Canned Pineapple’s Demand Forecast Using Econometrics Model

Preeyanat Eapsirimetee, Nanthi Suthikarnnarunai, Member, IAENG, and Somchai Hanhirun

Abstract—Due to emerging and growing of technology, there are changes in trading systems and world economic systems. The world seems to be narrowed. The manufacturing countries make up with several strategies to keep their customers. Canned pineapple is one of the important products which create income to the country. The researcher, therefore, use to econometric model to develop the demand forecasting model to forecast the exporting demand. The model shows that price of our products, price of our competitor’s product, and income affects demand. The result obtained is in line with the theory of demand which price of product is an inverse proportion with the demand. The result from the model also clearly shows the seasonal pattern of demand. The researcher hopes that the result obtained in this research will be used by the manufacturer in preparing its product to serve the exporting demand.

Index Terms—Demand forecast, Canned Pineapple, Demand Theory, Econometrics Model

I. INTRODUCTION

THAILAND has joined the ASEAN Economic Community (AEC) and has signed the Free trade Agreement (FTAs) with several countries. This has resulted in changes in the national trading systems with more trade liberalization. Agriculture sector has benefited from trade liberalization and making profits from exporting more goods and can produce income up to 11% of GDP per year [1]. Now, Thailand has named as “Kitchen of the World” [2] because it is the only country in Asia that exports all kind of agriculture products. This strength is the result of the success in research and development in agricultural production technology. The examples of important exported agricultural product are rubber, pineapple, durian, and etc. Processed fruit is another product which has been ranked as the 10th of the exported product of Thailand.

Pineapple is a well known fruit in the world as it has good taste and contains with several vitamins [3]. It is originated from Brazil in South America. Currently, Brazil is a country of which can produce the largest amount of fresh pineapple in the world [4]. However, Thailand is a leading exporter of canned pineapple as shown in Table 1. Other important exported products of pineapple are fresh pineapple and pineapple juice [5]. Table 2 shows a statistics of the exported quantity of other processed pineapple products.

From 2007 to 2009, there is a fluctuation in exported canned pineapple’s quantity from the production countries. Most countries claimed that it is because of the natural disasters, both drought and floods. In 2010, Thailand has increased the quantity of exported canned pineapple by 2.13 percent but decrease 5.07 percent in value [6]. From the report of Office of Agricultural Economics, there are total of 1.2 million rai in Thailand where cultivates a pineapple, mostly in Prachuap Khiri Khan, Rayong and Chon Buri. Twenty-six percent of fresh fruit is used as domestic consumption, four percent is exported as a fresh fruit, and seventy percent is used as a supply to a processed fruit manufacturer [7]. Yield of Thailand’s fresh pineapple is shown in Table 3. It shows the yield is a proportional of a selling price. However, the selling price is not an only reason of why the yield is increase or decrease. Many researchers present ways to forecast yield of pineapple using different methods [7], [8]. This research aims to forecast the demand of Thailand’s canned pineapple in the world market. The results received from this research can be matched up with the forecast of demand by other

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Thailand</td>
<td>568</td>
<td>619</td>
<td>509</td>
<td>8.97</td>
<td>-17.72</td>
</tr>
<tr>
<td>Philippines</td>
<td>242</td>
<td>233</td>
<td>204</td>
<td>-3.71</td>
<td>-12.44</td>
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<tr>
<td>Indonesia</td>
<td>91</td>
<td>221</td>
<td>147</td>
<td>142.85</td>
<td>-33.48</td>
</tr>
<tr>
<td>Kenya</td>
<td>71</td>
<td>94</td>
<td>51</td>
<td>32.39</td>
<td>-45.76</td>
</tr>
<tr>
<td>China</td>
<td>81</td>
<td>77</td>
<td>64</td>
<td>-4.93</td>
<td>-16.88</td>
</tr>
<tr>
<td>Australia</td>
<td>164</td>
<td>158</td>
<td>121</td>
<td>-18.85</td>
<td>-12.31</td>
</tr>
<tr>
<td>Total</td>
<td>1,217</td>
<td>1,382</td>
<td>1,096</td>
<td>13.55</td>
<td>-20.69</td>
</tr>
</tbody>
</table>

Sources; Tradmap, 2010; own calculations
researchers; therefore, the players in the canned pineapple’s supply chain can adjust their strategies or operations according with the foreseen or forecasted results.

II. SUPPLY CHAIN OF CANNED PINEAPPLE INDUSTRY IN THAILAND

Generally, the supply chain of canned pineapple industry in Thailand is an integration of agricultural producers (farmer), manufacturers, and end consumer as seen Figure 1 [9]. The detail of each component in supply chain can be explained in detail in the next paragraph.

Figure 1: Supply Chain of Canned Pineapple Industry in Thailand

The customer of Thailand’s canned pineapple can be divided into two groups – foreign customer and domestic customer. Seventy percent of the products have been exported to several countries, i.e., the United State of America, Germany, France, Japan, etc. Thirty percent of the products have served the domestics consumptions, such as restaurant, hotel, and household. At the midstream of supply chain, manufacturers, which might be called processing industry in this case, play important role in producing products to serve customer demands. The main types of processed pineapple are canned, juiced, dried, crystallized, and stirring [9]. Others supporting activities in this stage are packing, collecting/storing, and picking [9]. At the upstream stage, farmers are controlled by farming’s good agricultural practice, Department of Agriculture [10]. This aims to control a quality of supply. The modern and important concept of logistics in this stage is contract farming which ensure that the manufacturer will always have fresh pineapple for their production process. In case that there is not enough supply, import of fresh pineapple is possible [11], [12].

III. METHODOLOGY IN FORECASTING THAILAND’S CANNED PINEAPPLE DEMAND IN WORLD MARKET

Since the objective function of this research is to forecast Thailand’s exported quantity of canned pineapple, therefore, the econometric model with demand theory [13], [14], [15], [16] is employed to explain the phenomena of the current development of canned pineapple in the world market.

A. Concept of Demand theory

Demand theory refers to the customer decision in changing of external factor i.e., consumer’s income, population, and taste etc. Especially, price level of goods or services affect consumer’s purchasing power. The determinants of demand concern goods quantity or services that customer need to purchase effect that to decrease or increase of quantity [17], [18], [19], [20].

B. Determinants of Demand

However, determinants of demand have influenced in goods quantity or service, consumer behavior and time as following details [18], [21], [22];
- Change in price
- Change in income
- Change in population size
- Change in consumer expectations
- Change in price of related goods
- Change in seasonal and so on.

The above determinants might be used to formulate the econometric model for forecasting the demand as equation (1). Refers to the demand theory, price of products and price of related product is an inverse proportional to the demand of products, else are a direct proportional with the demand of products.

\[ Q_x = f(P_x, I, T, Py, Pop, o,...) \]  \hspace{1cm} (1)

Where

- \( Q_x \) = demand forecasted
- \( P_x \) = price
- \( I \) = income
- \( T \) = taste
- \( Py \) = other related products’ price
- \( Pop \) = size of population
- \( O \) = Seasonal

C. Demand Function

The demand function or econometric model for this problem is shown as equation (2).

\[ Q_{DT} = \beta_1 - \beta_2 PT + \beta_3 PP + \beta_4 PI + \beta_5 GDP + \epsilon \]  \hspace{1cm} (2)

When

- \( DT \) = quantity of demand canned pineapple
- \( PT \) = selling price of Thailand canned pineapple
- \( PP \) = selling price of Philippine canned pineapple
- \( PI \) = selling price of Indonesia canned pineapple
- \( GDP \) = income of population
- \( \beta \)’s = parameter

<table>
<thead>
<tr>
<th>Classified</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>Rate Increase Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canned</td>
<td>568.40</td>
<td>618.52</td>
<td>508.97</td>
<td>8.81</td>
</tr>
<tr>
<td>Fresh</td>
<td>2.82</td>
<td>3.61</td>
<td>2.74</td>
<td>28.01</td>
</tr>
<tr>
<td>Juice</td>
<td>135.71</td>
<td>152.79</td>
<td>151.42</td>
<td>12.58</td>
</tr>
</tbody>
</table>

Sources: Information & Communication Technology Center, Ministry of Commerce; own calculations
Eviews 2.3 is used as a tool to analyze the results of equation (2) [23]. Input data to the model is from [24], [25], [26], [27], [28], [29], [30], [31], [32], [33]. The result reveals that the model can explain the variation that deviate from the true value up to 82% with significant level of 95% as shown in Table 4. The final equation of Thailand’s exported quantity of canned pineapple has shown in equation (3).

\[
DT = -31271925.2 -30081.99*PTSA(2) + 20981.67PPSA + 33787.17*PISA + 3432.82*GDPSA
\]  
(3)

\[
(4.49) \quad (2.41) \quad (2.48) \quad (3.51) \quad (3.81)
\]

R-squared = 0.825745  
Adjusted R-squared = 0.798937  
Durbin-Watson stat = 2.606416  
F-statistic = 30.80174

From the above equation, it reveals that the relationship between forecasting demands of canned pineapple with each determinant is 99.77%, 98.04%, 98.04%, and 99.92%, respectively. Table 5 shows the error analysis between actual value and forecasted value provided by our model. It can be explained as the exported quantity of canned pineapple is decreased when selling price in Thailand is increased. Other factors is a direct proportional with the demand.

### TABLE IV
**Estimate Equation (2) with Program Eviews 2.3**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std.Error</th>
<th>T-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-31271925.2</td>
<td>6951492</td>
<td>-4.498592</td>
<td>0.0001</td>
</tr>
<tr>
<td>PTSA(2)</td>
<td>-30081.99</td>
<td>12475.20</td>
<td>-2.411344</td>
<td>0.0023</td>
</tr>
<tr>
<td>PISA</td>
<td>20981.67</td>
<td>8435.57</td>
<td>2.487285</td>
<td>0.0196</td>
</tr>
<tr>
<td>GDPSA</td>
<td>33787.17</td>
<td>9617.54</td>
<td>3.513078</td>
<td>0.0016</td>
</tr>
</tbody>
</table>

R-squared = 0.825745  
Adjusted R-squared = 0.798937  
Durbin-Watson stat = 2.606416  
F-statistic = 30.80174

### TABLE V
**Statistics of Forecasting Error**

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root Mean Squared Error</td>
<td>2911074</td>
</tr>
<tr>
<td>Mean Absolute Error</td>
<td>2383666</td>
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<tr>
<td>Mean Abs. Percent Error</td>
<td>9.503143</td>
</tr>
<tr>
<td>Theil Inequality Coefficient</td>
<td>0.052557</td>
</tr>
<tr>
<td>Bias Proportion</td>
<td>0.000000</td>
</tr>
<tr>
<td>Variance Proportion</td>
<td>0.047831</td>
</tr>
<tr>
<td>Covariance Proportion</td>
<td>0.952169</td>
</tr>
</tbody>
</table>

### IV. CONCLUSION AND RECOMMENDATION ON FUTURE RESEARCH

After changing in economic systems due to several trade agreements, Thai manufacturer has to adapt or change the strategy, so that can compete in the global market. The fruit processing industry is one of the important industries of which majorly produce income to the country, therefore, we decided to use an econometric model to produce an accurate forecasted demand of canned pineapple. The manufacturers and farmers can use our forecast as a guide to prepare readiness of the products to satisfy need of customer. The next step, we will use the econometric theory to integrate the whole supply chain of canned pineapple industry.

### ACKNOWLEDGMENT

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The demand forecast of Thailand’s export quantity of canned pineapple until 4th of 2014 is shown in Table 6 and Figure 2. It clearly shows the seasonal pattern of the exported demand of canned pineapple of Thailand, which is divided into four seasons as the pattern of current demand.
REFERENCES


