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A comparative analysis on the impact of COVID-19 towards selected fresh food price in Malaysia

(Analisis perbandingan impak COVID-19 ke atas harga makanan segar terpilih di Malaysia)

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Abstract

The COVID-19 pandemic adversely impacted Malaysia's economic growth, as well as the price of fresh food. The impact of COVID-19 on selected fresh food prices in Malaysia during the Movement Control Order (MCO) phases had been analysed. The objective of this study was to investigate any significant difference in price changes after MCO implementation on fresh food items. The samples were collected from 40 local and imported items. The prices of these items were recorded daily during the phases of the Movement Control Order. A paired t-test was carried out to analyse the differences between the mean price of the selected items during pre-MCO and RMCO. Besides that, this study intended to evaluate the effect of price difference in every phase of MCO by using analysis of variance (ANOVA) followed by a specific comparison method and the price differences between regions. About 35% of fresh food items were sold at higher prices than in the pre-MCO period. Celery had the highest price increment, while all types of shallots showed the most significant price drop. In total, there was 27 fresh food items that fluctuated in price, most of which revealed a price rise during the 2nd and 4 phases of MCO. Eight items were volatile in price based on standard deviation values, and all items had different prices between regions. The highest price was frequently observed in Sabah and Sarawak. The government should implement measures to maintain the price of local and imported fresh food for consumers. Although the prices of these items were relatively stable during these phases, price monitoring should be done regularly to encourage producers to produce and market their products consistently.

Introduction

The ongoing rapidly expanded COVID-19 disease has driven an uncertain economic situation worldwide. Food crisis usually follows suit a pandemic disease like the COVID-19 due to the disruption of food supply chain and farming activities, unemployment, and income loss (Tse et al. 2006; Kuwono 2014). FAO (2020) highlighted that COVID-19 could have created a crisis within a crisis when the most vulnerable communities or groups have difficulties getting or paying for food. As a result, many government have implemented interventions to reduce the impact of COVID-19, including mask-wearing, school closures, social distancing and lockdowns.

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Recent researches evaluated the effects of COVID-19 on the food supply chain (Hobbs 2020; Kumar et al. 2020; Nicola et al. 2020; Pu and Zhong 2020; Yu et al. 2020; Siddiquei and Khan 2020;). A study by Pu and Zhong (2020) argued that unreasonable movement control order (MCO) would have blocked the marketing channels of agricultural products, thus reducing the production capacity and cycles. Effective logistics specifically for agricultural products and promoting alternative marketing methods such as e-commerce should be practised to ensure an undisrupted supply of farm inputs and food products sales. Kumar et al. (2020) also agreed to embark on digital solutions to connect farmers to markets to overcome vulnerabilities in agricultural supply chains caused by COVID-19. Lockdown that has kept people 'stay at home' has led to a price hoarding of perishable food items (Siddiquei and Khan 2020).

On the contrary, Ali and Khan (2020) found that only perishable fresh fruits and vegetables with high water content significantly declined in wholesale price while others have gained based on t-test analysis conducted. An increase in the retail price of essential food items due to the closure of dine-in restaurants and other agricultural distributors has forced them to shift supplies to the end consumers (Richards and Rickard 2020). The consumers' panic-buying behaviours and the change in consumption patterns have led to demand-side shocks in the food supply chain (Hobbs 2020; Nicola et al. 2020; Siddiquei and Khan 2020; Yu et al. 2020).

Many countries, including Malaysia, have adopted the movement control order or 'stay at home' requirement, an action to limit movement within the country to curb COVID-19 transmission. The Malaysian government has gazetted the four phases of MCO from 18 March to 12 May 2020 (*Table 1*). When the COVID-19 statistics showed decreased trends in the number of new cases and death, the Conditional Movement Order (CMCO) was introduced and gazetted from 13 May to 12 June, followed by the Recovery Movement Control Order (RMCO) until 31 December 2020. During the early MCO implementation, the news was circulated about the dumping and disposal of food from agri-food producers and limited logistic services due to interstate travel restrictions (Yi and Wahid 2020). The agri-food producers complained about the impact of MCO's implementation on unsold agricultural output, limited logistic services, and insufficient farm labour. Nevertheless, a price change during MCO has not been proven to happen in most areas or only in a specific locality or no apparent change.

This study provided an overview of the current market scenario after implementing the four phases of MCO, CMCO and RMCO. Due to the MCO implementation, price changes have not been empirically conducted to clarify the actual situation of the MCO's food supply chain issues.

Table 1. Duration and date of MCO, CMCO and RMCO

The Movement Control Order (MCO) phases	Date (duration)
MCO phase 1	18 Mar – 31 Mar 2020 (14 days)
MCO phase 2	1 Apr – 14 Apr 2020 (14 days)
MCO phase 3	15 Apr – 28 Apr 2020 (14 days)
MCO phase 4	29 Apr – 12 Mei 2020 (14 days)
Conditional MCO (CMCO)	13 May – 9 Jun 2020 (28 days)
Recovery MCO (RMCO)	10 June – 31 Aug 2020 (97 days)

Source: National Security Council (NSC)

The impact of COVID-19 on the agri-food sector has not been evaluated in Malaysia since most studies have been conducted in China, India, Canada and the United States of America (Ali and Khan 2020; Pu and Zhong 2020; Richards and Rickard 2020; Yu et al. 2020). The results from those countries are mixed depending on the MCO situation in their respective countries.

This study assessed the MCO's impact on selected fresh food prices, illustrated the price volatility and specifically sought answers to the following research questions: 1) Was there any significant price changes after MCO implementation on fresh food items? 2) Did the price fluctuate during MCO phases? 3) Did the price differ between regions due to MCO? Therefore, this study analysed and compared pre-MCO and post-MCO food prices, the volatility of price for each phase of MCO and the differences between regions.

Methodology

This study selected 40 fresh food items consisting of 30 local items and 10 imported items. Selected daily prices for all 40 fresh food items were compiled by FAMA, which covers 53 districts from all states in Malaysia. Data were gathered for the period of 2 Jan to 20 June 2020 to represent the duration of pre-MCO and four phases of MCO, CMCO and RMCO.

A paired t-test was carried out to analyse the difference between the mean price of pre-MCO and RMCO. Let X_i denote pre-MCO prices and Y_i denote RMCO prices. The n pairs can describe the data $(X_i - Y_i)$, $i = 1, \ldots, n$. Let, $W_i = X_i - Y_i$, $i = 1, \ldots, n$. If there is no difference, W_i would have zero mean. Thus, the hypothesis can be tested for $H_0 : \mu_w = 0, H_1, : \mu_w \neq 0$, where $W_i, \ldots W_n$ are assumed to be a sample from a normal population having an unknown mean μ_w and unknown variance σ_w^2. Hence, H_0 not rejecting if $-t_{\frac{\alpha}{2},n-1}) < \sqrt{n}\frac{\bar{W}}{S_w} < t_{\frac{\alpha}{2},n-1})$ and reject H_0 if otherwise (Ross 2004), where $\alpha = 0.05$ significance level, n - 1 is the df, $\bar{W}$is the sample mean difference and S_w is the sample standard deviation of the difference W. $\bar{W}$and S_w can be shown as $\bar{W} = n$ and and $\frac{\sum Wi}{n} S_w = \frac{\sqrt{\sum W_i\text{-}W)^2}}{n-1}$

Analysis of variance (ANOVA) compare means of several samples, an extension of the t-test for two independent samples to more than two groups (Ostertagova and Ostertag 2013). The null hypothesis, $H_0 : \mu_1 = \mu_1 = \ldots = \mu_k$ and reject H_0 if there is at least one pair with unequal means. The sum of squares for error (within groups), SSE = $= \sum,(n_I - 1). s_i^2$, and the sum of squares for treatments (between groups), SSC = $\sum n_I.(\bar{x}_I - \bar{x}^2)$, where $\bar{x}$ represent the mean sample i, s_i^2 is the sample variance. MSC = SSC / k – 1, MSE = SSE / $N - k$. Assuming the test conditions are satisfied, F = MSC / MSE, then hypothesis H_0 is rejected if $F_{1-\alpha,k-1,N-k}$

To evaluate the effects of price difference in every phase of MCO, the analysis was conducted using one-way ANOVA for pre-MCO, MCO phase 1, MCO phase 2, MCO phase 3, MCO phase 4, conditional MCO, and recovery MCO. One-way ANOVA test was also performed for determining price changes between Northern, Eastern, Central, Southern, Sabah and Sarawak regions during MCO phases. In addition, the post hoc comparison was tested to evaluate the statistical significance between different MCO phases and regions by using the Scheffe test. The analyses were performed using IBM SPSS 21 and SAS software.

The standard deviation of price has been used as a measure of volatility (Moledina et al. 2004). It measures how widely prices are dispersed from the average price. If prices showed a narrow range, the standard deviation showed a low value indicating low volatility and vice versa.

Results and discussion

The descriptive statistics that consist of the observation, mean score, standard deviation, minimum and maximum value of the price are shown in *Table 2*. The highest

Table 2. Descriptive statistics of the samples

Items	Observation	Mean (std. dev)	Min	Max
Live broiler	333	6.37 (0.75)	3.65	8.00
Chicken (standard)	969	7.92 (0.87)	4.65	10.00
Chicken (super)	518	8.64 (1.07)	6.00	10.00
Onion (Holland)	970	4.32 (0.92)	3.00	11.00
Shallot (India)	658	9.88 (2.99)	3.00	23.00
Shallot (Thailand)	734	12.84 (2.70)	5.00	20.00
Shallot (Rose)	689	11.19 (3.18)	5.00	24.00
Garlic	966	10.81 (1.74)	7.00	15.00
Spinach	956	4.01 (1.17)	2.15	9.20
Starfruit	777	5.79 (0.98)	2.65	8.00
Papaya	966	3.52 (0.57)	1.90	5.00
Bunga kantan	965	1.65 (0.44)	1.00	3.00
Local green chili	673	9.89 (1.57)	5.00	16.50
Local red chili	665	10.40 (1.86)	4.75	16.50
Red chili (China)	132	7.96 (1.15)	6.00	11.50
Red chili (Thailand)	179	8.65 (2.54)	6.00	20.00
Kulai chili	953	12.31 (3.31)	5.00	27.50
Scallion	970	9.19 (3.65)	3.50	22.50
Celery	970	10.52 (4.73)	3.50	26.50
Okra	968	7.10 (1.75)	3.00	14.00
Green bean	968	9.69 (2.56)	4.00	16.00
Long bean	967	6.49 (1.56)	3.00	11.00
Kangkung	967	3.67 (0.77)	1.90	7.00
Coconut (peeled)	962	2.33 (0.28)	1.10	3.25
Coconut (grated)	935	6.88 (0.97)	4.50	8.50
Ketola	970	4.85 (0.95)	1.75	8.20
Round cabbage (China)	808	3.11 (0.54)	1.35	5.50
Round cabbage (Indonesia)	355	3.10 (0.26)	2.50	3.50
Round cabbage (Local)	934	4.20 (0.71)	2.15	7.50
Banana (Berangan)	969	4.77 (0.76)	2.75	6.50
Banana (Mas)	962	4.59 (0.81)	2.75	6.50
Chicken eggs (grade A)	959	0.39 (0.03)	0.30	0.46
Chicken eggs (grade B)	957	0.37 (0.03)	0.27	0.45
Chicken eggs (grade C)	950	0.35 (0.04)	0.24	0.43
Watermelon (red)	367	3.17 (0.48)	2.10	4.00
Watermelon (seedless)	823	2.87 (0.74)	1.20	5.00
Brinjal	969	6.68 (1.77)	3.00	11.25
Cucumber	969	3.07 (0.90)	0.85	6.50
Tomato	968	4.90 (1.31)	2.00	9.50
Potato (Holland)	968	3.32 (0.53)	1.90	5.25

Source: Calculation by the author based on the data from FAMA's daily price

observations were collected from *ketola*, scallion and celery, while the lowest was from China red chili (132 observations). The highest price ranges, from minimum to maximum, were found in celery with a price difference of RM23, followed by Kulai chili (RM22.50) and Indian shallots (RM20). The smallest price ranges were found in chicken eggs grade A (RM0.16), grade B (RM0.18), grade C (RM0.19), Indonesian round cabbage (RM1) and watermelon (RM1.90). The prices of the listed items were relatively volatile during the MCO phases when most of the items had a standard deviation range from 0.03 for chicken eggs to 4.73 for celery.

Pre-MCO vs RMCO

The results in *Table 3* and *Table 4* showed that 14 fresh food items (35%) were sold at higher prices than the pre-MCO period, consisting of 10 local (celery, red chili, cucumber, kulai chili, *bunga kantan*, Mas banana, *ketola* and eggs (grade A, B, C) and four imported items (Thailand red chili, garlic, Holland onion and potato) (*Table 3*).

Table 3. The average price difference of local items between pre-MCO and RMCO

Items	Pre-MCO (RM)	RMCO (RM)	Price difference	t value
Celery	8.40	17.90	9.50	15.28*
Red chili	10.32	11.91	1.59	3.94*
Cucumber	2.80	4.39	1.59	12.04*
Chili (Kulai)	12.11	12.96	0.85	3.44*
Bunga kantan	1.57	1.76	0.19	7.24*
Banana (Mas)	4.63	4.68	0.05	3.78*
Eggs (grade A)	0.37	0.40	0.03	16.56*
Ketola	4.94	4.96	0.02	2.64*
Eggs (grade B)	0.35	0.37	0.01	14.36*
Eggs (grade C)	0.33	0.34	0.01	10.03*
Live broiler	6.36	7.31	0.94	0.23
Chicken (standard)	7.94	8.78	0.84	1.29
Watermelon (Red)	3.27	3.48	0.21	1.72
Papaya	3.51	3.68	0.17	0.70
Round cabbage	4.22	4.33	0.11	0.92
Banana (Berangan)	4.80	4.84	0.04	1.03
Okra	7.89	6.28	–1.60	–14.79*
Green bean	10.09	9.13	–0.96	–3.86*
Long bean	6.71	6.06	–0.65	–3.52*
Brinjal	7.18	6.59	–0.59	–8.42*
Green chili	10.17	9.60	–0.58	–3.54*
Scallion	8.10	7.55	–0.55	–9.77*
Seedless watermelon	3.16	2.90	–0.26	–8.92*
Starfruit	5.79	5.78	–0.02	–3.38*
Tomato	4.92	4.79	–0.13	–1.62
Coconut (grated)	6.90	6.79	–0.11	–1.15
Spinach	4.05	3.94	–0.11	–0.89
Coconut (peeled)	2.33	2.28	–0.05	–0.42
Chicken (super)	8.83	8.80	–0.03	–0.05

*Significant at $p < 0.05$

Table 4. The average price difference of imported items between pre-MCO and RMCO

Items	Pre-MCO (RM)	RMCO (RM)	Price difference	t value
Thailand red chili	8.37	10.54	2.17	6.7*
Garlic	10.26	10.57	0.31	10.33*
Holland onion	4.12	4.40	0.29	9.12*
Holland potato	3.24	3.33	0.09	7.5*
Shallot (Rose)	12.79	7.18	–5.60	–11.97*
Shallot (India)	11.18	6.28	–4.90	–9.41*
Shallot (Thailand)	13.62	12.03	–1.59	–6.36*
Red chili (China)	8.25	7.60	–0.65	–5.68*
Round cabbage (China)	3.14	3.04	–0.10	–4.28*
Round cabbage (Indonesia)	3.12	3.10	–0.02	–4.81*

*Significant at $p < 0.05$

The other six local items were insignificant increases in price. Besides that, the price of 14 fresh food items decreased by eight local and six imported items. Another five local items were insignificantly reduced in price. The relatively high-price items were locally produced, while most of the imported items declined.

The results in *Table 3* showed that most of the local items had a difference in their average prices between pre-MCO and RMCO. The highest price increment for local items was celery with RM9.50 price difference, followed by local red chili and cucumber. Other items showed less than RM1 price changes: kulai chili, *bunga kantan*, Mas banana, grade A, B and C chicken eggs, and *ketola*. After MCO implementation, there was also a price reduction in okra, green bean, long bean, brinjal, green chili, scallion, seedless watermelon, and starfruit from RM1.60 to 2 cents.

Table 4 shows the average price difference of imported items between pre-MCO and RMCO. Thailand red chili experienced the highest price increment with RM 2.17 in price difference, while all shallot (Rose, India and Thailand) showed an enormous price drop range from RM5.60 to RM1.59. Other imported fresh food items such as garlic, Holland onion and potato, also displayed less than RM1 price increment. China red chili, China and Indonesian round cabbage showed price reduction between RM0.65 and RM0.02. The results showed a significant difference for every imported item based on the paired t-test that had been conducted.

Price change during MCO phases

Based on the ANOVA results, only 27 fresh food items fluctuated in price during MCO phases, consisting of 19 local and eight imported food items. Nevertheless, most fresh foods experienced a price rise during MCO's 2nd and 4 phases. Among the difficulties faced by agri-food producers are selling their products (91%) due to disrupted marketing channels (58%) and logistic issues (13%) (Hairudin et al. 2020).
The results in *Table 5* indicated a significant difference in the average price of items in every phase of MCO except for *Bunga kantan*, papaya, round cabbage, Mas banana, Berangan banana, *ketola*, starfruit, peeled coconut, grated coconut, *kangkung*, and spinach. Celery and cucumber had an increase in price starting from fourth MCO onwards. Red chili (local and Kulai variety) decreased in price during first MCO and these item's prices increased during third MCO. The price of live broiler and both types of chicken (standard and super) dropped during second MCO and increased during RMCO. Watermelon

Table 5. The average price (RM) difference of local and imported items in every phase of MCO

	Average price (RM)						
Items	Pre-MCO	MCO1	MCO2	MCO3	MCO4	CMCO	RMCO
Celery	8.40a	9.75a	8.93a	9.44a	12.18b	15.07c	17.89d
Red chili (local)	10.32bcd	9.40ab	8.92a	9.83abc	11.15de	11.91e	10.76cd
Red chili (Kulai)	12.11abc	11.54ab	11.02a	12.01abc	13.64c	13.30c	12.96bc
Cucumber	2.80ab	2.92ab	2.68a	2.82ab	3.16b	3.76b	4.39d
Live broiler	6.36bc	6.43bc	5.71a	5.84ab	6.09ab	6.76cd	7.31d
Chicken (standard)	7.94bc	7.98c	7.51ab	7.48a	7.54ab	8.12c	8.78d
Chicken (super)	8.82b	8.91b	8.52ab	8.00a	8.19ab	8.55ab	8.80b
Watermelon	3.27bc	2.95ab	2.89a	2.87a	2.95ab	3.28bc	3.48c
Bunga kantan	1.57a	1.65a	1.66a	1.74a	1.78a	1.73a	1.76a
Papaya	3.51a	3.53a	3.45a	3.45a	3.49a	3.59a	3.68a
Round cabbage	4.22a	4.16a	4.14a	4.13a	4.13a	4.20a	4.33a
Banana (Mas)	4.63a	4.62a	4.53a	4.48a	4.50a	4.56a	4.68a
Banana (Berangan)	4.80a	4.80a	4.72a	4.66a	4.69a	4.78a	4.84a
Eggs (grade A)	0.37a	0.38a	0.40bc	0.41c	0.41c	0.40bc	0.40bc
Eggs (grade B)	0.35a	0.36a	0.39b	0.40b	0.40b	0.38b	0.37a
Eggs (grade C)	0.34a	0.35ab	0.37cd	0.38d	0.38d	0.36bc	0.34a
Ketola	4.94a	4.82a	4.65a	4.59a	4.79a	4.78a	4.96a
Green chili	10.17c	9.88abc	8.92a	9.14ab	10.02bc	10.04bc	9.60abc
Starfruit	5.79a	5.89a	5.62a	5.78a	5.93a	5.80a	5.78a
Coconut (peeled)	2.33a	2.32a	2.31a	2.36a	2.35a	2.34a	2.28a
Coconut (grated)	6.90a	6.91a	6.89a	6.95a	6.89a	6.77a	6.79a
Kangkung	3.70a	3.52a	3.47a	3.57a	3.75a	3.79a	3.65a
Spinach	4.05a	3.78a	3.81a	3.96a	4.11a	4.17a	3.94a
Tomato	4.92ab	4.87ab	4.77a	4.67a	5.47b	4.77a	4.79ab
Seedless watermelon	3.16c	2.57ab	2.46a	2.41a	2.56ab	2.76ab	2.90bc
Scallion	8.10ab	12.32c	11.78c	9.78b	9.77b	9.52b	7.55a
Brinjal	7.18b	6.38ab	6.23a	6.11a	6.14a	6.12a	6.59ab
Long bean	6.71b	6.42ab	5.84a	6.00ab	6.66b	6.52ab	6.06ab
Green bean	10.09bc	9.37abc	9.08abc	8.45a	8.89ab	10.25c	9.13abc
Okra	7.89b	6.67a	6.62a	6.50a	6.47a	6.12a	6.28a

Mean values with the same letter in the same row are not significantly different at $p < 0.05$

showed a decline in price during MCO1 till fourth MCO. Besides that, a slight increase in the price of eggs (grade A, B and C) had occurred starting from second MCO. Tomato's price only had an increment during fourth MCO, while other than that, the price had only been decreasing. Scallion's prices suddenly increased during first MCO, and the price became stable and decreased later during RMCO. Long beans did not have a large price difference at each phase of the MCO, while green beans showed a price decline from first MCO to fourth MCO.

The price of China and Thailand red chili had decreased from first MCO before it started to increase during fourth MCO, nearly to pre-MCO level except for Thailand red chili that went higher (*Table 6*). Garlic prices fluctuated, as it first started to increase during first MCO and reached the highest price, became stable and then decreased later during RMCO. Holland

Table 6. The average price difference of imported items in every phase of MCO

Items	Average price (RM)						
	Pre-MCO	MCO1	MCO2	MCO3	MCO4	CMCO	RMCO
Red chili (China)	8.25b	6.00a	6.00a	6.50a	8.33b	8.42b	7.60ab
Red chili (Thailand)	8.37ab	7.97ab	6.36a	6.50a	9.50ab	10.17b	10.54b
Garlic	10.26a	11.70c	11.50c	11.62c	11.42bc	11.07ab	10.57ab
Onion (Holland)	4.12a	4.44ab	4.45ab	4.80b	4.50ab	4.46ab	4.40ab
Holland potato	3.24a	3.39a	3.44a	3.49a	3.47a	3.33a	3.33a
Round cabbage (Indonesia)	3.12a	3.17a	3.14a	3.00a	3.00a	3.09a	3.10a
Round cabbage (China)	3.14a	3.20a	3.11a	3.07a	3.06a	3.03a	3.04a
Shallot (Thailand)	13.62b	12.70ab	12.67ab	11.93a	11.55a	11.38a	12.03ab
Shallot (India)	11.18c	11.40c	10.83c	9.99bc	8.54b	6.89a	6.28a
Shallot (Rose)	12.79c	12.15c	12.34c	11.95c	9.87b	7.61a	7.18a

Mean values with the same letter in the same row are not significantly different at $p < 0.05$

onion didn't have a large price difference at each phase of the MCO except in the third MCO when it reached RM4.80/kg, although it has always been higher than pre-MCO phase. Meanwhile, seedless watermelon, brinjal, and shallot (Thailand, India and Rose) experienced a continuous decline in price throughout the MCO phase. Some items such as seedless watermelon and Thailand shallot dropped in their prices but subsequently increased post CMCO. The price of Indonesian and Chinese round cabbage did not show significant difference between the MCO phases.

Price volatility during the MCO phase

Based on standard deviation values, there were eight items volatile in price. Out of the 15 items which experienced a price increase, only three items were volatile in price during MCO. Two local items and a single imported item are volatile because their standard deviation (SD) values are high, celery with SD 4.73, Kulai chili with SD 3.31 and Thailand red chili with SD 2.54. *Figure 1* shows the price volatility for those items across the MCO phases. Celery was the most volatile and had the highest price increment among all the items, regardless of local or imported items. It was bound to spike up since MCO phase 4 and reached the top in recovery MCO.

Five items showed price reduction and had standard deviation values of more than two, namely, scallion (3.65), Rose shallot (3.18), India shallot (2.99), Thailand shallot (2.70) and green bean (2.56) (*Figure 2*). High standard deviation showed high price volatility during MCO phases. The price of scallion increased at the beginning of MCO but then dropped starting second MCO. Shallot (Thailand, India, Rose) price has declined across MCO phases, specifically drastic reduction for Rose and Thailand shallot. The price of green beans has been some up-and-down movement in the middle of the MCO phases.

Price changes between regions

There were differences in the average prices between regions for every item as shown in *Table 7*. The price of live broiler was not significantly different between regions except in Sabah and Sarawak, with the average price of RM7.21/kg. The same pattern occurred for Indian shallot, with the price range for northern, eastern, central and southern regions being between RM8.84 to RM9.95/kg, but the average price for Sabah and Sarawak reached RM13.46/kg. Both standard and super-type of chickens have different prices between regions, with the highest price found in Sabah and Sarawak region. The lowest average price for

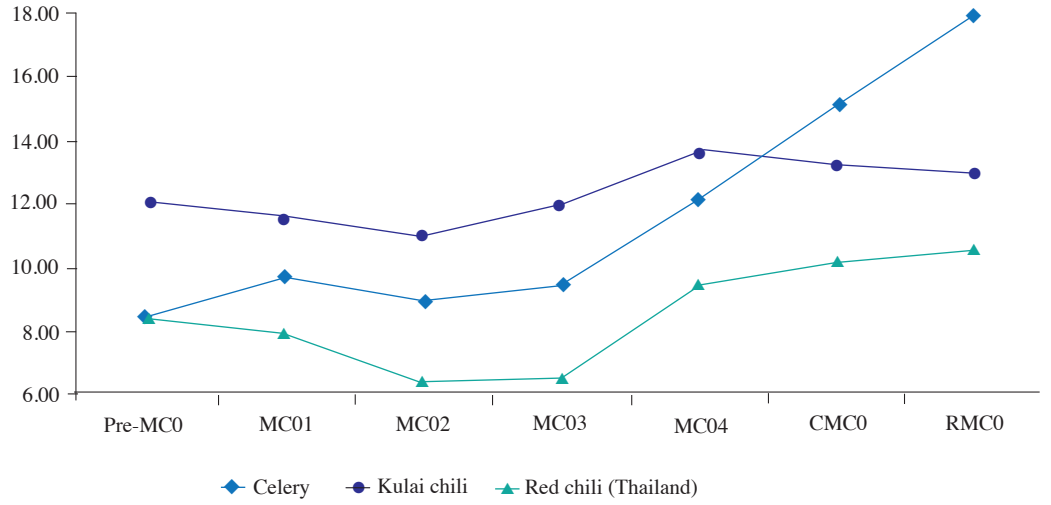

Figure 1. The items that were volatile in price across MCO phase (increasing price)

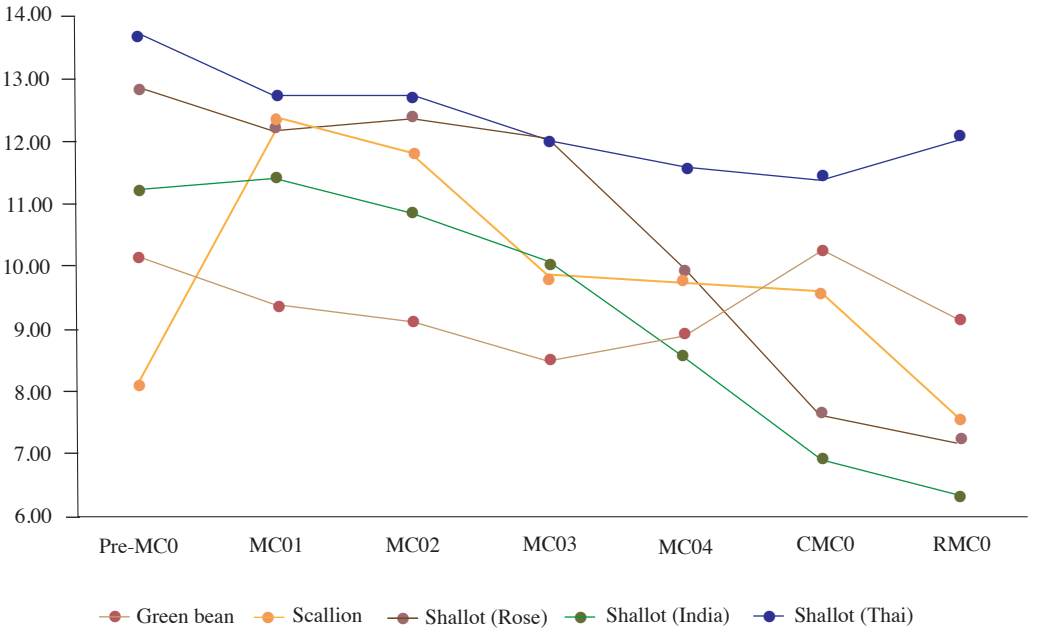

Figure 2. The items that were volatile in price across MCO phases (decreasing price)

standard chicken was found in the central region, while the lowest average for super chicken was from the southern region. There were items significantly different in prices for each region, such as spinach, grated coconut, Mas banana, *ketola*, garlic, long beans and Kulai chili. Papaya was found to be the lowest in price at Sabah and Sarawak and the highest in the eastern region. Celery, local red chili, and Holland onion prices fluctuated whereby northern, southern, Sabah and Sarawak regions showed higher prices compared to eastern and central regions. A higher price for cucumber was found in the northern, Sabah and Sarawak regions while the other regions showed less

Table 7. The price difference between northern, eastern, central, southern, Sabah and Sarawak regions during MCO phases

Items	Northern	Eastern	Central	Southern	Sabah and Sarawak
Live broiler	6.25a	6.03a	6.09a	6.28a	7.21b
Chicken (standard)	7.92c	7.59b	7.35a	7.74bc	9.09d
Chicken (super)	8.66c	8.22b	8.63c	5.50a	9.64d
Spinach	4.22c	3.79b	3.43a	3.53ab	5.03d
Papaya	3.54b	3.83c	3.50b	3.50b	3.06a
Celery	10.38b	8.87a	10.04ab	9.67ab	14.77c
Local red chili	10.48c	9.77b	8.91a	10.52c	11.88d
Cucumber	3.34c	2.87a	2.90ab	2.92ab	3.17bc
Coconut (peeled)	2.53d	2.28b	2.45c	2.29b	1.97a
Coconut (grated)	7.53d	6.50b	7.45cd	7.30c	5.26a
Bunga kantan	1.50b	1.67c	1.26a	1.79c	2.01d
Banana (Mas)	4.78c	5.02d	5.35e	4.47b	3.20a
Banana (Berangan)	5.20d	5.00c	5.27d	4.71b	3.31a
Chicken eggs (grade A)	0.38a	0.38a	0.39b	0.38a	0.42c
Chicken eggs (grade B)	0.36ab	0.35a	0.38c	0.37b	0.39d
Chicken eggs (grade C)	0.34ab	0.33a	0.37d	0.35b	0.37d
Ketola	4.94bc	4.35a	5.30d	4.72b	5.22cd
Garlic	11.21c	9.71a	10.71bc	11.81d	10.39b
Holland onion	4.51b	3.68a	3.81a	4.93c	4.47b
Shallot (Rose)	11.38b	8.79a	10.85b	10.99b	13.74c
Okra	7.36b	6.67a	7.70b	7.30b	6.50a
Green bean	11.08c	7.93b	10.97c	10.69c	7.19a
Long bean	6.68c	5.53a	7.10cd	7.17d	6.12b
Brinjal	6.51a	5.97a	7.49b	7.40b	6.46a
Local green chili	9.35a	9.58a	9.55a	10.82b	9.58a
Scallion	9.14b	7.45a	8.85b	7.73a	14.12c
Seedless watermelon	3.02b	2.28a	3.39c	3.02b	3.03b
Starfruit	6.64c	6.50c	5.09a	5.43b	5.09a
Shallot (India)	9.95a	8.84a	9.78a	9.07a	13.46b
Shallot (Thailand)	13.50c	9.48a	13.13bc	13.84c	12.37b
Round cabbage (China)	3.26b	2.91a	2.84a	2.96a	3.87c
Round cabbage (local)	4.21b	3.89a	4.35b	4.44b	4.21b
Kulai chili	12.76c	10.23a	11.78b	11.88bc	15.89d
Kangkung	3.75bc	3.69bc	3.33a	3.55ab	3.91c
Tomato	4.85b	4.14a	4.69b	4.78b	6.41c
Potato (Holland)	3.15b	2.99a	3.39c	3.61d	3.68d

Mean values with the same letter in the same row are not significantly different at $p < 0.05$

than RM3. The price of peeled coconut was relatively stable in all regions except in northern and central regions. *Bunga kantan* and scallion had a steady price but increased slightly in Sabah and Sarawak. Berangan banana was found as low as RM3.31/kg in Sabah and Sarawak and the highest in the central region (RM5.27/kg).

The price of chicken eggs (grade A) were highly similar in various regions except the central region and only increased by 4 cents for Sabah and Sarawak. The results obtained for chicken eggs (grade B) and (grade C) also showed a similar price pattern for all regions. Rose shallots recorded the highest price in Sabah and Sarawak, but the lowest was found in the eastern region, while the prices for the other regions obtained almost similar results. The price of okra and green bean were relatively stable and only observed a slight decrease in their price in the eastern, Sabah, and Sarawak regions. The price of local green chili was almost similar except for the southern region, which showed a slight peak among the rest. A higher price of brinjal was found in the central and southern regions while the other regions showed lower than RM6.51/kg. Thailand shallot price was high at all regions except for the eastern region, which was only at RM9.48/kg. Seedless watermelon, starfruit, both China and local round cabbage, *kangkung*, tomato, Holland potato moderately differed in their prices for the regions specified in this study.

Comparing and listing the highest price between regions showed that Sabah and Sarawak had the most frequent compared to other regions with 15 items found to have the highest price (*Table 8*). The second most frequent region to be found had the highest price was the Southern region, followed by the central and northern regions. The eastern region has happened to have the highest price once for papaya.

Table 8. The highest price items between regions

Northern	Eastern	Central	Southern	Sabah and Sarawak
Cucumber	Papaya	Banana (Mas)	Garlic	Live broiler
Coconut (peeled)		Banana (Berangan)	Holland onion	Chicken (standard)
Coconut (grated)		*Ketola*	Long bean	Chicken (super)
Green bean		Okra	Local green chili	Spinach
Starfruit		Seedless watermelon	Shallot (Thailand)	Celery
			Round cabbage (local)	Local red chili
				Bunga kantan
				Chicken eggs (grade A, B, C)
				Shallot (Rose)
				Scallion
				Shallot (India)
				Round cabbage (China)
				Kulai chili
				Kangkung
				Tomato

Conclusion

The study identified the impact of COVID-19 on selected fresh food prices in Malaysia across the phases of the Movement Control Order. There was a difference between the mean prices of 14 items and 10 local food items between pre-MCO and RMCO. The results also indicated a difference in the average prices of four imported items. ANOVA test was performed to detect any price fluctuation during the MCO phases. The results showed that only 27 items fluctuated in price, consisting of 19 local and eight imported items. Lockdown had affected fresh food prices, especially on the second and fourth phases of MCO. The price of fresh food had increased in this phase due to the difficulties faced by the agri-food producers who were selling their products, disrupted marketing channels and logistic issues. Eight items had volatility in price based on standard deviation value. About 36 items were found significantly different in price between regions, with the most frequent price hike was in Sabah and Sarawak regions, followed by the southern and northern region. Although most fresh items showed decreasing price trends, the government needs to monitor the price of selected items that have shown a continuous increment in price to determine the possible cause, whether it was due to supply or demand disruption or mere speculation. Not all perishable items food price were increased during MCO.

Price monitoring should be done continuously, at least until the COVID-19 pandemic is under control. This could encourage the agri-food producers to produce and market consistently. Hence, the government must control and monitor the price of goods to avoid affecting the consumers in the future.

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Abstrak

COVID-19 telah diisytihar sebagai pandemik dan situasi ini memberi impak negatif terhadap pertumbuhan ekonomi Malaysia termasuklah kesan ke atas harga makanan segar. Oleh itu, impak COVID-19 ke atas harga makanan segar terpilih di Malaysia sepanjang fasa Perintah Kawalan Pergerakan (PKP) telah dianalisis. Objektif kajian ini adalah untuk mengkaji perubahan 40 harga makanan segar tempatan dan import yang signifikan selepas PKP dilaksanakan. Harga harian makanan segar tersebut direkod sebelum dan sepanjang pelaksanaan PKP. Analisis ujian *t* berpasangan dijalankan untuk menganalisis perbezaan harga purata makanan segar sebelum PKP dan selepas fasa Perintah Kawalan Pergerakan Pemulihan (PKPP). Selain itu, kajian ini dilaksanakan untuk menilai perubahan harga di setiap fasa PKP dan antara zon menggunakan ANOVA. Sebanyak 35% makanan segar dijual pada harga yang lebih tinggi berbanding dengan sebelum pelaksanaan PKP. Peningkatan harga tertinggi yang direkodkan ialah daun saderi, manakala semua jenis bawang kecil mengalami penurunan harga yang tertinggi. Terdapat 27 harga makanan segar meningkat dan menurun, terutamanya peningkatan harga ketika fasa kedua dan keempat PKP. Sebanyak lapan barang makanan segar terbukti mengalami turun naik harga melalui analisis sisihan piawai. Semua barangan juga menunjukkan harga yang berbeza di setiap zon. Harga tertinggi direkodkan di Sabah dan Sarawak. Kerajaan perlu melaksanakan tindakan sewajarnya untuk mengekalkan harga makanan segar tempatan dan import daripada melambung tinggi. Walaupun harga makanan segar adalah stabil sepanjang tempoh pelaksanaan PKP, pemantauan harga perlu sering dilaksanakan untuk memastikan pengeluar makanan menjual dan memasarkan barangan segar secara konsisten.