

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 a 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.

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Preeyanat Eapsirimetee is now with *PhD. student*, Department of Logistics Engineering, University of the Thai Chamber of Commerce, Dindang Bangkok, 10400, Thailand. (phone: +66-2-697-6730; fax: +66-2-692-3014 ;e-mail: econ38@hotmail.com)

Nanthi Suthikarnnarunai is now with the Department of Logistics Engineering, University of the Thai Chamber of Commerce, Dindang, Bangkok, 10400, Thailand. (phone: +66-2-697-6730; fax: +66-2-692-3014 ;e-mail: nanthi_sut@utcc.ac.th, ssjnsj@yahoo.com)

Somchai Hanhirun is now with Inspector General Ministry of Industry Thailand, Rama VI Road , Ratchatewi Bangkok, 10400, Thailand (phone :+66-2-202-3000 ;fax: +66-2-202-3048 ;e-mail: harnhirun@yahoo.com)

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.

TABLE I
 STATISTICS OF EXPORTED CANNED PINEAPPLE

Country	Year			Rate Increase Quantity	
	2007	2008	2009	2007-2008	2008-2009
	Quantity	Quantity	Quantity		
Thailand	568	619	509	8.97	-17.77
Philippines	242	233	204	-3.71	-12.44
Indonesia	91	221	147	142.85	-33.48
Kenya	71	94	51	32.39	-45.74
China	81	77	64	-4.93	-16.88
Another	164	138	121	-15.85	-12.31
Total	1,217	1,382	1,096	13.55	-20.69

Sources; Tradmap, 2010; own calculations

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

researchers; therefore, the players in the canned pineapple's supply chain can adjust their strategies or operations according with the foreseen or forecasted results.

TABLE II
 STATISTICS OF EXPORT CANNED PINEAPPLE

Classified	Year			Rate Increase Quantity	
	2007	2008	2009	2007-2008	2008-2009
	Quantity	Quantity	Quantity		
Canned	568.40	618.52	508.97	8.81	-17.7
Fresh	2.82	3.61	2.74	28.01	-24.2
Juice	135.71	152.79	151.42	12.58	-0.9

Sources; Information & Communication Technology Center, Ministry of Commerce; own calculations

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 domestic 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.

$$Q_x = f(P_x, I, T, P_y, Pop, O, \dots) \quad (1)$$

Where

- Q_x = demand forecasted
- P_x = price
- I = income
- T = taste
- P_y = 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).

$$Q_{DT} = \beta_1 - \beta_2 PT + \beta_3 PP + \beta_4 PI + \beta_5 GDP + \varepsilon \quad (2)$$

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
- β 's = parameter

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).

$$DT = -31271925.2 - 30081.99 \cdot PTSA(2) + 20981.67 \cdot PPSA + 33787.17 \cdot PISA + 3432.82 \cdot GDPSA \quad (3)$$

$$(4.49) \quad (2.41) \quad (2.48) \quad (3.51) \quad (3.81)$$

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 EIEWS 2.3

Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	-31271925	6951492	-4.498592	0.0001
PTSA(2)	-300081.99	12475.20	-2.411344	0.0023
PPSA	20981.68	8435.57	2.487285	0.0196
PISA	33787.18	9617.54	3.513078	0.0016
GDPSA	3432.82	900.33	3.812814	0.0008

R-squared	0.825745	Mean dependent var	26881110
Adjusted R-square	0.798937	S.D. dependent var	7088941
S.E. of regression	3178685	Akaike info criterion	32.92852
Sum squared resid	2.63E+14	Schwarz criterion	33.15981
Log likelihood	-505.3921	F-statistic	30.80174
Durbin-Watson stat	2.606416	Prob (F-statistic)	0.000000

Sources; analysis

TABLE V
STATISTICS OF FORECASTING ERROR

Statistics	Estimate
Root Mean Squared Error	2911074
Mean Absolute Error	2383666
Mean Abs. Percent Error	9.503143
Theil Inequality Coefficient	0.052557
Bias Proportion	0.000000
Variance Proportion	0.047831
Covariance Proportion	0.952169

Sources; Analysis

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.

TABLE VI
FORECASTING DEMAND OF THAILAND'S EXPORT QUANTITY OF CANNED PINEAPPLE

Year	Forecasting Demand
2010.4	36,679,172
2011.1	35,082,873
2011.2	33,102,679
2011.3	37,108,341
2011.4	37,391,147
2012.1	35,468,497
2012.2	31,840,877
2012.3	37,180,501
2012.4	38,105,483
2013.1	35,839,941
2013.2	30,536,890
2013.3	37,253,890
2013.4	38,298,174
2014.1	36,197,203
2014.2	29,187,993

Sources; Analysis

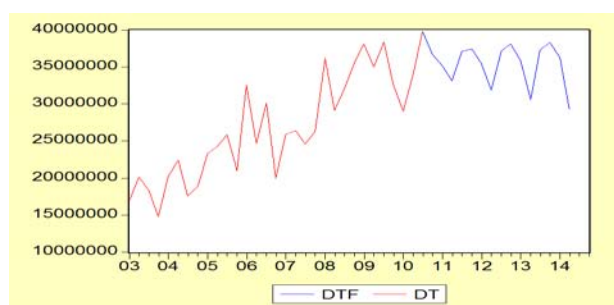


Figure 2: Forecasting Demand of Thailand's export quantity of canned pineapple

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.

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