PRICES ON AGRICULTURE AUCTION OF CENTRAL JAVA PROVINCE INDONESIA

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Abstract

This paper is the preliminary study on price formation of descending auction model of agriculture auction of Central Java province Indonesia. With applying field data of auction during 2005-2008 to estimate the winning bid that assumed as a linear function of variables characteristic of commodity and market environment. The preliminary estimates suggest that the winning bid is significantly depends on the reservation price of the seller. It satisfies the optimal bidding strategy hypothesis. Thus, it allows us to adopt more structural econometric model which is derived directly from theoretical auction model following the method of LAFFONT and MONIER-DILHAN and OSSARD (1995).

Keywords: Price-formation, descending auction, bid-function, ordinary least squares

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1. Introduction

Based on Nations Encyclopedia's data, about 45% of Indonesian workers are engaged in agriculture, which accounts for 17% of GDP in 2001. Some 31 million ha (76.6 million acres) are under cultivation, with 35% to 40% of the cultivated land devoted to the production of export crops. Some 60% of the country's cultivated land is in Java. With those important roles to the economy, the government faces some big challenges in improving the welfare of farmers exploit. One of the challenges faced is the process of economic globalization and the encouragement of free trade. For agricultural products this means covering the whole agribusiness system through the power process indebted, post-harvest handling, processing industry, the activities of trade, market institutions, services, including supporting the ability of farmers as producers.

Agriculture activities still facing problems such as inconsistencies in number and quality of the products, productivity is low, the market has not been well organized, which is not transparent market where all this leads low acquisition price and the low income of farmers and the weak competitiveness of products.

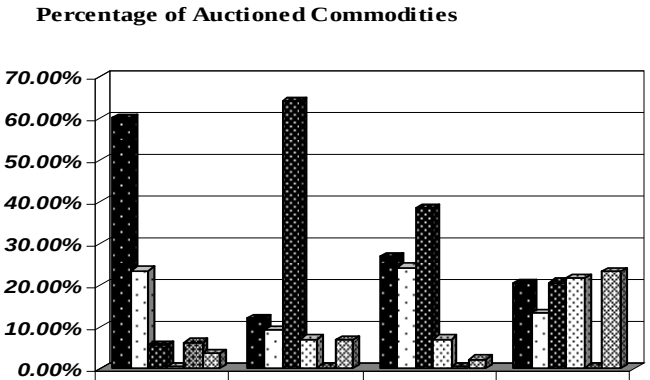
The structure of the agricultural products market in the village level, have problems facing the weak bargaining position of farmers, which always oppressive price, low quality and distribution chain length, so the damaged goods quickly so that the accumulation of waste. The market price establishment at the wholesale level and in the farmers is by the direct bid between individual farmers and individual traders. This condition is always put farmers on the weak position because of the weak economic position of farmers and the limited information that the farmer-owned.

One of the solutions to solve those problems government develops the institution market with auction mechanism, as agriculture auction market. In this market seller (producers) will be direct with the buyer, the creation of a transparent pricing, marketing point cut, boost quality and production that in turn can increase the income of farmers and increase the agricultural income.

Agro-Auction market in the province of Central Java began operations in October 2003 and the transaction is held by auction mechanism, buyers hold open bidding, the price is the highest bidding as price realization transaction. Institutions who developed this market are the Department of Industry and Trade of Central Java Province, the Department of agriculture and local government. Implementation of the auction market is generally once every 2 months; with the level of diversity of products those are very diverse. According to the index data, there are 792 commodities items which traded on this market. But not all products are sold in each auction. Based on the market implementation data from 2005 to 2008, every year has the different trend of the commodity that was traded in. On 2005's auction section, Cereals became most traded commodity in while this year, with the average percentage in each auction was 44.6 % of the total average transaction per auction and dominated by rice's transaction. Central Java is the second biggest province producer of rice in Indonesia, and on several region, rice still became the ***most wanted*** commodity, that's make it taken the most interest commodity to traded on this market. For 2006's auction series, trend of the commodity that was traded in changed. There was in average 40.4 % of the total average transaction that traded for sugar commodity. Cereals commodities have been dominated again during 2007 - 2008 auction season.

The types of commodities that were traded can be grouped into 6 kind product of agricultural field, to get a diversity tendency of commodity. Trend of the percentage of the commodities per year traded, give a tendency for commodities diversity during auction has been held. From the trend in figure 1 can be seen that transactions were no longer dominated by one type of commodity.

Figure 1. Percentage of Auctioned Commodities

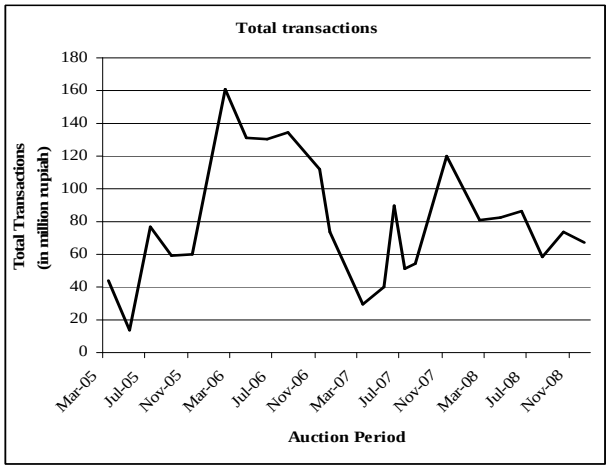


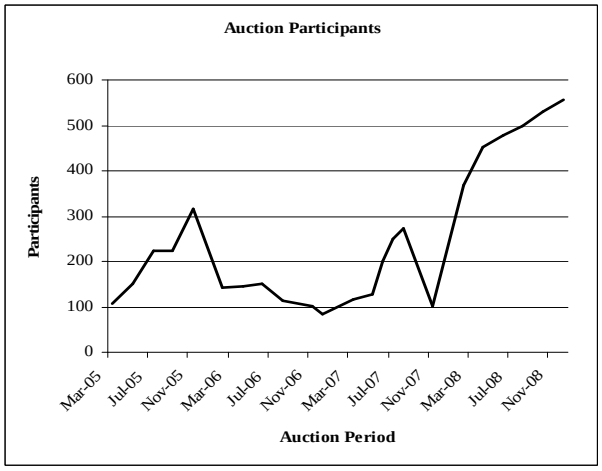
	2005	2006	2007	2008
food corps	60.18%	12.27%	26.88%	20.62%
Horticultural corps	23.54%	9.41%	24.39%	13.42%
Plantation corps	5.67%	64.16%	38.63%	20.79%
Livestock	0.48%	7.09%	7.15%	21.63%
Fisheries	6.32%	0.28%	0.66%	0.31%
Other commodities	3.81%	6.78%	2.29%	23.23%

This show indication that the auction market has been reaching each fields of agriculture's market.

Membership of this market was dominated by farmers' association, main market traders 'cooperative in Java and individuals trading company. But such increases in the number of members who participate didn't have a significantly effect on the total of auction transactions. It can be seen from figure 2, although the number of participants increased, the total transaction tends to decrease. This indicates that the decrease of trade transactions for some of commodities which have most contribution to the total transaction. This tendency can be caused by some traders who switch on others commodities that are considered potential, even though the commodity was a new entry in the market. Even then, some of traders were come to discover some new commodities. It is commonly for products derived from primary commodities.

Figure 2. Total Transactions and Number of Auction Participants





Some questions are prompted by the foregoing mechanism of the improving of auction mechanism in this market, such as

a. Are there evidences that show benefits for market pricing mechanism and farmer return from auction mechanism?
b. Which the possible auction mechanism/forms that can be maximize the seller's expected revenue (farmers) and given an accurate market information?

Moreover, with the high level of heterogeneities products and traders, causing less market can predict the types of products that will bid. Sometimes many buyers / sellers can not find the required goods or sell goods which they take in the auction market. So, for the rare products facing a risk is not sold or sold with price is sometimes not appropriate, this is to avoid loss of seller due to transportation cost to the auction market.

In order to addresses these problems, the first part of the research which is mentioned in this paper is observing price formation of an auctioned commodity by the data of price of the commodity already auctioned. This study should help us understands how the price-setting on this market and whether the use of auction mechanism is more efficient than other sales mechanism in general market on improving profitability for farmers/seller. This paper is only the initial stages of the proposed research program, as the preliminary study for determining market pricing on the auction. We use price analysis method of LAFFONT and MONIER-DILHAN and OSSARD (1995) has developed for vegetable auction market of Marmande (France).

2. Price Formation of Central Java agriculture auction market

We have auction data from 2005 to 2008, with 792 commodities items which traded on, but actually not all products are sold in each auction. Hence, for this study, we observe for one commodity in which most frequently auctioned, i.e. rice, especially for IR64 variety. For each auction we have the winning bid, the reservation price from seller and other relevant variables (such as quantity and market price reference). From the data we focus on the price formation that allows us to observe the strategy of buyers. To begin with, we can now derive the practical auction mechanism to the theoretical auction model.

2.1.Auction Theoretical Model

Bid for buying and selling in the market auction conducted by product sample and / or quality specifications. Market auction members have to register the commodity before the auction will be held at the latest 3 days before the auction. Specification of the commodity to be traded should be stated clearly and completely. Then the data of bidding to buy / sell in will enter to the auction market system. Auction based on the serial number that is adjusted by the presence of the auctioneers. If there are some commodities with the registration, type / quality and delivery of the same month, the head of the auction will auctioning all at once for the registration. As one frequently used on selling agricultural product, in this market use descending auction for determine the winning bids, an auction where the auctioneer announces prices, usually started with high unit price, and then he lowered. The first bidder who calls out that's she will accept the current price wins the product at that price.

Buyers come to the market from distinct markets and each auction is quite specific, thus enable us to analyze as the descending auction with independent private values and reservation price model. This model based on the following assumptions.

1. The bid is provided at least as high as the reservation price which is known by all bidders in advance.
2. When forming bid, each bidder knows his private value but does not know others' private value. But he knows the probability distributions in which others' private value are drawn and are identical for all bidders.

From these assumptions, we can derive the optimal bid, as buyer's dominant strategy, by a function of the bidder's private value, the reservation price of the object, the number of bidders, and the distribution of private values (RILEY AND SAMUELSON, 1981):

$$b_l^i = v_l^i - \frac{1}{\left[F(v_l^i\right]^{I-1}} \int_{p_l^0}^{v_l^i} \left[F(x)\right]^{I-1} dx \quad (1)$$

Where

b_l : The bid of potential buyer

v_l : Bidder's private value

p_l^0 : The reservation price of seller

$F(.)$: Cumulative distribution function

I : The number of potential buyers

$i = 1,...,I$

We may suppose that it is adopted by all buyers, then the selling price in which is the winning bid by a buyer if and only if all other buyers have made lower bids. In other words, it is the highest bid among all the bids of the buyers, can be expressed by $b_w = Max(b_l)$.

Equation (1) shows that a buyer will make his bid below his reservation value v^i and confirm that b^i increasing in v^i. When it applies to a descending auction in which the selling price of the commodity start from a very high price, on the other hand b^i cannot be larger than v^i, so the auction can start from the highest value among all of v^i. Hence, by observing the distribution of v^i given the appropriate choice of a reserve price for the seller, such that he can get the optimal of his expected gain. But in general, only bids are observed while private values v^i are not observed. Thus, the structural approach should be adopted to estimate the distribution of the unobserved private values.

But in this preliminary study we focus on the empirical analysis for the observed bids based on the observed variables i.e. the reservation price, quantity of commodities and other relevant variables, that be assumed the bid depends on.

2.2. Auction prices

For each auction we have the data of the winning bids, the reservation price and the market price are measured in Rupiah/kg. The quantity is measured in tons. The qualitative variables which defined as the date when the auction is held correspond to crops season of the commodity. The data variables are summarized in the following table

Table 1. Summary Statistics

Quantitative Variables

Number of Auction :225

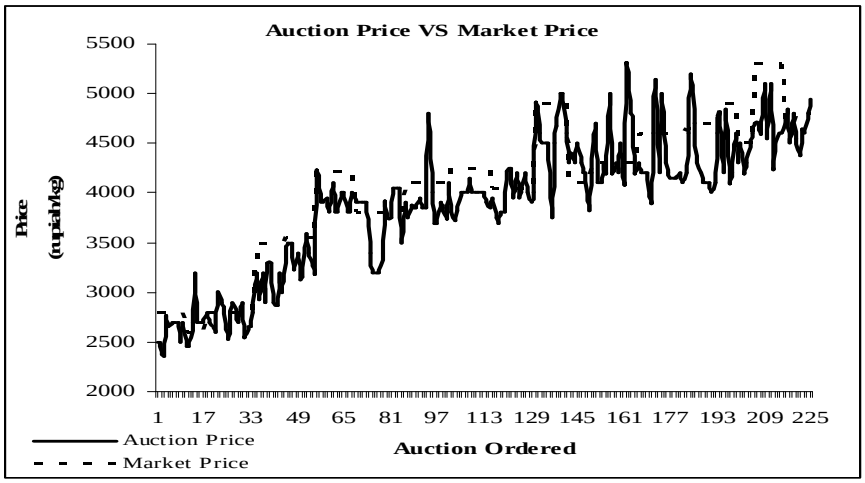
Variables	Mean	Standard Deviation	Maximum	Minimum
Bid	3885.13	682.98	5300	2350
Reservation Price	3927.91	670.68	5300	2350
Market Price	4069.09	699.21	5297	2600
Quantity	304.41	438.61	3000	20

Correlation Matrix

	Bid	Reservation Price	*Market Price*	*Quantity*	*Season1*	*Season2*
Bid	1.000					
Reservation Price	0.980	1.000				
Market Price	0.901	0.893	1.000			
Quantity	-0.306	-0.294	-0.262	1.000		
Season1	-0.057	-0.048	-0.142	-0.104	1.000	
Season2	0.212	0.199	0.341	0.046	-0.860	1.000

Goal of the implementation of this auction market is the place for the establishment of a transparent price and to increase price in the level of producers, with the indicator that is the difference between the prices formed in the auction market with market prices become closer. The comparison between the selling price and market price can be seen in figure 3.

Figure 3. Auction Prices and Market Prices Comparison



With this data set, we provide the simplest approach of the auction empirical analysis by estimating the observed selling price, as the highest bid (b_l) among all the bids of the buyers for each auction (l). The empirical analysis begins by assuming that the observed price, depends on these following characteristics (Z_l):

a. Commodities Characteristic

   $Z_{l,1}$ = Reservation price

   $Z_{l,2}$ = Market price reference

   $Z_{l,3}$ = Quantity of offered commodities

b. Market Characteristic

   $Z_{l,4}$ = Crop seasons, is a dummy variable which takes the value 1 for the auction on the harvest season, 0 otherwise.

We assume that the bid (b_l) is a linear function of four kinds of variables above: $b_l = \Phi(Z_l)$. So the function linear (Φ) can be written:

(2) $b_l = \beta_0 + \beta_1 Z_{l,1} + \beta_2 Z_{l,2} + \beta_3 Z_{l,3} + \beta_4 Z_{l,4}$

Assuming that the selling price is a random variable and has a normal distribution $N(E(b_l), \sigma(b_l))$, the ordinary least squares method is used to estimate of the

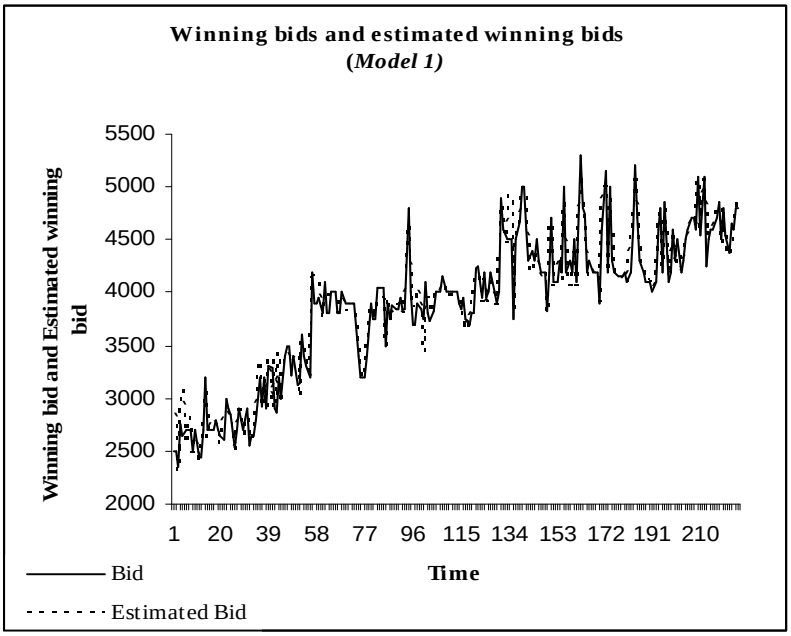
expectation $E(\tilde{b})$ from the statistical model $\tilde{b}_l = \beta_0 + \beta_1 Z_{l,1} + \beta_2 Z_{l,2} + \beta_3 Z_{l,3} + \beta_4 Z_{l,4} + \tilde{u}$, where $\tilde{u} \approx N(0,1)$. We estimate three models: the model 1, with all the four exogenous variables, then the model 2 with only the reservation price and the model 3 without the reservation price, we obtained the results in table 2.

Table 2. Estimation Results

	Model 1	Model 2	Model 3
Constant	-36.493	-34.129	396.082
Reservation price	0.868	0.997	0
Market price reference	0.134	0	0.913
Quantity	-0.032	0	-0.992
Crops season	-24.92	0	-132.981
Adjusted R Square	0.963	0.959	0.827

The result indicated that the selling price is explained by a linear regression on these four variables and also on the three last, without the reservation price or on the reservation price $(\beta_1, \beta_2, \beta_3, \beta_4 \neq 0)$. The negative constant on model 1 and model 2 indicate that when auction is held without these four variables, the price will be -36.493 and -34.129 standard deviation below the mean of their selling price. The quantity and Crops season coefficient are negative. Although for the quantity coefficient is not significant. It might be explained that the final buyers buy on several offer in the auction, they buy in regarding the interesting price which is offered. So, quantities offered in this market do not affect their willingness to pay.
Concerning the goodness-of-fit of estimated model, model 1 enable us to track closely the winning bid (b_l) by the estimated winning bids $(\tilde{b})$, with only the reservation price is significant. It can be seen in figure 4.

Figure 4. Winning bids and estimated winning bids



Conclusion

By deriving the auction mechanism in agro-auction market of Central Java to the descending auction with independent private values and reservation price model, we want to obtain the estimation of the distribution of the unobserved private values which is assumed determine the optimal bidding of each buyer. By providing information about buyer valuations allows the seller on choosing an appropriate reserve price, such that it can improve the expected income by this market mechanism.

In this paper we have analyzed price formation using auction field data. Using the linear model of bid function and estimate by ordinary least square method, our estimation describe that the winning bid depends significantly with the reservation price of the seller. On the other hand, the selling price, as the maximum bid, in this market gives a trend still below of the market price that might encourage participants bidding on this market. Moreover, auction is held every two months that also encourage potential buyers to attempt in the auction. Because buyers prefer to take advantage of price fluctuation in the market by daily trading rather than waiting for the two-monthly auction. It can be seen, even though increasing of number of participants but the total transaction tends to decrease. Hence, in order to obtain more structural approach to the analysis of auction, it means that the econometric model is derived directly from the underlying auction model, we wish to use this preliminary suggestion to extent our analysis of price formation on the auction mechanism which is wish useful for developing the policy analysis in Agro-Auction Market of Central Java.

References:

LAFFONT, J., MONIER-DILHAN, S. AND OSSARD, H (1995): Price Analysis of a Vegetable Auction Market: Acta Hort. (ISHS) 340:375-380

LAFFONT, J., OSSARD, H. and VUONG, Q. (1995): Econometrics of First Auctions: Econometrica, Econometric Society, vol. 63(4): 953-80

RILEY, J.G. and SAMUELSON, W.F.(1981): Optimal Auction: American Economic Review, vol. 71(3): 381-392