

The Empirical Study of Factors Influencing Coconut Price in Thailand

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Abstract

Coconut is an important economic crop in Thailand. The production of coconuts tends to decrease and does not correspond to the continuously increasing demand in recent years. The reason is that the price of coconut in the country is fluctuating and the benefits of farmers do not motivate them to return to grow coconuts compared to other crops. The purpose of this research is to analyze factors that influence coconut price in Thailand using monthly time series from January 2008 to August 2019, the samples of 140 periods are observed. The results based on multiple regression analysis showed that the price of coconut in the world market, the Thai currency, and the consumer price index are factors that influence the price of coconut in the country when considering the statistical significance at the level of 0.01. While the production of the domestic coconuts does not influence the price of the domestic coconut, the estimated model can predict the price of the domestic coconut by 68.51 percent.

Keywords: Demand and Supply, Coconut Price, Multiple Regression

1. Introduction

Coconut is an economic crop that has been important to Thai society and culture for a long time. Coconut has been processed into a variety of products, such as processing into coconut milk for use as an ingredient of meat dish and dessert, coconut sugar that is beneficial and nutritious for health as well as rich in many minerals and vitamins (including calcium, potassium, magnesium, etc.). Coconut water is a refreshing beverage that helps reduce thirst well. It has a high amount of glucose and fructose, which the human body can immediately absorb and convert sugar into energy. It suits people who are exhausted or feel tired from exercising. In addition, coconut has medicinal properties. It helps to prevent heart disease, balance blood sugar, prevent calculi, treat rash, and so on (HonestDocs, 2019). Currently, coconut is an agricultural commodity that creates economic value for Thailand more than ten billion baht a year. Especially, the ready-made coconut milk contained an export value of approximately 14,000 million baht in 2018, accounting for 80 percent of the market, or being the number one in export volume for the ready-made coconut milk in the world market. The major countries importing ready-made coconut milk from Thailand were the United States, Australia, the United Kingdom, the Netherlands, and Canada, respectively. While other exported coconut

products, such as young coconuts (coconut fruits) and copra, had an export value of over 4,000 million baht in 2018. The countries importing such coconut products were China and the United States. (Ministry of Agriculture and Cooperatives, 2017; Office of the Permanent Secretary, Ministry of Commerce, 2019).

It was found that the production of coconut in Thailand in the past ten years (2009 - 2018) had continuously decreased. Thailand used to have an area of about 160,000 hectare of coconut production (with 972,876 tons) in 2009, reduced to 121,600 hectare of coconut production (with 857,298 tons) in 2018, due to farmers fell the coconut trees to grow other economic crops providing higher returns than coconut plantations such as fruit trees, rubber trees, and oil palm trees, including a severe outbreak of plant pathology and coconut pests, namely coconut rhinoceros beetle, Asiatic palm weevil, coconut hispine beetle and coconut black-headed caterpillar. Moreover, the domestic coconut prices are changeable and do not encourage farmers to return to grow coconuts to replace old or expired coconuts for production. While the imported coconuts are cheaper than those in the country as well as the entrepreneurs like to import coconuts from abroad. Almost coconuts are imported from Indonesia in order to respond to household demand and to be used as important raw materials in the food processing industry as various kinds of products such as instant coconut milk and copra products including further export to the trading partner countries of Thailand to bring revenue into the country (Kasetkaoklai, 2016; Ministry of Agriculture and Cooperatives, 2017; Na Nakorn, 2018).

For this reason, the Ministry of Agriculture and Cooperatives has realized the importance of coconuts by establishing coconut strategy for industry 2018 - 2036 with the objectives to: (1) produce coconuts in sufficient quantity and quality to meet consumer demand, (2) develop the potential of farmers to be able to produce coconuts, reduce production costs as well as prevent and eliminate coconut pests, (3) develop a group of farmers to be strong and able to stand on their own abilities, and (4) promote the processing of various coconut products as well as create trading opportunities and value-added in coconut products. However, the success of coconut strategy for industry requires cooperation from all sectors, especially the farmers themselves considered the significant primary production source of coconut supply chains. On the contrary, it is found that the current income that farmers receive from coconut plantation still does not motivate them to turn to grow more coconuts, due to the fluctuation of coconut prices in the country results in a risk of the coconut plantation of farmers. Therefore, this research aims to study factors that influence coconut prices in Thailand. Regarding the research works of literature, there were not any studies relating to this matter before. This research results will benefit farmers, entrepreneurs, public and private sectors regarding production planning, marketing, import-export of coconuts resulting in an appropriate market balance between producers and business units, including industrial sectors involved in the production, processing, import-export of coconuts and coconut products.

2. Research Methodology

The data used is a monthly time series starting from January 2008 until August 2019 with a total of 140 samples. The variables used in this study consisted of (1) the domestic price of coconut (P_{DC}) using the price index at the farm-gate price of domestic coconut (2005 = 100), (2) the domestic production of coconuts (Q_{DC}) using the production index of domestic coconut (2005 = 100), (3) the world market price of coconut (P_{WC}) using the coconut oil price in the world market (Unit: US\$/ton), (4) the Thai currency using the real effective exchange rate (REER) with higher REER means Thai Baht had appreciated, and (5) the consumer price index (CPI_{PF}) using the consumer price index in the processed food category. However, the sources of the variables are obtained: P_{DC} and Q_{DC} from the

Office of Agricultural Economics under the Ministry of Agriculture and Cooperatives of Thailand, P_{WC} from the World Bank, REER from the Bank of Thailand, and CPI_{PF} from the Trade Policy and Strategy Office under the Ministry of Commerce of Thailand. All the variable has been transformed to the logarithmic form for the advantage of explanation in elasticity or percentage change. The relationship between dependent and independent variables can be explained as follows:

The function form of the relationship between the variables:

$$P_{DC,t} = f(Q_{DC,t}, P_{WC,t}, REER_t, CPI_{PF,t}) \quad (1)$$

The multiple regression model in logarithmic form:

$$L(P_{DC,t}) = \alpha_0 + \beta_1 L(Q_{DC,t}) + \beta_2 L(P_{WC,t}) + \beta_3 L(REER_t) + \beta_4 L(CPI_{PF,t}) + \varepsilon_t \quad (2)$$

Determining α_0 refers to the constant term, β refers to the regression coefficient of independent variables, t refers to the time and ε refers to the error term.

Equation (1) and (2) are the function and the multiple regression model between dependent and independent variables. The estimator of the regression coefficient is the ordinary least squares (OLS). However, the assumption of estimated coefficient with the OLS method for time series analysis must not violate three important conditions, namely, (1) multicollinearity considering from statistical value of variance inflation factors (VIF), (2) autocorrelation considering from D.W. statistics, and (3) heteroskedasticity considering from χ^2 statistics of White's test. However, if the estimation of multiple regression model violates the above conditions, the problem should be fixed before interpretation. Otherwise, the results obtained will not meet the conditions for estimating the best linear unbiased estimator (BLUE) (Gujarati and Porter, 2009; Wooldridge, 2014).

3. Empirical Results

In order to perform the multiple regression with time series analysis, there are three conditions to consider, namely, multicollinearity, autocorrelation, and heteroskedasticity to obtain the analysis results consistent with the conditions of estimation with the BLUE. The investigation process consists of the following details. According to the investigation of multicollinearity in the multiple regression model, it is found no problem of multicollinearity because the VIF statistics of all independent variables are less than 10. That is to say, VIF statistics of $L(Q_{DC})$ is equal to 2.195, $L(P_{WC})$ is equal to 1.170, $L(REER)$ is equal to 2.062, and $L(CPI_{PF})$ is equal to 3.284. For autocorrelation, it is found that the estimation of the multiple regression model has a problem of autocorrelation because the D.W. statistics does not approach 2.0 (D.W. is equal to 0.185.). Therefore, the autocorrelation should be fixed by the HAC robust S.E. method (Cottrell and Lucchetti, 2019). Turning to heteroskedasticity, it is found that the estimation of the multiple regression model has a problem of heteroskedasticity based on the results from the White's test method that presents the χ^2 statistics equal to 35.792 (p-value is equal to 0.001). That is to say, it rejects the null hypothesis (H_0) specifying the model has no heteroskedasticity or homoskedasticity. Therefore, the heteroskedasticity is fixed by HAC robust S.E. method. (Cottrell and Lucchetti, 2019). After investigating the three hypothesizes and fixing various problems occurred, then using the coefficient estimation results to present in Table 1 as follows.

Table 1 The estimation results of multiple regression model

Variable	Coefficient	S.E.	t-ratio	p-value
Constant	1.271	3.714	0.342	0.732
L(Q _{DC})	-0.026	0.115	-0.231	0.817
L(P _{WC})	0.886	0.113	7.820	<0.001
L(REER)	-3.115	0.921	-3.382	<0.001
L(CPI _{PF})	2.713	0.361	7.504	<0.001

VIF (L(Q_{DC}) = 2.195, L(P_{WC}) = 1.170, L(REER) = 2.062, L(CPI_{PF}) = 3.284)

The estimated coefficients of the multiple regression equation are presented below.

$$L(\hat{P}_{DC,t}) = 1.271 - 0.026L(Q_{DC,t}) + 0.886L(P_{WC,t}) - 3.115L(REER_t) + 2.713L(CPI_{PF,t})$$

$$S.E. \quad (3.714) \quad (0.115) \quad (0.113)^* \quad (0.921)^* \quad (0.361)^*$$

$$R\text{-squared } (R^2) = 0.694$$

$$F_{4,135} = 42.995 \text{ (p-value} = <0.001)$$

* denotes the statistical significance at level 0.01.

Referring to Table 1, the results of factors influencing the determination of coconut prices in Thailand include the world market price of coconut (P_{WC}), Thai currency (REER), and the consumer price index (CPI_{PF}). The details can be explained as follows.

When the world market price of coconut increases by one percent, resulting in the domestic price of coconut increases by 0.886 percent with statistical significance at level 0.01. While Thai currency (REER) is appreciated by one percent, resulting in the domestic price of coconut drops by 3.115 percent with statistical significance at level 0.01. Lastly, when the consumer price index increases by one percent, resulting in the domestic price of coconut increases by 2.713 percent with statistical significance at level 0.01. However, the independent variables or the model used for the analysis can predict the domestic price of coconut by 69.412 percent, as for the remaining 30.588 percent is due to other factors which are not included in the model.

4. Concluding Remarks

The purpose of this research is to analyze the factors influencing coconut price in Thailand using a monthly time series using the multiple regression method. The independent variables used in this study, namely, the domestic production of coconuts, the world market price of coconut, the Thai currency, and the consumer price index. The result is found that the factors influencing the determination of coconut prices in Thailand considering the size of the highest impact consist of the Thai currency (3.115), followed by the consumer price index (2.713) and the world market price of coconut (0.886), respectively. The reason for the Thai currency is a factor influencing the determination of domestic coconut prices with the highest impact due to the fact that Thailand still has to import a lot of coconuts from foreign countries. Therefore, if the Thai currency is appreciated in overall, it will result in the cheaper price of imported coconut from abroad. Comparing with coconut imported from foreign countries may increase which directly affect the domestic price of coconut being on a downward trend according to the demand and supply mechanism of the market. As for the production of coconuts in the country, it does not influence the determination of the domestic price of coconut which is consistent with the reason of the Thai currency. That is to say, Thailand still does not produce enough coconuts to meet domestic demand, especially as raw material for processing coconuts into a variety of products, to export to the trading partner countries

of Thailand which is likely to continuously expand. Therefore, Thailand has to import coconuts from abroad continuously. For this reason, the amount of coconut production in Thailand is not significant to the determination of coconut prices in the country.

The suggestion is that the government or related stakeholders should manage the demand and supply of the coconut market appropriately, especially during the appreciated of Thai currency, the entrepreneurs may import more coconuts from foreign countries, which directly affect the domestic price of coconut, resulting in the domestic price of coconut to tend to decrease and finally affecting the low income of the coconut farmers. However, regarding the literature, it is found that Thailand still has strengths in the production of coconuts comparing to competing countries such as Indonesia, Philippines, India, etc. That is to say, the coconut grown in Thailand is a good coconut species. It has a production period throughout the year. A coconut tree can be harvested for up to 60 years. It can be utilized and created value-added from all parts of the coconut, such as coconut fruits, coconut leaves, coconut peel, coconut shell, coconut trunk, and so on. In addition, the demand for coconuts and coconut products both domestic and the world market is likely to increase continuously. Therefore, the government should promote and support the coconut plantation for farmers in terms of production technology and disease prevention and pest control system in order to raise the efficiency of domestic coconut production both in quantity and quality, resulting in the higher competitiveness of Thailand and persuade farmers to return to grow more coconuts instead of other crops. Besides, the government should manage the demand and supply of the domestic coconut market in accordance with the demand for coconuts in the household and coconut processing industry for export without affecting the price and income of coconut farmers in Thailand.

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