the market-oriented principle and strength risk management.
- Insist on the principle to support the operated-well fishery enterprise and limit the worse one.
- Insure the loan adjust dynamically.
- Improve the method of loan based on area and industry.

In addition, fishery enterprise should actively apply foreign capital and technology via many means, for example, direct investment, loan from the World Bank or other foreign commercial bank, or the indirect investment, issue B stock or international bond, and so on. At present we think compensative trade is suitable for the fishery enterprises, i.e. import the important devices and produce the fishery in China, and pay back the charge of equipment via the direct or indirect product compensation.

The second layer: the loan based on policy bank and cooperated fund

The layer is supplementary one, including loan based on policy bank and cooperated fund. The loan based on policy bank is mainly operated by China Agricultural Development Bank. At present its function focuses on agricultural products policy purchase. In future, it should strength the policy fishery loan and embody the lean in funds to promote the development of fishery. In addition, it should discount interest for the huge loan the fishery lend from commercial bank when the interest of the loan is high than usual due that the commercial bank insure the huge loan to policy insurance company according to the radio of the loan. The insurance company will be responsible for paying for the funds if it can't be back in time [7].

The fishery cooperation finance mainly consists of three parts: one is the service the rural credit union provides to the catching fishery, the farming fishery and the process fishery, another is the new type stock and cooperation fund, the last is the committee of fishery cooperation fund. In past decades, the Agricultural Bank of China and branches of others State-owned Commercial Bank have to face the trend that the right of loan is gradually controlled by their superior organization, and the number of loan becomes less. Furthermore the Agricultural Development Bank of China had adopted funds closing-management for policy purchase, so the usage of funds decreases greatly. Most of the rural credit union has already ceased their business, the increasing extent of saving has descended, and the postal-office saving service has developed quickly. So fishery cooperation finance and the folk loan play an important part pole as the complement to bank credit.

It is noticeable that the folk credit is the loan behavior amongst fishery company, individual and/or fishery farmers. It exists in mostly rural areas and has character that the rate is negotiated by the two parties of the loan and varies from area and time. In order to develop the positive effect of folk loan, the policy should make good use of it and prevent the loan with too great rate.

the third layer: fishery insurance/trust and capital market

The layer is co-assistant one, mainly including fishery insurance, trust and capital market [8]. The Property Insurance Company of China Insurance Group undertakes the fishery business in our country. In additional, the committee of fishery boat insure also do the part of some business. On the condition of fishery insurance at present, fishery insurance should focus on:

● Build up national policy fishery insurance company, Reinsurance Company.
● Array part of fishery insurance business into policy finance business. Preference policy should be adopted for fishery insurance, such as derate tax.
● Combine volunteering insurance with compulsory insurance due that the fishery farmer and the owners of fishery company have shortage of insurance consciousness and can't afford more the fee of insurance.

Fishery trust and fishery lease also can promote the ability of financing in some degree. As the same another useful channel is to apply the direct finance tools to financing via finance market.

● Financing via money market. When the fishery company needs Commercial Credit, he can make financing via Commercial P.O. and promissory note. When the bill is not mature and the holder need money, he can transfer it or discount it to the bank.
● Financing via capital market. The company can gather the capital through bond when he had reformed as a joint-stock company. At present there are 6 fishery companies had come into the market as a joint-stock company. So when they need capital, they can issue the enterprise bond to collect money under supervise of the People's Bank of China (the central bank of China).

Conclusions

We had build a model based on the concept of inverse supply and estimated via cointegration and error correction model on China panel data. It shows that the capital price has no impact on aquatic product price and the labor price has positive impact in the long-run model. This result shows capital had becoming the limited factor for fishery development. Then we put forward a finance support proposal system for aquaculture development, which consists of three layers. Every layer has their core operation business and reinforce among them.

Acknowledgements

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