KU 건국대학교 KONKUK UNIV.

Prediction and Analysis of Daepa price

Subject:	**Agricultural Price Analysis**
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Contents

1. Introduction

Daepa holds a significant position in the South Korean market due to its popularity and versatile usage in various culinary dishes. Daepa belongs to the Allium family and shares similarities with scallions and other onion-like vegetables.
Over the past years, daepa has witnessed both stability and fluctuations in its market conditions. To understand the price behavior of daepa, we will analyze the marketing trend of this commodity.

In recent years, the demand for daepa has shown steady growth in the South Korean market. Firstly, the increasing popularity of Korean cuisine globally has led to a rise in demand for authentic ingredients, including daepa. Additionally, the health benefits associated with daepa have contributed to its market growth (antioxidant content, vitamins, minerals). Also, as the price of daepa rose, new words such as Pa-tech and DaepaCoin were also occurred. This means that instead of buying daepas, consumers are saving money by growing daepa themselves.

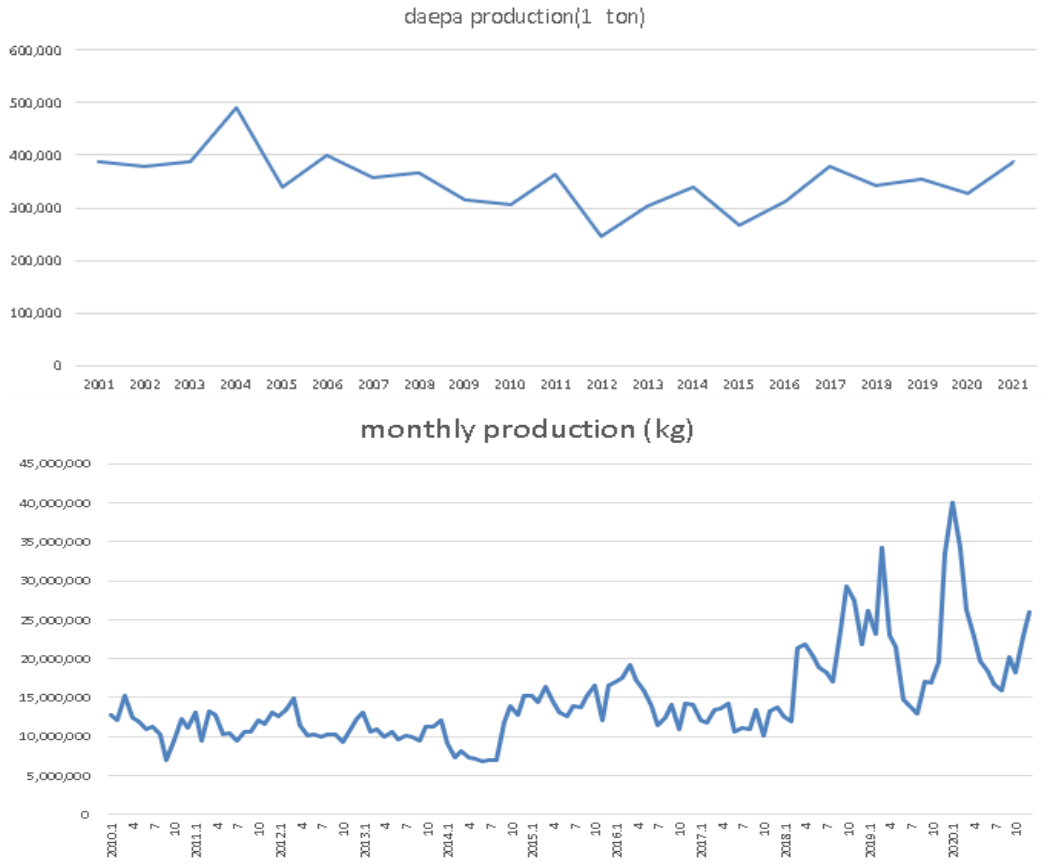
Daepa has also faced certain challenges in the market: fluctuations in supply due to seasonal variations and weather conditions have influenced the price dynamics of this commodity. Factors such as crop failures or variations in production volumes can cause price fluctuations in the short term.

Overall, the price behavior of daepa in the most recent marketing year has been influenced by the growing demand for Korean cuisine, supply-side factors, and the dynamics of substitute goods in the market. Analyzing these factors through regression analysis will provide further insights into the price behavior of daepa and its market conditions in South Korea.

2. Variables and Data

To analyze the price of daepas, variables were set based on the supply model. In the annual data analysis, the daepa price was set as a dependent variable, and the daepa production, the price of scallions expected to be a competitive goods, GDP per capita (economic growth) and the trend were set as independent variables. Also, in monthly data analysis, the daepa price was set as a dependent variable, and the daepa production, the price of scallions expected to be a competitive goods, CLI (composite leading index) as economic growth, trend, and dummy variables.

1) Daepa production

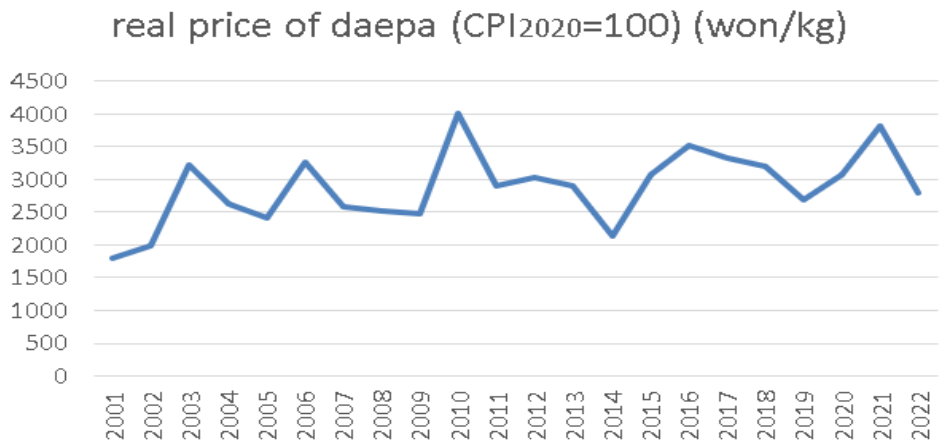


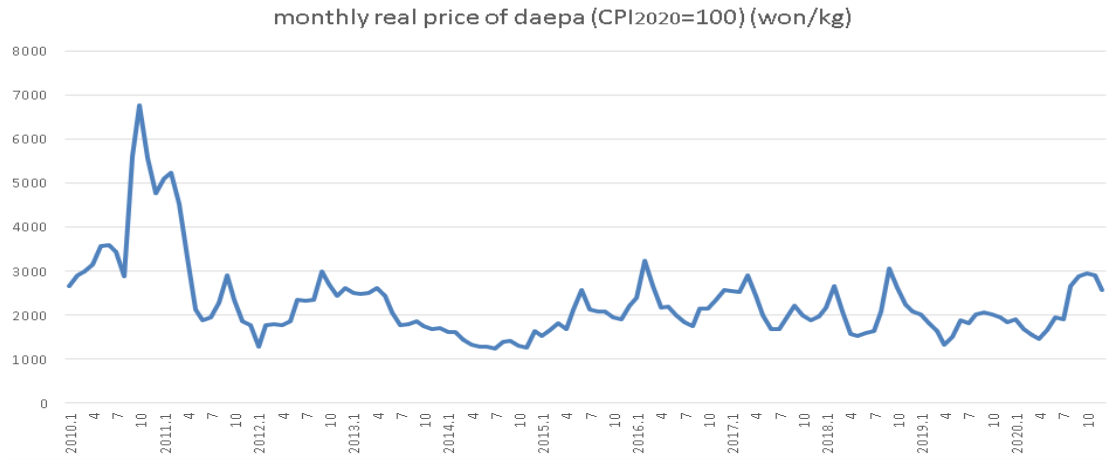
Data source: KOSIS's annual daepa production data and OASIS's monthly daepa production data

2) Price of daepa

Data source: AT KAMIS's annual and monthly retail price data for the price of daepa

The price will be converted to real prices based on CPI (2020).





3) Price of scallion
Data source: AT KAMIS's annual and monthly retail price data for the price of scallion
The price will be converted to real prices based on CPI (2020).

4) Economic growth:
Data source: KOSIS's GDP per capita (unit:10,000won) and KOSIS's CLI (composite leading indicator)

The Composite Leading Index (CLI) is an economic indicator that is used to predict the future direction of economic activity in a country or region. It is designed to provide early signals of the economic flow in three to six months.

3. Regression

We conduct the regression analysis by dividing it into a long-term supply model using yearly data and a Short-term supply model using monthly data.

3.1 Long-term Inverse Supply Model

$$P = b_0 + b_1 Q + b_2 P_s + b_3 E + t + t^2 + e$$

P: Price of daepa (won/kg), b0: intercept, Q: supply consumption of daepa (1 ton),
Ps: price of scallions (competitive goods) (won/kg), E: GDP per capita (10,000won), economic growth, t: trend

We analyzed which model was the best model through regression analysis with the trend variables in several orders, and finally decided to make the trend variable second.

3.1.1 The Regression result of Long-term inverse supply model

Long term Inverse Supply Model (2001~2020)

요약 출력

회귀분석 통계량	
다중 상관계수	0.86076
결정계수	0.74091
조정된 결정계수	0.64838
표준 오차	319.548
관측수	20

분산 분석

	자유도	제곱합	제곱 평균	F 비	유의한 F
회귀	5	4088088	817618	8.00713	0.00095
잔차	14	1429556	102111		
계	19	5517643			

	계수	표준 오차	t 통계량	P-값	하위 95%	상위 95%	하위 95.0%	상위 95.0%
Y 절편	-3135	2509.23	-1.2494	0.23201	-8516.7	2246.78	-8516.7	2246.78
production(1 ton)	0.00038	0.00179	0.21092	0.83599	-0.0035	0.00422	-0.0035	0.00422
쪽파(scaliion real price)	0.4408	0.09574	4.60397	0.00041	0.23545	0.64615	0.23545	0.64615
GDP per capita, Econominc growth	2.25862	1.7071	1.32307	0.20702	-1.4028	5.91999	-1.4028	5.91999
t	-237.01	231.636	-1.0232	0.32357	-733.82	259.803	-733.82	259.803
t^2	-2.3702	2.73161	-0.8677	0.4002	-8.2289	3.48857	-8.2289	3.48857

Long term Inverse Supply Model (2001~2020)

$$P = -3135 + 0.00038Q + 0.4408P_s + 2.2586E - 237.01t - 2.3708t^2 + e$$
$$(2509.23)\ (0.00179)\ (0.09574)\ \ (1.7071)\ \ (231.636)\ \ (2.73161)$$

To understand the change in the price of Daepa in the long-term supply model, the model was set with Daepa production, price of scallion, GDP Per Capita representing economic growth, and trend variables as independent variables.
The analysis of results are as follows.

Result of Regression Analysis

- The coefficient of y-intercept is not significant because the p-value of intercept is greater than 0.05.
- The coefficient of production of Daepa is not significant because the p-value of the production is greater than 0.05.
- The price of Scallion has a significant coefficient because the p-value value is less than 0.05. When the price of scallion increases by 1 won/kg, the price of daepas increases by 0.4408 won/kg.
- The coefficient of GDP per capita is not significant because the p-value value of GDP per capita has a value greater than 0.05.
- T and T^2 have p-values greater than 0.05, so the coefficient is not significant.

We also conducted regression analysis using data from 2001 to 2019. The reason will be explained in the price forecast stage.

Long term Inverse Supply Model (2001~2019)

요약 출력								
회귀분석 통계량								
다중 상관	0.85924							
결정계수	0.73829							
조정된 결	0.63763							
표준 오차	331.528							
관측수	19							
분산 분석								
	자유도	제곱합	제곱 평균	F 비	유의한 F			
회귀	5	4030769	806154	7.33461	0.00181			
잔차	13	1428842	109911					
계	18	5459611						
	계수	표준 오차	t 통계량	P-값	하위 95%	상위 95%	하위 95.0%	상위 95.0%
Y 절편	-2910.6	3812.64	-0.7634	0.45886	-11147	5326.15	-11147	5326.15
t	-219.34	325.341	-0.6742	0.512	-922.2	483.516	-922.2	483.516
t^2	-2.2003	3.53193	-0.623	0.54407	-9.8306	5.42994	-9.8306	5.42994
GDP per c	2.09589	2.68638	0.78019	0.44925	-3.7077	7.89946	-3.7077	7.89946
폭파(scalii	0.44593	0.11795	3.78069	0.00229	0.19111	0.70074	0.19111	0.70074
productio	0.00038	0.00186	0.2034	0.84197	-0.0036	0.00439	-0.0036	0.00439

Long term Inverse Supply Model (2001~2019)

$$P = -2910.6 + 0.00038Q + 0.4459P_s + 2.0959E - 219.34t - 2.2t^2 + e$$
(3812.64) (0.00186) (0.11795) (2.68638) (325.34) (3.532)

3.1.2 Results of Regression Analysis

- The coefficient of intercept is not significant because the p-value of the intercept is greater than 0.05.
- The coefficient of production of Daepa is not significant because the p-value of the production is greater than 0.05.
- The price of Scallion has a significant coefficient because the p-value value is less than 0.05. When the price of scallion increases by 1 won/kg, the price of daepa increases by 0.44593 won/kg.
- The coefficient of GDP per capita is not significant because the p-value value of GDP per capita has a value greater than 0.05.
- T and T^2 have p-values greater than 0.05, so the coefficient is not significant.

3.2 Short-term inverse Supply Model

$$P = b_0 + b_1Q + b_2P_s + b_3E + b_4t + a_1D_1 + \cdots + a_{11}D_{11} + e$$

P: Price of daepa (won/kg), b0: intercept, Q: supply consumption of daepa(1kg),
Ps: price of scallions (which is competitive goods of daepas) (won/kg), t: trend
D: dummy variables (0 or 1)

To understand the price change of daepas in the supply model, the model was set with the price of daepa as dependent variables, daepas' production, scallions' price, economic leading index (CLI) indicating economic growth, trend variables, and dummy variables as independent variables.

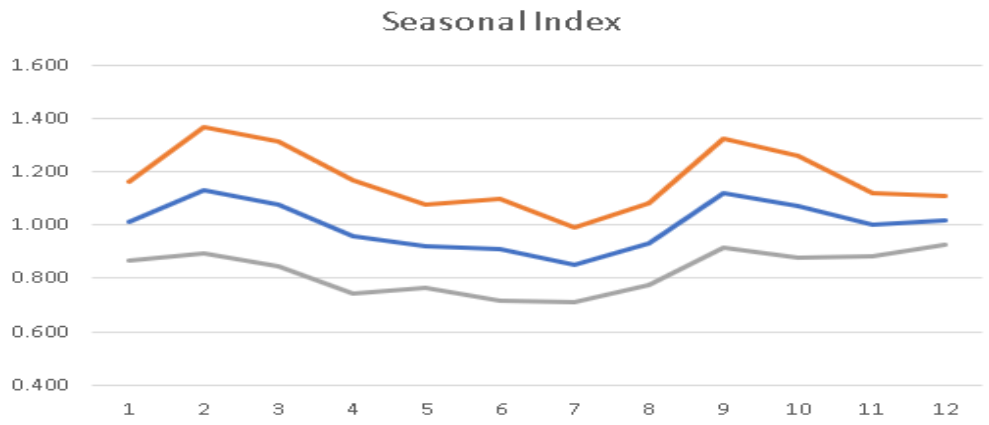
In this model, the presence or absence of seasonality of daepa prices will be identified, and for this purpose, a monthly seasonality analysis from 2010 to 2020 will be conducted.

3.2.1 Seasonal Index

First, we will get AT KAMIS's monthly price data (real price converted using CPI). The seasonality index was calculated using the CMA(12) method. The seasonality index indicates

the degree of variation in prices from the average for each month. Based on all of this, we're going to see which month shows the highest price and which month shows lowest price.

Seasonality Price index													
year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2010	0,886	0,963	0,956	0,919	0,965	0,916	0,834	0,669	1,263	1,493	1,236	1,092	
2011	1,219	1,281	1,147	0,903	0,637	0,615	0,700	0,931	1,313	1,152	0,941	0,901	
2012	0,636	0,872	0,888	0,865	0,885	1,090	1,031	1,012	1,263	1,105	0,975	1,036	
2013	1,016	1,027	1,062	1,147	1,103	0,958	0,857	0,908	0,983	0,971	0,977	1,044	
2014	1,028	1,056	0,965	0,916	0,900	0,915	0,891	0,992	1,000	0,903	0,846	1,034	
2015	0,916	0,958	1,009	0,906	1,113	1,320	1,058	0,983	0,936	0,854	0,824	0,976	
2016	1,067	1,468	1,207	0,985	0,980	0,876	0,801	0,763	0,955	0,944	1,027	1,139	
2017	1,148	1,134	1,291	1,084	0,902	0,768	0,790	0,934	1,060	0,988	0,946	1,010	
2018	1,110	1,376	1,047	0,765	0,737	0,752	0,777	1,015	1,538	1,330	1,133	1,046	
2019	1,001	0,907	0,829	0,703	0,818	1,031	0,991	1,111	1,146	1,118	1,075	1,010	
2020	1,048	0,902	0,811	0,732	0,795	0,908	0,853	1,103	1,071	0,989	0,917	0,794	
2021	1,020	1,538	1,655	1,477	1,151	0,669	0,559	0,655	0,794	0,893	1,044	1,052	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
average	1,008	1,123	1,072	0,950	0,916	0,902	0,845	0,923	1,110	1,062	0,995	1,011	11,917
adjusted (SI)	1,015	1,131	1,080	0,957	0,922	0,908	0,851	0,929	1,118	1,069	1,002	1,018	12,000
stdev	0,148	0,234	0,234	0,212	0,157	0,193	0,140	0,152	0,204	0,191	0,117	0,090	
index+sd	1,163	1,366	1,314	1,168	1,079	1,100	0,991	1,082	1,322	1,260	1,119	1,108	
index-sd	0,867	0,897	0,846	0,745	0,765	0,715	0,711	0,777	0,914	0,878	0,885	0,929	



According to the seasonal index, the highest value is 1.131 in February and the lowest value is 0.851 in July. Therefore, February prices are 13% higher than average prices and July prices are 15% lowest than average prices.

Now, let's identify the months that are considered the harvest months. We can assume based on the lower seasonality index values. Typically, harvest months have lower price fluctuations as the supply increases. From the data, we can infer that the harvest months are June, July, and August.

3.2.2 Result of Regression Analysis

회귀분석 통계량	
다중 상관	0.814584197
결정계수	0.663547413
조정된 결	0.620040613
표준 오차	561.3077485
관측수	132

분산 분석

	자유도	제곱합	제곱 평균	F 비	유의한 F
회귀	15	72078900.46	4805260.03	15.25157937	6.22588E-21
잔차	116	36547701.07	315066.389		
계	131	108626601.5			

	계수	표준 오차	t 통계량	P-값	하위 95%	상위 95%	하위 95.0%	상위 95.0%
Y 절편	-20057.39289	3199.518096	-6.2688793	6.42257E-09	-26394.44162	-13720.34415	-26394.44162	-13720.34415
productio	7.20969E-06	1.24069E-05	0.58110398	0.562297759	-1.73637E-05	3.17831E-05	-1.73637E-05	3.17831E-05
scallion pr	0.367388199	0.041853919	8.77786858	1.70778E-14	0.284491239	0.450285159	0.284491239	0.450285159
CLI	307.6020086	48.005069	6.4076985	3.29033E-09	212.5219207	402.6820965	212.5219207	402.6820965
t	-87.29791231	12.0563735	-7.2408102	5.25694E-11	-111.1770792	-63.41874546	-111.1770792	-63.41874546
D1	-548.7614705	244.2460514	-2.2467568	0.026547646	-1032.521551	-65.00139013	-1032.521551	-65.00139013
D2	-334.2257038	243.9102124	-1.3702817	0.173245076	-817.3206126	148.8692051	-817.3206126	148.8692051
D3	57.51652141	240.8702774	0.2387863	0.811692644	-419.5574133	534.5904561	-419.5574133	534.5904561
D4	148.7488632	246.4238568	0.60363012	0.547268158	-339.3246353	636.8223617	-339.3246353	636.8223617
D5	-82.67937588	243.2603679	-0.3398802	0.734561411	-564.4871859	399.1284342	-564.4871859	399.1284342
D6	-253.6184001	244.8031247	-1.0360097	0.302352526	-738.4818344	231.2450342	-738.4818344	231.2450342
D7	-638.872352	248.1971777	-2.5740516	0.011310673	-1130.458136	-147.2865681	-1130.458136	-147.2865681
D8	-428.3308924	248.1459	-1.7261252	0.086987365	-919.8151144	63.15332963	-919.8151144	63.15332963
D9	-25.18253808	245.6736948	-0.102504	0.918533621	-511.7702462	461.40517	-511.7702462	461.40517
D10	355.5645435	241.7152243	1.47100599	0.143997027	-123.1829151	834.312002	-123.1829151	834.312002
D11	344.2969108	242.9032488	1.41742407	0.159039411	-136.8035798	825.3974014	-136.8035798	825.3974014

Regression analysis was conducted using the production of daepas, the price of scallions, trend variables, economic growth, and dummy variables as independent variables to confirm whether the values obtained from the seasonal index were significant.

The results are as follows:

$$P = -200057.4 + 0.000007Q + 0.3674P_s + 307.6E - 87.3t - 548.76D_1$$
$$(3199.51)\quad (1.24.7E-05)\quad (0.0419)\quad (18.005)\quad (12.06)\quad (244.25)$$
$$-334.23D_2 + 57.517D_3 + 148.749D_4 - 82.679D_5 - 253.62D_6 - 638.87D_7$$
$$(243.91)\quad (240.87)\quad (246.42)\quad (243.26)\quad (244.8)\quad (248.19)$$
$$-428.33D_8 - 25.182D_9 + 355.56D_{10} + 344.297D_{11} + e$$
$$(248.15)\quad (245.67)\quad (241.72)\quad (242.90)$$

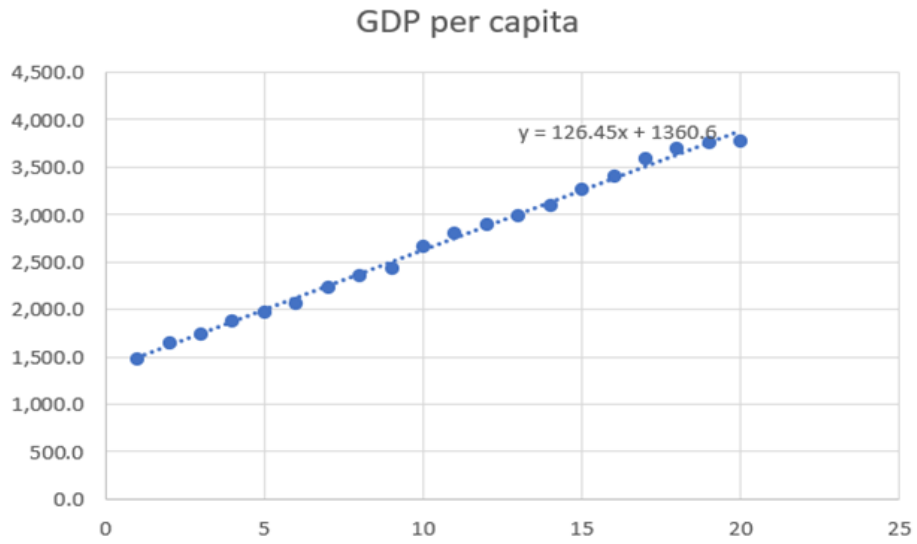
As a result of the regression analysis, it was found that the y-intercept, scallions' price, economic growth, trend variables, and D1 and D7 were statistically significant.

- According to the regression analysis of the monthly supply model, the P-value of the scallion's price, which is a competitive product of daepas, is 1.70778E-14, which is statistically significant at the 99% confidence level. That is, when the price of scallions increases by 1 won/kg, the price of daepas increases by about 0.3674 won/kg.
- The p-value of the CLI, which means economic growth, is 3.29033E-09, showing a significant value at the 99% confidence level. In other words, if the Composite Leading Indicators (CLI) increases by 1% compared to 2020, the price of daepas increases by 307.6 won/kg.
- The p-value of the trend variable is 5.25694E-11, which shows a significant value at the 99% confidence level. Likewise, Trend variable represents the monthly increase of the price of daepas. The price of daepas decreases by 87.298 won/kg as one month passes.
- Since D1 and D7 are significant for dummy variables, daepa prices show seasonality in January and July.

4. Forecasting price

4.1 Long-term Price Forecast

To predict the Daepa price, the average value was used for variable of production and price of scallion, and the GDP Per Capita (Economic Growth), and use the value of the trend variable.



Through the above equation (126.45X+ 1360.6), the GDP Per Capita value was obtained by puting on the X value for the year.

Daepa price prediction

The average was calculated by setting the period of 2016-2020 for the last five years and the period of 2001-2020 for the entire period to predict the Daepa price.

As a result of predicting the price of Daepa in 2021, the average of the last five years was calculated and put for the regression equation, and the total period was 2,676.38 won and 2,690.22 won. Considering that the actual price of Daepa in 2021 was 3807, the predicted price differed greatly from the actual price.

	Daepa real price	t	t^2	GDP Per Capita	scallion real price	production
2016~2020	2976.380197	20	400	4016.05	5896.639894	343421.4
2001~ 2020	2690.215346	20	400	4016.05	5243.257688	348317

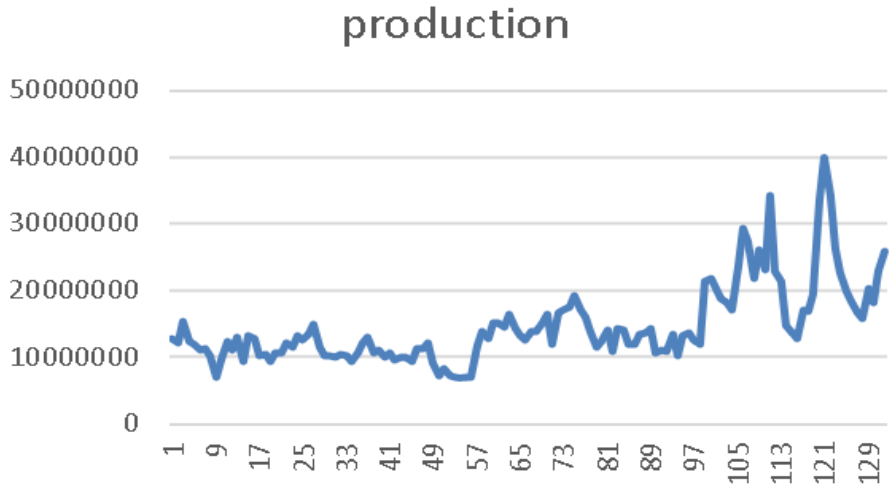
While doing research, we found that the price of Daepa in 2021 was quite high compared to other years. Therefore, we estimated Daepa price by calculating the average by setting the period from 2015 to 2019 for the last five years and the period from 2001 to 2019 for the entire period.

As a result of the prediction, significant results were obtained as the difference between the actual price of Daepa in 2020 and the price of Daepa as a result of substitution was small. In fact, the price of Daepa in 2020 was 3070 won, the price of Daepa in the entire period was 2717.26 won, the average for the last five years was 2904.55 won.

	Daepa real price	t	t^2	GDP Per Capita	scallion real price	production
대파 가격(2001~2019)	2717.263462	19	361	3889.6	5170.113356	349466.8
대파 가격(2015~2019)	2904.5492	19	361	3889.6	5605.238764	331595.8

4.2 Short-term Price Forecast

Since data from January 2010 to December 2020 were used, the price was predicted in July 2021. Data from January 2010 to December 2020 will predict prices for July 2021.



As you can see from the graph, the price of daepas has risen and fallen significantly over the past three years. Therefore, for price prediction, the future price is derived by the average production volume over the past three years and past ten years, the average price of scallion over the past three years and ten years, the CLI forecast value of July 2021, and the t value of July 2021.

In other words, two methods were used: the method of using the average from 2010 to 2020 and the method of using the average from 2018 to 2020.

The CLI (composite leading indicator) that represents economic growth is an indicator of the economic flow in three to six months, and if the index rises from the previous month, it means an economic rise and if it falls, it means an economic downturn, so the CLI value could be substituted into the equation without prediction.

In July, the value of all dummy variables except D7 is 0, so only D7 is included of the 11 dummy variables. And the t value in July 2021 was 138, so it was substituted into the equation.

	Daepa real price	production(kg)	scallion real price	CLI(Economic growth)	t	D7
2010~2020	2462.514188	14643789.89	5785.1037	107.2	138	-638.372
2018~2020	2500.616293	21700620.08	5750.33	107.2	138	-638.372

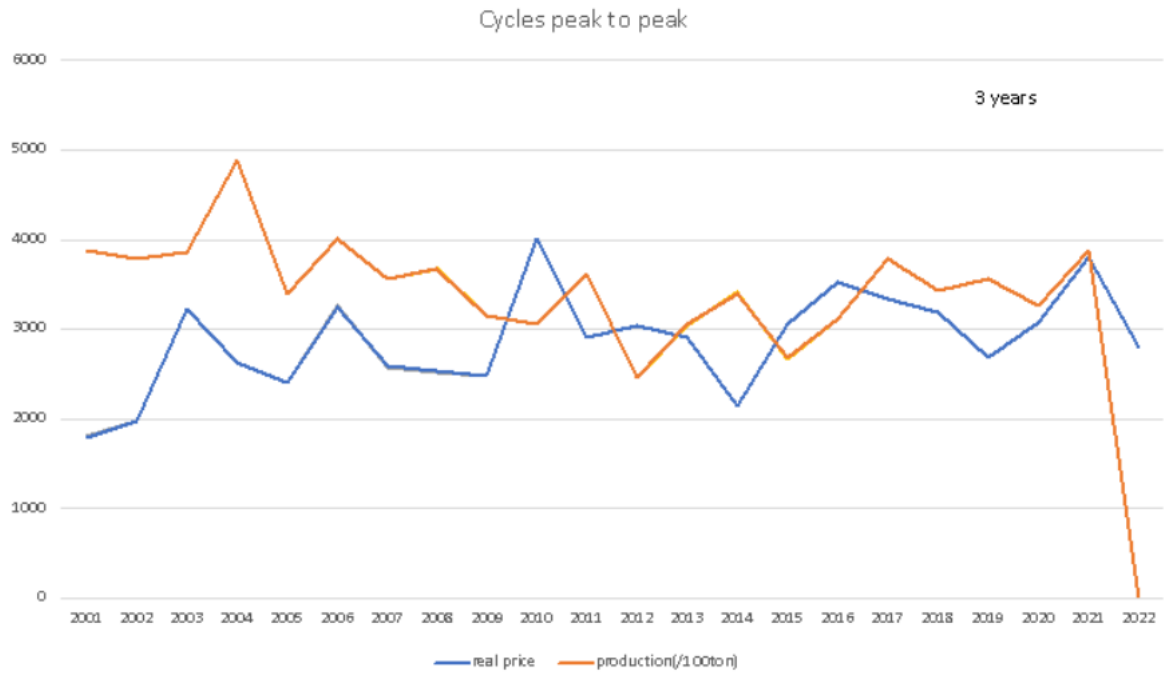
The estimated price of daepas obtained using the average from 2010 to 2020 was 2,462.5 won/kg, and the estimated price of daepas obtained using the average from 2018 to 2020 was 2,500.6 won/kg. The actual daepa price in July 2021 was 2020.34 won/kg, which was less than the predicted price, and as much as 460 won/kg.

We think that this difference comes from a decrease in the production of daepas. The actual production of daepas in July 2021 was 8857396 kg, but the values substituted for price forecasts were 14643789 kg and 21700620kg. This unexpected decrease in the production of daepas was caused by the cold wave of the previous winter and the decrease in the cultivation area. In the previous year, unprecedented cold weather and heavy snow continued, causing enormous damage to daepa farmers, and the harvest of daepas was delayed. In addition, a year ago, the price of daepas plunged, causing farmers to plow daepa fields, which reduced the cultivation area of daepas, affecting daepa production in July 2021.

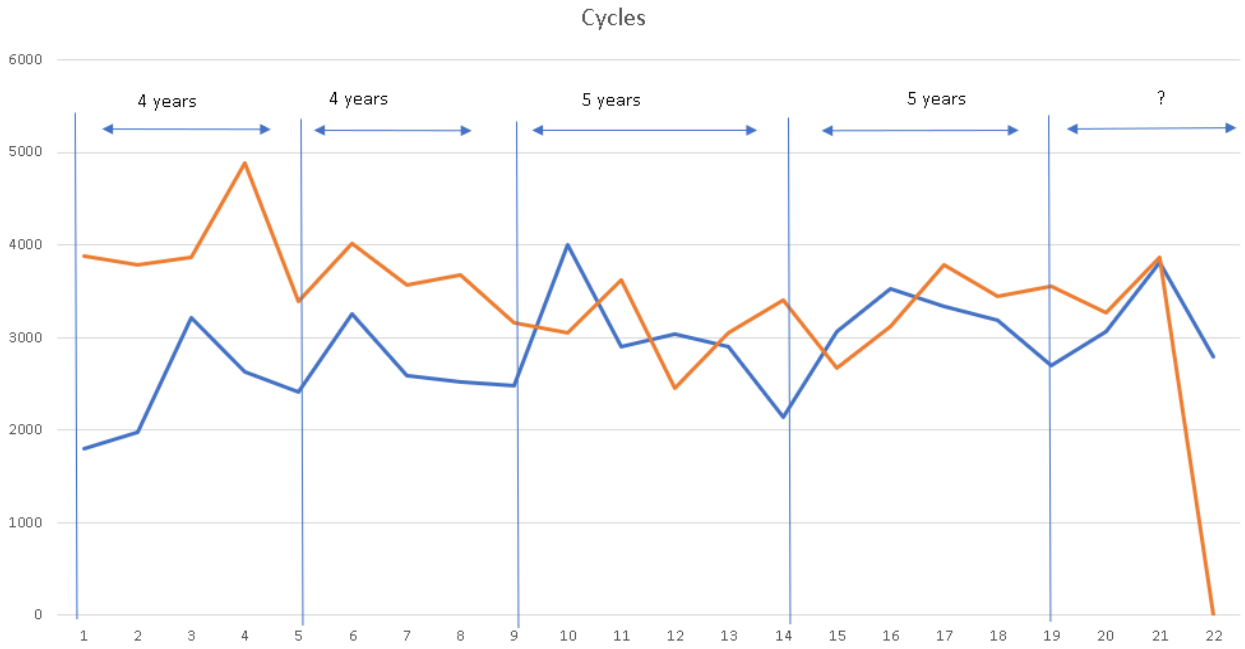
5. Cycle

5.1 Results

	Won per kg				Measuring Cycles: Trough to Trough					
			RP - CMA=	RP - CMA=	Deviations in Period					
year	Real Price	CMA3	DEV	DEV	1 (trough)	2	3	4	5	YEARS TO TAKE
2001	1797.044995									
2002	1979.743537	2331.768098	-352.024562	-352.024562	-352.024562					
2003	3218.515764	2608.686339	609.8294241	609.8294241		609.8294241				
2004	2627.799718	2751.050999	-123.251281	-123.251281			-123.251281			3
2005	2406.837515	2762.583016	-355.745501	-355.745501	-355.745501					
2006	3253.111815	2747.650503	505.461312	505.461312		505.461312				
2007	2583.002179	2786.70571	-203.703531	-203.703531			-203.703531			
2008	2524.003135	2529.053893	-5.05075815	-5.05075815				-5.05075815		4
2009	2480.156365	3003.346989	-523.190624	-523.190624	-523.190624					
2010	4005.881468	3128.809124	877.0723439	877.0723439		877.0723439				
2011	2900.389538	3312.455381	-412.065843	-412.065843			-412.065843			
2012	3031.095137	2944.441062	86.6540746	86.6540746				86.6540746		
2013	2901.838512	2689.281279	212.5572332	212.5572332					212.5572332	5
2014	2134.910187	2699.356667	-564.44648	-564.44648	-564.44648					
2015	3061.321302	2905.215055	156.1062472	156.1062472		156.1062472				
2016	3519.413675	3304.063587	215.350088	215.350088			215.350088			
2017	3331.455784	3345.999943	-14.5441596	-14.5441596				-14.5441596		
2018	3187.130372	3069.650904	117.4794674	117.4794674					117.4794674	5
2019	2690.366557	2982.498976	-292.132419	-292.132419	-292.132419					
2020	3070	3189.065275	-119.065275	117.4794674		117.4794674				
2021	3806.829268	3223.480582	583.3486862	583.3486862			583.3486862			3
2022	2793.612478									
				average	-417.507917	453.1897589	11.93562404	22.35305228		4



Cycles (peak to peak)



Cycles (trough to trough)

Based on the trough-to-trough analysis of the existing cycle in Daepa production and price, several observations can be made:

Real Price Falls

In 2005, 2009, 2014, and 2019, there were significant declines in the real price of Daepa. These price falls indicate periods of decreased demand or increased supply, leading to downward pressure on prices. Potential economic and contextual factors contributing to these price falls could include global economic slowdowns, changes in consumer preferences, the availability of substitute goods, adverse weather conditions affecting supply, and specific government policies or regulations.

Peak in Production

The analysis reveals peaks in Daepa production in 2004, 2008, 2011, and 2017. These periods indicate increased supply and higher levels of production. Factors that may have contributed to these production peaks include favorable weather conditions, increased investment in Daepa farming techniques, response to higher prices in previous periods, or improved agricultural practices.

Average Cycle Duration

The average cycle duration observed in the analysis is approximately four years. This indicates a pattern of fluctuation in Daepa production and price, with peaks and troughs occurring roughly every four years. Understanding this cyclical pattern can help stakeholders, such as farmers, traders, and policymakers, anticipate and respond to changes in the Daepa market.

Deviations within Cycles

The analysis further provides insights into the deviations within the observed cycles. The first period (trough) shows a significant decrease in the real price of Daepa, averaging at -417.5 won/kg. The second period sees an average increase of 453.189 won/kg, indicating a recovery or growth phase in the Daepa market. The third period shows a relatively smaller increase of 11.9 won/kg, The fourth period exhibits a slightly larger increase of 22.35 won/kg.

Overall, this analysis suggests that various economic, historical, and contextual factors can explain the fluctuations in Daepa's price and production.

5.2 Historical and contextual factors that may explain the fluctuations

5.2.1 Real Price Fall in 2005

In 2005, several factors could have affected South Korea and influenced consumer preferences, trade liberalization and competition, government policies/regulations, the global economy, and weather conditions. Here are some notable events:

① Liberalization and Competition: Free Trade Agreement (FTA) Negotiations:

In 2005, South Korea was actively engaged in negotiating various FTAs. These agreements aimed to reduce trade barriers and promote market access. The evolving trade environment might have increased the competition faced by domestic agricultural producers, potentially impacting the real price of Daepa.

② Agricultural Subsidies and Support Programs:

The South Korean government implements policies and provides subsidies to support the agricultural sector. In 2005, there might have been changes in agricultural subsidies or support programs that influenced the production and pricing dynamics of Daepa.

③ Economic Recovery:

The global economy was recovering from the aftermath of the early 2000s dot-com bubble burst and subsequent economic slowdown. The recovery might have influenced consumer purchasing power and demand for agricultural commodities like Daepa.

④ Climate and Crop Yields:

Weather conditions, including rainfall patterns, temperatures, and natural disasters, can significantly impact agricultural production. In 2005, adverse weather conditions, such as droughts or heavy rains, could have affected the crop yields and supply of Daepa, potentially impacting its real price.

5.2.2 Peak in Production in 2008

The production of Daepa also peaked in 2008, with a notable increase compared to the previous year. This peak in production could be attributed to a delayed response to the increased prices observed in the previous period (2005-2007). Farmers may have ramped up production to take advantage of the higher prices.

5.2.3 Real price fall 2009

The global financial crisis in 2008 had a significant impact on the global economy, leading to a decrease in demand for many commodities, including Daepa. The fall in real prices in 2009 can be attributed to reduced demand amidst the economic downturn.

5.2.4 Real price fall 2014

In 2014, South Korea experienced several events and factors that could have influenced consumer preferences, trade liberalization and competition, and weather conditions. While the specific impact on Daepa is not available, here are some noteworthy events that occurred in South Korea during that period:

① Slowdown in Global Trade:

In 2014, the global economy experienced a slowdown, particularly in trade growth. This economic environment could have affected South Korea's export-oriented economy, potentially impacting the agricultural sector and Daepa exports.

② Trade Liberalization:

South Korea has been involved in various trade agreements that could have affected the availability and competition of agricultural goods. In 2014, South Korea was in the process of negotiating the Trans-Pacific Partnership (TPP), which aimed to liberalize trade among Pacific Rim countries. Although the TPP negotiations concluded in 2015, the potential anticipation or discussions surrounding the agreement could have influenced trade dynamics.

③ Weather Conditions:

Weather patterns and natural disasters can impact agricultural production. In 2014, South Korea experienced a severe drought that affected crop yields, particularly for rice. While the specific impact on Daepa is not documented, adverse weather conditions can have a cascading effect on overall agricultural production and supply, potentially influencing prices.

5.2.5 Price falls in 2019

In 2019, South Korea experienced several significant events and factors that could have influenced the price of daepa. Here are some noteworthy examples:

① Economic Slowdown: In 2019, the global economy experienced a slowdown due to various factors, including trade tensions and geopolitical uncertainties. A weaker global economy can affect export markets, trade flows, and overall consumer demand, potentially impacting South Korea's agricultural exports, including Daepa.

② Covid 19 outbreak.

6. Conclusion

The price of scallions was a common significant independent variable in the long-term inverse supply model and the short-term inverse supply model. It is predicted that the price of scallions will continue to increase, and at the same time, the price will continue to increase. In fact, as the price of daepas has recently increased, the government has also applied 0% quota tariffs to stabilize food prices and lower the burden of farm production. In the case of daepas, the fluctuation in production due to the weather is large. The decrease in production due to the winter cold wave acts as a factor in the price increase.

In the variables of this report, the price of daepas, the production of daepas, the price of scallions, economic growth, t, and dummy variables were used, and short-term and long-term prediction models were selected based on the variables set. In the long-term model, the average from 2001 to 2019 and the average from 2015 to 2019 were used, and 19 for t and 4016 for GDP per capita were put in the model. In the short-term model, a method of using the average of scallion prices and daepas production from 2010 to 2020 and a method of using the average of scallion prices and daepa production from 2018 to 2020 were used. Both methods used trend value of 138, a CLI value of 107.2, and a dummy variable of D7.

In the long-term model, an analysis based on data from 2001 to 2019 and 2015 to 2019 showed a difference of about 182.69 won/kg to as much as 367.75 won/kg when comparing the predicted price of daepas with the observed price. The reason why we used data from 2001 to 2019 instead of data from 2001 to 2020 is that in 2020, it showed unprecedented observations that were different from previous practices. We derived the reason as follows. The first thought to be a shortage of workers due to the departure of foreign workers due to COVID-19. The following is an article on the decline of foreign workers. The second reason was that the production of daepas decreased due to the summer rainy season in 2020. In addition, we think the cold wave in the previous winter has a great impact. Sinan and Jindo are Korea's representative daepa producers, considering that the unprecedented cold wave and heavy

snow damaged farms, which also affected them. Cold waves and heavy snow also affected the analysis of short-term models.

In the short-term model, there was a difference of about 165 won/kg to 353 won/kg when comparing the predicted price of daepas with the observed price. we think this was caused by an unexpected decrease in production of daepas. This is because daepa farmers suffered enormous damage due to unprecedented cold and heavy snow in the previous winter, and daepa production fell far from the previous three-year average due to the delayed harvest of daepas.

Through this study, variables were set to predict the price of daepas, long-term and short-term price prediction models were set through regression analysis, and seasonal index and cycle were also analyzed. we think the limitation of our report is that the small amount of data and the unexpected situation (COVID-19, weather) did not reflect the actual situation. When all variables that affect the price of daepas are reflected in the model and the number of data is sufficient, the price of daepas can be accurately predicted.

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