Abstract- This paper gives idea not only the marketing but also the economics importance of Thailand hog products is significant. The supply and demand analysis of market for any products will gain the benefit to the country policy level which the Office of Agriculture Economics always concerns as regular. This is for using to predict the situation and to define the processing in future. In the case that the quantity supply of products is defined in the same period of price, the model will be in simultaneous equations system. However, whenever the information is efficient, the quantity of supply will be defined with the price in the previous period. The purpose of the study is to forecast the trend in pig production in both quantity and price along with the hypothesis assumption: the quantity of pig increases, the price of pigs has decreased. The weather as a casual factor has an outstanding role in the change of the produced quantity consequence in the price. Beside the weather, festival period such as Chinese New Year and Lent Vegetarian Festival in Thailand including pandemic disease PRRS resulting in the abortion of sows children, the demand on equilibration of the demand the supply market significantly influences the cyclical. Therefore, considered as a significant risk in terms of market value, from the various determinants effects can be the significantly influence the domestic purchase prices. These results seem to become even stronger in the future.

Keywords- hog production, manufacturing, marketing, production plan

I. INTRODUCTION

The hog production is similar to other businesses that producers must have the knowledge intensity to understand the conditions of production and marketing of the goods including evaluating the future situation and trend properly. So, the hog farmers will be able to forecast in advance at least one year, which will be used as the guidelines of the production plan to make the achievement in manufacturing or else to cause the least loss.

In order to increase the profits or reduce the losses, demand and supply of livestock animals are needed to know in advance to set the production planning under the different scenarios such as net amount of stocks, net imports, total distribution, total slaughter and total supply relating used by techniques of making the low cost, price movements and the factors affecting pricing including the knowledge, experiences in livestock marketing, attitude and suitable guidelines for development an improvement of marketing opportunities to explore.

Regarding the information above, the purpose of the study is to predict the trend in
pig production in both quantity and price along with the hypothesis assumption: the quantity of pig increases, the price of pigs has decreased. Data in the study was a secondary data obtaining from Index Mundi and The Swine Raisers Association of Thailand.

II. LITERATURE REVIEW

Pig meat products are widely consumed and as well as can be made the revenue for Thailand. Currently, pig farming is raised in a large scale for commercial farm. There is now more demand for consuming because the problem called “bird flu” outbreaks in poultry making the consumers reduce consumption on chicken meat and switch to others instead. In the market structure, the pork prices have to depend on pig prices. So, the government has to control the current price not to be the abnormally high, which is taken advantage for consumers. The market swine can show as the image following Figure 1:

![Figure 1: Cycle of market swine](image1)

1 = the responsibility of the Animal Disease Control Division, Department of Livestock Development, Ministry of Agriculture.

2 = the responsibility of the Veterinary Public Health Division, Department of Livestock Development, Ministry of Agriculture.

3 = the responsibility of the Department of the Interior Ministry of Interior.

4 = the responsibility of the Division of Food and Drug Administration, Ministry of Public Health.

Source: University of Sukhothai Thammathirat, 2544, p. 421 [1]

The hog cycle, the cycle refers to the behavior in ways that lead to changes in both production quantity and price levels in the same format. It will occur from time to time consecutive following as Figure 2:

![Figure 2: Hog cycle affects from quantity and price](image2)

Analysis on demand and supply of a product in the market or in the country is an important part of cost analysis. The analysis can create via by tables, graphs and using the complex mathematics. Selection method will be based on the objective of the study and the data obtained. The quantitative analysis aims to estimate the coefficients or parameters such as price elasticity and income elasticity including price forecasting that affect the price to propose the guidelines for agricultural policy.

The quantitative analysis is performed to study the behavior of a variable by timeseries analysis and forecasting the trend, seasonal behavior including the life cycle of variables such as price or product requirements in order to understand the past trends to predict the nearly future.
To summarize the relationship between price elasticity and price flexibility on demand equation that can be defined by two types: first, defined the quantity as dependent variable or second, defined the price as dependent variable which this one also known as “inverse demand function” and the coefficient will make the price flexibility that is correlated with price elasticity as: \( FE = I \) or \( E = F^{-1} \) when \( F \) and \( E \) are \( n \times n \) matrix of price flexibility and price elasticity. If \( R^2 \) is high, the estimation on elasticity in this method will have a chance to make lower value. But Waugh (1961) [2] saw that the \( E \) value should come from the equation that has the quantity acting as dependent variable. This idea is contrast to Wohlgenant (1989) [3] that proposed the empirical research on inverse demand function by using the price as dependent variable and analyzed the \( F \) and calculated \( E \) value.

### III. METHODOLOGY

A basic concept of modeling continuous demand for agricultural products on the farm level is to assume that consumer demand for food and the inputs are used to create marketing services which this aspect has the relationship in a fixed proportion. As the result, the continuous demand for agricultural products on the farm is obtained directly from the difference on primary demand curve to the cost of market unit (Tomek and Robinson, 1990 [4]; Wohlgenant, 1989 [3]). In other words, the difference between retail price and farm prices mean the marginal product per unit.

So, when the retail price is less to any costs of market from the demand curve, it will get the continuous demand curve. The different of this price includes the fixed amount and fixed percentage in elasticity. So, the elasticity of continuous demand will derive from the elasticity of primary demand curve and elasticity of price transmission between two level markets (See George and King, 1971 reference by Wohlgenant, 1989 [3]).

The product from farm is the inputs of the processing plant and the marketing business unit. As food processing that needs to use the inputs for producing would have to have a material substitution between farm and other factors. The lack of information on quantity of goods at retail by then, analysis of demand and supply in the market is impossible but the relationship links from input of marketing business to farm enabling the model to study demand-supply by using the reduced form proposed by Wohlgenant (1989) [3].

Demand for retail:
\[ Q_t^r = D_t(P_t, Z_t) \]  
Supply for retail:
\[ Q_t = \Sigma S_t(P_t, P_r, W_t) \]  
Demand at farm:
\[ Q_t^f = \Sigma D_t(P_t, P_r, W_t) \]  
Supply at farm:
\[ Q_t = \text{predetermined} \]  
Equilibrium market at retail:
\[ Q_t^r = Q_t^r = Q_t \]  
Equilibrium market at farm:
\[ Q_t^f = Q_t = Q_t \]

When \( r \) and \( f \) show at the retail market and at farm, \( Z \) is exogenous moving on primary demand curve, \( W \) is index shows price of input factors using produce the market service, \( P \) is the price of product and \( i \) is the unit of output on reduced form. We will use (1), (2) and (5) including (3), (4) and (6) rewritten to be 2 equations:

\[
\Sigma S_t(P_t, P_r, W_t) - D_t(P_t, Z_t) = 0
\]

\[
Q_t - \Sigma D_t(P_t, P_r, W) = 0
\]

Total differentiation of equations (7) and (8) and converted to elasticity in the form:

\[
(\xi_{rr} - \xi_e)\frac{dP_t}{P_t} + \xi_e\frac{dP_r}{P_r} + \xi_Z\frac{dZ_t}{Z_t} - \xi_{rr}\frac{dW_t}{W_t}
\]

\[
-\xi_e\frac{dP_r}{P_r} - \xi_{rw}\frac{dW_r}{W_r} = 0
\]

When \( \xi_{rr} \) is elasticity supply for retail per retail price, \( e \) is elasticity demand for retail per retail price; \( \xi_e \) is elasticity demand for retail per exogenous \( Z \), \( \xi_{rw} \) is elasticity supply for retail per factor \( W \) price and \( \xi_{fr} \) is elasticity demand at farm per factor \( W \) price.

Aggregate elasticity supply for retail of every business market units is defined by aggregate elasticity on weight of quantity in each producing unit.
Assumption of elasticity: First, equation of quantity supply and equation demand are homogeneous of degree zero per price at business unit level meaning that equation in industry level has homogeneous because the demand for retail has homogeneous of degree zero per price and income referring as in equation (9) and (10) not different when $P_r$, $P_f$ and $Z$ changed in the same level. In the same level, when the variable in $Z$ (price of goods and income) changed in the same proportion. Second, the condition of symmetric relation that is the effect from the change in farm price per supply for retail has to be symmetric with the negative effect of the change in retail price per demand at farm. This symmetric is in the industry level for each business unit. The symmetric between supply for retail and demand at farm means

$$\hat{\delta_1} \tilde{\delta} = \left[ \hat{\delta_1} \tilde{\delta} \right] \left[ \hat{\delta_1} \tilde{\delta} \right]$$

(11)

Aggregate industry is

$$\Sigma \hat{\delta_1} \tilde{\delta} (Q_f/P_f) = \Sigma \hat{\delta_1} \tilde{\delta} (Q_f/P_f)$$

(12)

When we multiply the left hand side with $Q_r/Q_r$ and multiply the right hand side with $Q_r/Q_r$, we get

$$\hat{\delta_1} = \hat{\delta_1}$$

(13)

when $\hat{\delta_1}$ is farmer’s share = $P_r Q_r/P_f Q_f$

(14)

which equation (14) comes from equation (11) in the form of elasticity (See the detail from Tomek with Robinson, 2003 [5]).

IV. DISCUSSION

To study demand of pork in Thailand that affects to pig’s prices and the supply of pigs has the important evident to explore as (1) Demand – supply equation is quite rare to study in the past century because everyone thinks it is as normal understanding. (2) Using demand – supply equation in the different level of market has the weak point but the researchers solve the problem by using the technique called Ordinary least squares (OLS). (3) Model is dynamic. And (4) this paper can be an example to link the demand for retail and continuous demand at farm following as:

A. Characteristic

The observation from the Table 1 shows that the demand on pork is increasing from time to time in average around 4.47% making the pork price for retail increasing 0.21 $/kg and price at farm increasing 1.58 $/kg.

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantity Demand (per person)</th>
<th>Price Retail (B)</th>
<th>Price Farm (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>9.74</td>
<td>84.1</td>
<td>39.75</td>
</tr>
<tr>
<td>2000</td>
<td>10.12</td>
<td>75.89</td>
<td>32.75</td>
</tr>
<tr>
<td>2001</td>
<td>10.28</td>
<td>75.87</td>
<td>35.5</td>
</tr>
<tr>
<td>2002</td>
<td>11.3</td>
<td>75.65</td>
<td>37</td>
</tr>
<tr>
<td>2003</td>
<td>11</td>
<td>74.05</td>
<td>30.5</td>
</tr>
<tr>
<td>2004</td>
<td>11.9</td>
<td>91.04</td>
<td>44.87</td>
</tr>
<tr>
<td>2005</td>
<td>11.7</td>
<td>96.79</td>
<td>49.53</td>
</tr>
<tr>
<td>2006</td>
<td>12.3</td>
<td>95.99</td>
<td>45.81</td>
</tr>
<tr>
<td>2007</td>
<td>13.7</td>
<td>82.04</td>
<td>39.03</td>
</tr>
<tr>
<td>2008</td>
<td>11.70</td>
<td>110.0</td>
<td>47.01</td>
</tr>
<tr>
<td>2009</td>
<td>11.44</td>
<td>115.0</td>
<td>53</td>
</tr>
<tr>
<td>2010</td>
<td>11</td>
<td>120.0</td>
<td>59.61</td>
</tr>
</tbody>
</table>

Source: Swine Producers and Processors for exporting Association

Model is equation that expected to have links in the relationship between price and supply. And because of the different relationship between the errors term and the market equation, primary demand in the retail market is set as exogenous term. Under competitive market, the increase (or decrease) in primary demand will affect to derived demand in the farm level. With the derived demand for input factors and supply come along with the maximize profit theory. From that theory, paper divides demandsupply equation into 2 levels, plant carve level and farm level as followed:
Agricultural Business on Price & Quantity of Hog and Economics Perspective on Tendency in Future

Plant Carve:
Inverse Demand \( P^d_t = f(Q^d_t, M, u_t) \) (15)
Supply \( Q^s_t = f(P^s_t, P_t, I, u_t) \) (16)
Equilibrium \( Q^d_t = Q^s_t; P^d_t = P^s_t = P_t \) (17)

Farm:
Inverse Demand \( P^f_t = f(Q^f_t, P_s, P_r, I, u_t) \) (18)
Supply \( Q^s_t = f(P^s_t, P_r, P, P_t, u_t) \) (19)
Equilibrium \( Q^f_t = Q^s_t; P^f_t = P_t = P_r \) (20)

where
Assume \( u_t \sim (0, \sigma^2 u) \), \( f = 1, \ldots, 4 \) but \( u_3 - u_4 \) has contemporaneously related. \( Q^d_t \) is demand of butcher when \( M \) is marketing cost, \( P^s_t \) is price of supplier, \( P_r \) is price of hog alive, \( I \) is interest rate, \( P^s_t \) is determined supply by the price of pork, \( P_p \) is piglet price, \( P_r \) is rum price. The Equations of demandsupply create opportunity to adjust demand on retail automatically that influence on inverse demand for pork carve as shown in equation 15; also, can affect to inverse demand for supplier. The livestock will response on movement for primary demand because the change in farm price can affect to pork farmers’ profits.

**B. Equation Analysis**

Regarding to previous information on the connection between two level markets, for example, the weather affects to the quality of pig alive and pork. Including the change in demand of retailers and the pork carvers affect to demand on pig alive. Besides, the mis-specification is always occurred making the variance of equation (1), (2), (18) and (19) not be zero. Normally, we should estimate equation (15) – (20) but noticeable that the sample size here is quite small because of rarely on collecting data from the organization only nine years that may not enough to refer on asymptotic distribution theory but the result from this paper referring from this asymptotic distribution until getting the value of coefficient and covariance matrix toward to converge.

**V. CONCLUSIONS**

The result on this paper can be used to predict and prepare for the future agricultural policy plan by using the elasticity in different market level which it can be extended more than two level markets. In Thailand, the demand on pork will not be decreased, so the promotion on

<table>
<thead>
<tr>
<th>Table II</th>
<th>DEMAND-SUPPLY OF PORK CARVE BY OLS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td><strong>OLS Equation</strong></td>
</tr>
<tr>
<td>Demand</td>
<td>( \ln P^d_t = -1.568 - 0.093 \ln Q^d_t + 1.304 \ln P_r + 0.054 \ln I )</td>
</tr>
<tr>
<td>Supply</td>
<td>( \ln Q^d_t = 3.905 + 0.035 \ln P^s_t + 0.044 \ln P_p \ + 0.374 \ln I + 0.253 \ln Q^s_t )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table III</th>
<th>DEMAND-SUPPLY OF PIG ALIVES BY OLS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td><strong>OLS Equation</strong></td>
</tr>
<tr>
<td>Demand</td>
<td>( \ln P^f_t = -1.176 + 4.366 \ln P^s_t - 2.778 \ln P_p - 0.387 \ln I )</td>
</tr>
<tr>
<td>Supply</td>
<td>( \ln Q^f_t = 0.207 + 0.733 \ln P^s_t - 0.615 \ln P_r - 0.240 )</td>
</tr>
</tbody>
</table>

The interesting analysis in economics and econometric is (1) Coefficient of \( \ln Q^d_t \) (+0.672) in Table II and coefficient of \( \ln Q^d_t \) (-0.093) in Table III are the price flexibility of demand that refers to the way price on pork carve and pig alive change in relationship to the demand (2) Coefficient of \( \ln P^s_t \) (+4.366) in Table II and coefficient of \( \ln P^s_t \) (+0.035) in Table III are the elasticity of supply and both have the correct sign according to demand-supply theory. (3) We can realize that the models are dynamic on supply equation in both markets but in the farm level there are more lag ranges than pork carve. (4) Elasticity at farm level (0.035) is quite low. This 0.035 is the short time elasticity that can be supported by the biological on adaptation in the production of pork. (5) To calculate elasticity in long time, we can find by using coefficient of price (\( P^s_t \)) and value of \( \ln Q^s_t \) (6) Characteristic on dynamic models can show the effect in the long term on change in demand to price of pork and supply of pork alive at farm level.
pork consumption will bring the benefits to farmers especially to raise the quality of pork; however, to serve the consumers’ needs in the future: quality, safety and production process must be the outstanding core part to concern. Moreover, these models can be used with others commodities such as seashore farm and rice farm which these markets have many levels to concern. In general, the model consists of demand equation and supply equation. In this case the quantity supply on pork be defined as the same period of price, the model is called simultaneous equations system.

REFERENCES


