Available online at
http://myjms.mohe.gov.my/index.php/JEEIR

e-ISSN: 2289-2559

Journal of Emerging Economies & Islamic Research 9(1) 2021, 68 – 87.

Journal of Emerging Economies and Islamic Research

Influence of COVID-19's active cases on Malaysia's key economic performance indicators

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ARTICLE INFO

Article history:
Received 25 December 2020
Accepted 23 January 2021
Published 31 January 2021

Keywords:
COVID-19
Unemployment
GDP
CPI
Foreign exchange
Stock market

DOI:
10.24191/jeeir.v9i1.12736

ABSTRACT

The COVID-19 outbreak was a rare and unprecedented phenomenon. Hence, the pandemic forces the world economy to react unpredictably. Governments worldwide have undertaken several precautions, including social distance measures, public awareness programs, policies on testing and quarantine, and financial aid packages. Using endogenous growth theory, this paper examines the impact of COVID-19 towards Malaysia key economic indicator's performance using univariate regression analysis based on daily time series data from 1 January 2020 to 30 September 2020. Besides, this paper is also forecasting the upcoming three months of Malaysia's key economic indicator performance from October to December 2020, by using linear trend forecasting model. The results indicate that COVID-19 significantly impacted the unemployment rate, gross domestic product (GDP), consumer price index (CPI), foreign exchange rate (FOREX), and stock market index performance in Malaysia. The results of projecting the upcoming three months trends were forecasted to increase unemployment, GDP, FOREX, and stock market index performance. Instead, the CPI is expected to decrease. Furthermore, this paper provides four contributions in the later section.

1. Introduction

Novel Coronavirus 2019 (COVID-19) disease is an infectious disease caused by severe respiratory acute coronavirus syndrome. It was first detected in Wuhan, Hubei, China in December 2019 and contributed in the ongoing pandemic. The disease case is spread exponentially in global proportion. On 11 March 2020, the world woke up to a dangerous truth. COVID-19 was declared a pandemic by the World Health

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Organisation (WHO) (WHO, 2020). At the time of writing, this COVID-19's pandemic infected more than 68 million people with more than 1.5 million deaths recorded worldwide†. The pandemic declaration gives signals towards some countries' economic react and moves abnormally (Gopinath, 2020). Governments around the globe have taken strict steps, such as obligatory national lockdown and border closures. At the same time, restrict the transmission rate of the virus while minimising the pandemic. Malaysia is no exception when it comes to COVID-19 pandemic. Figure 1 shows COVID-19 active cases from 1 January 2020 to 30 September 2020 in which total cumulative active cases estimated to be more than 40,000 cases.

The effect of COVID-19 was catastrophic for the global economy as a whole. The World Economic Outlook, revised in June by International Monetary Fund (IMF), expects a sharp 4.9 per cent downturn in the global economy by 2020, which is much more severe than 2008-09 financial crisis. The Organisation for Economic Cooperation and Development (OECD), states that the pandemic of COVID-19 has contributed to worldwide socio-economic distress and global economic instability (OECD, 2020). The massive spread of the virus disrupted financial markets. Furthermore, the enforcement of lockdown and travel ban has dramatically affected the business's operations in different industries, impacting people's wages and contributing to economic instability in the world (Shah et al., 2020). This phenomenon has prompted the Malaysian Government to introduce several initiatives to sustain the badly affected economy due to this pandemic outbreak.

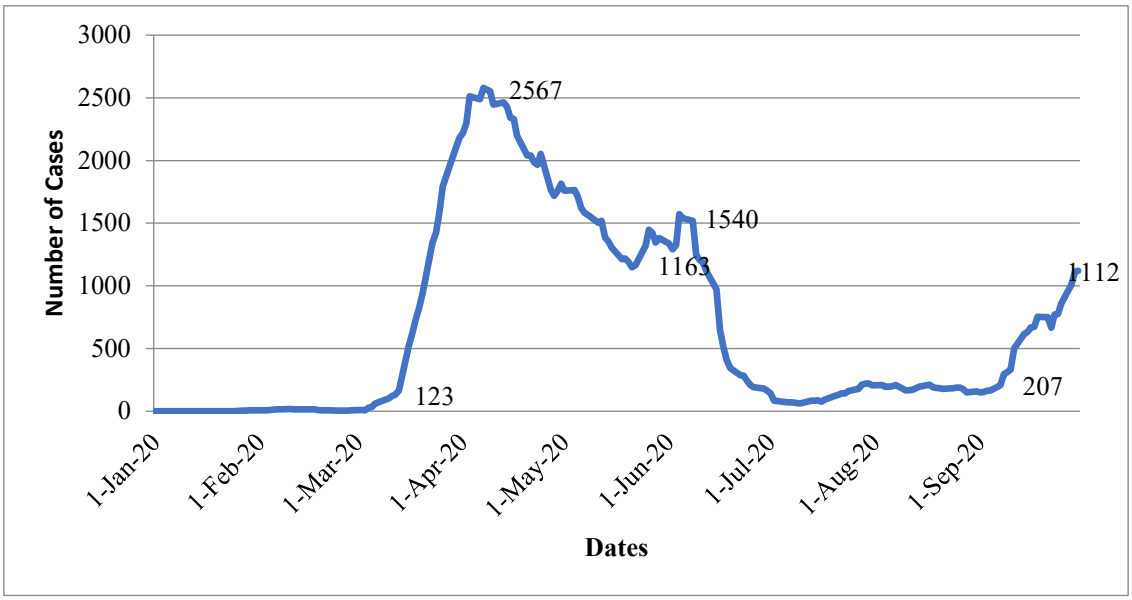

Fig. 1. COVID-19 active cases trend in Malaysia from 1/1/2020 to 30/9/2020. Source: Thomson Database Reuters‡

The COVID-19 crisis is not similar to the global financial crisis in 2008, and the Asian financial crisis in 1997. This COVID-19 current situation's concern is a public health crisis first, following by economic

† The record can be accessed at https://www.worldometers.info/coronavirus/

‡ The COVID-19 active cases data retrieved from Thomson Database Reuters

crisis. Hence, majority of the economists agree that the economic policy is mainly focusing on boosting public health efforts in handling the pandemic, and at the same time, ensuring the welfare of the citizens and the business (Cheng, 2020). Malaysia economic policy response to this pandemic comprises two stages. Stage one includes safeguarding employment and livelihoods. This stage is executed through income and liquidity support, which the goal is to help citizens allow them to pick up where they let off after being retrenched, loss jobs, and loss of main income. Second stages comprise of supercharging economic activity, after the completion of the first stage. This stage is implemented with the main aim is to help the business and individuals bounced back by the injection of the Government's fiscal policy. Hence, with the aids channelled to citizens via the first stage, it will encourage citizens' spending in shifting the Malaysia economy. With the first move, Tan Sri Muhyiddin Yassin the Malaysia Prime Minister announced a financial stimulus package on 27 March 2020. It helps nations reduce economic burden and citizens' financial burdens that were slowly affecting its population. A RM 250 billion package was introduced to safeguard's people welfare, sustain the affected businesses, including Small and Medium Industries, and strengthen the economy (Yassin, 2020). Correspondingly, Bank Negara Malaysia (BNM) offered a moratorium or delayed payment for all form of loans, except credit card debts to lessen the borrower's financial constraints.

Since June 2020, COVID-19 onset has started to attract academicians globally to conduct researches on the effect of this pandemic on the economy. Among them are in a few Eastern European Countries (Vasiljeva et al., 2020), China (Zhang et al., 2020), and Indonesia (Prawoto, Purnomo and Zahra, 2020). Hence, this study attempts to follow those researchers' footsteps by examining and forecasting the effect of COVID-19 on the economic performance indicators in the Malaysian's context. The study differs from those previous studies as it extends the previous research by using five key economic indicators – unemployment (Sheldon, 2020; Kim et al., 2020), Gross Domestic Product (GDP) (Fadol, 2020; Malliet et al., 2020), consumer price index (CPI) (Blundell et al., 2020; Moosa and Al-Nakeeb, 2020), Foreign Exchange Rate (FOREX) (Aslam et al., 2020; Umar and Gubareva, 2020), and stock market index performance (Erdem, 2020; Sherif, 2020).

This paper aims to examine the impact of Malaysia's COVID-19 active cases towards critical economic indicators performance. Concerning the study's aim, the researcher has applied Paul Romer's endogenous growth theory by selecting five key indicators. The method of analysis employed was a univariate regression analysis to discover the findings. After identifying the significance status, then the linear trend forecasting model was applied to project the upcoming three months of Malaysia's selected critical economic indicators performance starting from October to December 2020.

On the same ground, this study provides four contributions. First, this study would fill the gap by giving the proposed conceptual framework of COVID-19 impact on Malaysia's selected key economic indicators statistically assessed. Second, the period of study is also more extended than the previous studies done. Therefore this provides more essential insights and reaffirms the influence of COVID-19 on the studied performance indicators. Third, other researchers have the opportunity either to apply the framework of this study or to strengthen it. Finally, this paper's findings could help the Government implement the appropriate policy during the COVID-19 period.

The paper is organised as follows; Section 2 reviews related past literature on the effect of COVID-19 active cases on Malaysian critical economic performance indicators. Next, section 3 explains the methodology and build the mathematical equations model for forecasting in this study. Then, section 4 presents the key findings related to the objective of this paper. Lastly, section 5 provides the conclusions of the overall research.

2. Literature review

2.1 Exogenous and endogenous growth theory

The economic performance or economic growth has been revolutionised almost half-century. It started with Solow (1956) 's neo-classical Exogenous Growth theory. The exogenous approach emphasised that financial performance or economic growth is influenced outside of a given economic model. The model's basic assumptions are that economic growth or performance features a variation in constant return to scale, diminishing marginal productivity of capital, technical progress, and substitutability between capital and labour.

The new growth theory was introduced by Romer (1994) to improvise Solow's model. Romer proposed the introduction of Endogenous Growth theory, which this theory introduces new accumulation factors, such as accumulation of human capital, research and development, economic policies and macroeconomic conditions. As a result, this theory deemed counterpart neo-classical exogenous theory and played a substantial role in advancing growth on a long-run basis.

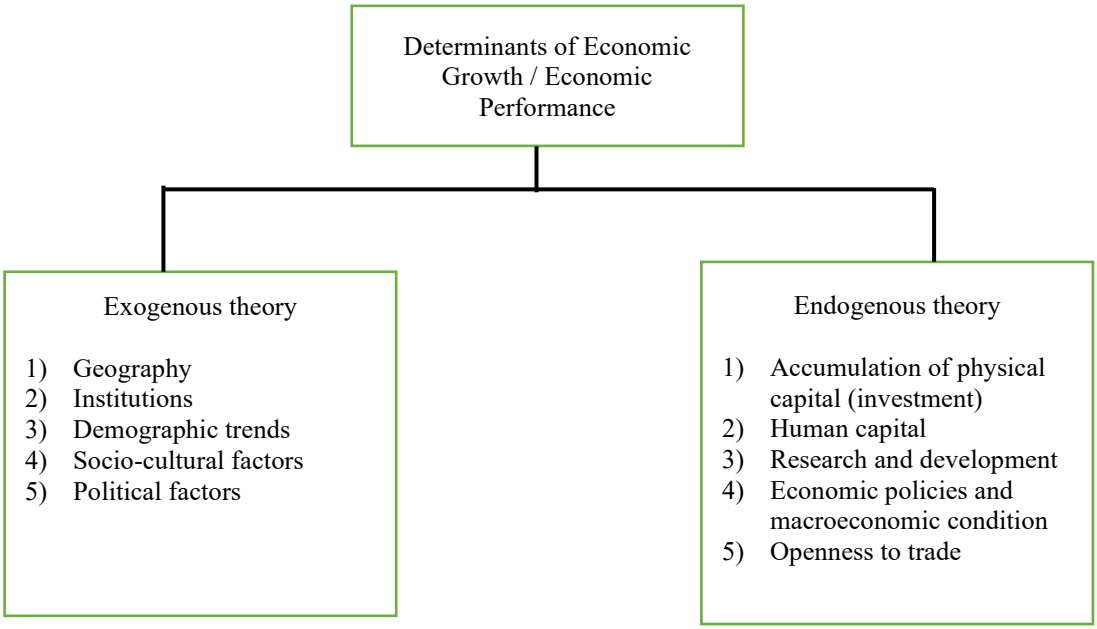

Fig. 2. Exogenous and Endogenous factors of economic growth and economic performance

Figure 2 explains the difference between exogenous and endogenous theory relates to economic growth and economic performance. The researchers apply endogenous theory based on previous researcher's empirical studies about the pandemic and economic indicators. The five key indicators explained in the later section are the unemployment rate, GDP, CPI, foreign exchange, and stock market, classified under economic and macroeconomic conditions.

2.2 COVID-19 outbreak and unemployment rate

The impact of the outbreak of COVID-19 pandemic on the unemployment rate in Malaysia cannot be overemphasised. Lisi (2016) has pointed out that unemployment is the key to economic performance. As

the economy grows, the labour market is more elastic in reducing unemployment (Mojica & Tatlonghari, 2017). The unemployment rate moves volatilely based on the economic situation, regardless of the short-run or long run. Companies have implemented strategies that minimise the number of staffs either by terminating the contract staffs (Sheldon, 2020), offering Voluntarily Separation Scheme (VSS) or firing employees (Rodriguez-Caballero and Vera-Valdes, 2020). The most affected are the older adult's employee group, where layoff can easily link to health risk assessment (Autin et al., 2020), where most of the small businesses were unexpectedly forced to close during the lockdown implemented in Malaysia to curb the spread of the virus (Ning and Wang, 2020).

Moreover, small businesses could not retain their contacts as lockdown forces major customers to stay at home, resulting in substantial income losses. Besides, foreign employees' dominance makes local workers struggle to get desired jobs (Amor & Hassine, 2017). Ultimately in a desperate measure to salvage their businesses and cut further losses, most of them resorted to laying off their employees, which adds to the higher unemployment rate.

On the other side, Tenzin (2019) believes that unemployment does play a significant role as an economic indicator. He believes that it is due to cyclical unemployment conditions, whereby companies are still maintaining the number of staffs in any financial situation. When the country experienced a recession, the management will layoff the staff, and when the country experiences recovery, they will rehire the staff again. Che et al. (2020) further stated that the unemployment rate further escalated when low-level skill employees found it difficult to re-enter the employment market requiring higher skill. On the other hand, the study of Kim et al. (2020) contradicts the former author. The authors pointed out that COVID-19 does not impact the unemployment rate since most of the graduates, especially those with bachelor and higher degrees, are expected to be relatively immune to the drop in unemployment. Further, those employees are said to be more proactive and contributed to the recovery of the bad sectors impacted by COVID-19 pandemic. Hence, labour forces expected to carry out production (Soylu et al., 2018). Auray & Eyquem (2020) also explained the unemployment rate could be confined or reduced during the COVID-19 via Government's several initiatives, especially with the government-linked companies. Thus, these initiatives generate a large amount of slack in the labour market, which will raise the output and productivity to recover the economy.

Hence, the first hypothesis is proposed as below:

H_1 = COVID-19 has significant influenced on the unemployment rate.

2.3 COVID-19 outbreak and GDP

In a bigger picture, GDP is influenced by factors and risk related to political, economic, and social (Sarwar & Haq, 2017). Hence, there were possibilities that health risk can be impacting GDP as well. Other researchers found GDP to be affected by the outbreak of COVID-19 (Fadol, 2020; Fezzi and Fanghella, 2020; Malliet et al., 2020). There seem to be mixed results on the influence of COVID-19 on the country's GDP. Fadol (2020) and Adam et al. (2020) indicate a positive relationship between two variables. They put forward that one possible reason is due to continuous consumptions by consumers in oil and gas and household necessities. Another reason is the Government's initiative to peg the petrol prices for six months when the movement control order was implemented on 18 March 2020, leading to increased demand and petrol consumption. Also, it was observed by that there have been an increasing trend on the consumption (Hashim et al., 2018) in household necessities such as food, shelter, and utilities despite series of MCO took place. Slepov et al. (2017) and Trinh (2017) in the study, proves that economic performance is significantly influenced by GDP because of Government initiative to perform investment to improve quality of life. The economic performance also impacts the GDP because of the rapid trend consumption by an

individual (Brueckner, 2017). Hence, COVID-19 is no exception, which investment is needed to improve health quality and hope in reducing COVID-19 active cases.

However, in contrast to Malliet et al. (2020), they discovered an inverse relationship of COVID-19 cases on GDP. Their study showed that the negative statistically significant association was due to sudden collapse in aggregate demand triggered by the lockdown. Alternatively, Fezzi & Fanghella (2020) said that the negative effect of COVID-19 on GDP is short-term. Even though specific industries were severely affected, such as tourism and hospitality, the circumstances became sustained with medium and heavy industry support during lockdowns. The Government allows those industries to operate as usual even though the lockdown still implemented. Therefore, the production continuity helps the country's GDP, and the impact of COVID-19 pandemic can be minimal. Thus, the second hypothesis is proposed as:

H_2 = COVID-19 has a significant influence on GDP.

2.4 COVID-19 outbreak and CPI

Another economic performance indicator that is expected to be affected by COVID-19 outbreak is CPI (Blundell et al., 2020; Moosa and Al-Nakeeb, 2020; Seiler, 2020). Before the pandemic, Higgins et al. (2016) pointed out that CPI swung sensitively due to seasonal movement regardless of any economic condition. For example, in Malaysia, CPI usually turned upwards during Hari Raya seasons and declined. Mishchenko et al. (2018), on the other hand, hinted that CPI impacted economic performance due to the negative impact of interest rate and inflation rate. Hence, economic performance becomes better if the Government lower down the interest rate and inflation rate. On the COVID-19 aspect, Moosa and Al-Nakeeb (2020) hinted that one of the factors that led to this result is the declining import prices resulting from less pedigree of international competition. This finding is supported by the fact that the pandemic leads to the emergency call to impose the lockdown, which negatively impacts consumers who mostly depend on local product. The lockdown is forcing most of the countries to restrict import. Therefore COVID-19 outbreak is significantly affecting the volatility of CPI.

Another factor that led to the significant impact of COVID-19 outbreak on CPI is the emergence of the inflation rate. This result also supported by Moosa and Al-Nakeeb (2020) and Seiler (2020). Due to the demand push approach by consumers, it led to an increase in food price. On the other hand, consumers' cost of living has a persistent impact on change in consumer behaviour during lockdowns, including new norms of working habits, prolonged uncertainties, and adoption of new lifestyles (Blundell et al., 2020). Most of the luxury cost of living consumers cannot spend money on entertainment, vacations, etc. Hence, it is suggested that some of the prices of the goods are volatile sensitively, which led towards CPI volatility. Therefore, the third hypothesis proposed as:

H_3 = COVID-19 has significantly influenced on CPI performance.

2.5 COVID-19 outbreak and the foreign exchange rate

In general, the exchange rate stability led to sustained economic performance (Humbatova et al., 2019). Most of the firms are exposed to foreign exchange rate risk (Apergis & Artikis, 2016). Hence, the company's financial performance is responsive to foreign exchange, thus impacting economic performance. Barguellil et al. (2018) and Fraj et al. (2018) focused on foreign exchange rate towards another angle. The author believes that exchange rate volatility is more harmful if countries adopt a flexible exchange rate policy and vast financial openness.

Some studies confirmed that the outbreak of COVID-19 pandemic significantly impacted foreign exchange rate (Aslam et al., 2020; Goda and Priewe, 2020; Umar and Gubareva, 2020). One of the reasons suggested is the investor's herd behaviour. Despite the outbreak of the virus, investors, especially foreign investors, react collectively. However, there is a disagreement by Umar and Gubareva (2020), in their study in which they found out that the currency market is affected based on Coronavirus Panic Index. Investors have no fear and did not panic to withdraw or take away their foreign investment out of the country.

On the other hand, investors will decide to put or withdraw their investment based on macroeconomic fundamentals instead of natural disasters or pandemic. This finding is supported by Aslam et al. (2020). Another possible reason is because of the ratio of export and import Lin & Lin (2017). Due to lockdown imposed by majority countries worldwide, export and import activities assumed a slow pace. This justification also supported by Aman et al. (2017). As a result, there is a vast difference between before and after pandemic's international trade. Goda and Priewe (2020) emphasised that the foreign exchange rate was not affected by the outbreak of COVID-19. The intervention by Central Banks is playing an essential role in controlling the currency. Other 14 countries also have a similar approach to Malaysia, as proven by them. It shows that the pandemic is intimidating foreign exchange rate movement as well. Also, the foreign exchange rate is not affected because domestic credit plays a significant role in improving economic growth rather than merely focusing on the exchange rate (Huong, 2019). Thus, the fourth hypothesis is as follows:

H_4 = COVID-19 has significant influenced on Foreign exchange rate

2.6 COVID-19 outbreak and stock market performance

Before the pandemic, several studies linked stock market performance as a key indicator of economic performance. Stock market performance was influenced by economic performance due to the rapid reactions based on any economic conditions Babajide et al. (2016). Lazarov et al. (2016) also supported the same argument, which indicates that stock market performance is motivated by speculation for revenue and extra profit from price volatility. When there is a motivation, hence there will be a massive and large number of transaction which led towards the bullish market (Bhullar, 2017). On the contrary, Ho (2018) pointed out that the stock market did not play the role because of slow liquidity and less transaction. But then, Osaseri & Osamwonyi (2019) plays as support. The stock market performance can go bullish where there was a combine external financing of the stock market from bonds, equities, and loans. Hence, these are the alternatives other than merely by cash transaction.

Previous studies proved a significant relationship between the outbreak of COVID-19 and stock market performance in the country (Chaudhary, Bakhshi and Gupta, 2020; Erdem, 2020). The findings suggest that the impact of COVID-19 has caused massive volatility in the stock market. Majority of sectors in the stock market were suffering in during pandemic. This finding has an opposite view with Sherif (2020) in the UK stock market, which the results suggested that most sectors benefited and perform well during the pandemic. Chaudhary et al. (2020) specified that the inception of COVID-19 triggered stock market uncertainty. Stock market index performance overreacted to the Government's announcements and updates regarding the lockdowns and operating policies and procedures among organisations. This argument is supported by Erdem (2020), who found out that overreaction occurred due to investor's sentiment that share prices might drop massively during the pandemic. Thus, they decided to sell their shares after reacting to the news. Investors also have perceptions that the cases of COVID-19 infections are underreported. Therefore, this creates more anxiety towards the investor's decision to manage their investment. As a result, the stock market became volatile, and the index dropped due to massive share selling by investors.

Hence, the final hypothesis is as follows:

H_5 = COVID-19 has significant influenced on stock market performance.

Therefore, all the hypothesised statements developed are adopted in the Malaysian context, since Malaysia is no exception to COVID-19 pandemic. Even the emergence of COVID 19 is still recent; it can benchmark other countries worldwide into chronological economic impact.

2.7 Hypothesis summary

Based on the literature reviews, hence Table 1 provides a summary of the hypotheses:

Table 1. Summary of the hypotheses

Hypothesis	Hypothesis statement
H1	COVID-19 has a significant influence on the unemployment rate.
H2	COVID-19 has a significant influence on GDP.
H3	COVID-19 has significantly influenced on CPI performance.
H4	COVID-19 has significant influenced on Foreign exchange rate.
H5	COVID-19 has significant influenced on stock market performance.

3. Methodology

The time-series data set used for the analysis was obtained from Thompson Data Reuters. It links to several data bank agencies, e.g. Department of Statistics Malaysia (DOSM), Bank Negara Malaysia (BNM) and Financial Times Stock Exchange (FTSE). It covers the period from 1 January 2020 until 30 September 2020. Daily data is used for this study. Two statistical methods are adopted to meet this study's aim: univariate regression analysis and linear trend model for forecasting.

The process of analysing data in this study is executed via the process of assessing the quantitative data. The quantitative research method on secondary data is used in this research as it is enabling to evaluate the data appropriately. The data series comprises the unemployment rate, GDP, CPI, the foreign exchange rate (FOREX), and Malaysia's stock market indices (KLCI). Next, the significant critical factors were used to generate the forecast, respectively, along with the duration of the pandemic COVID-19. The data is estimated using Microsoft Excel and Statistical Package for Social Sciences (SPSS) version 24.0.

The proxies for the variables are displayed in Table 2.

Table 2. Variables and the proxy used

Variables	Proxy	Description	Sources
Unemployment rate	Malaysia's percentage in the labour force that is jobless	An individual is not working, even though they can work, but still looking for the job	Giles et al. (2005)
GDP	The constant value of GDP consists of total consumer, investment, government spending, plus the value of export minus import (RM)	The total market value of all final goods and services produced by the country in a given year	Hameed & Ume (2011)
CPI	The weighted average of prices of a basket of consumer goods and services in Malaysia	Expenditure necessary for a household to achieve a given level of utility	Shapiro & Wilcox (1996)
Foreign Exchange rate	Value of MYR per USD	Exchange rate of one currency to another currency	Heller (1978)
Stock market Indices	Daily Kuala Lumpur Composite Index (KLCI)	Subsets of the stock markets measured by the index	Ou & Wang (2009)
COVID-19	COVID-19 daily active cases in Malaysia	The number of COVID-19 confirmed cases minus the number of recovered cases and deaths	Rath et al. (2020)

Equation 1 below shows the univariate regression model.

$$Y_n = \beta_0 + \beta_1 X + \varepsilon_n \qquad (n=1,2,3,4,5) \tag{1}$$

Whereby Y_i = Dependent variable for respective key economic indicators

β_0 = Intercept value of Y_n

β_1 = Gradient of X

X = Independent variable (COVID-19 cases)

ε_n = Error term

3.1 Forecasting method

The forecasts were generated using a linear trend model for each significant variable. Malim and Abdul Halim (2011) stated that this kind of forecast model is suitable for the long-term trend of various business and economic time series. Forecasting models based on regression or linear trend are examples of explanatory models constructed under the assumption that there is a possible relationship between the variable to be forecast and several independent variables. Thus, the formula for the linear trend model is written as in equation 2.

$$Y=a+bt \tag{2}$$

Whereby Y represents the predicted value of the actual value Y (COVID-19 cases) for a given value of t, a is the intercept of Y, b is the gradient of the forecast trend values, and t is any value of time that is selected.

4. Results and Discussion

This study examines COVID-19 towards selected vital economic indicators in Malaysia. The key economics proposed are unemployment, GDP, CPI, FOREX, and stock market index performance. This section will highlight critical discussions in this study. Before going into an in-depth discussion, there is a summary of the result to explain first.

Table 3. Descriptive statistics

Variable	Observations	Mean	Standard Deviation	Minimum value	Maximum value
Unemployment rate	196	4.484	0.6512	3.2	5.3
GDP	196	330791.34	25860.74	294250	352467
CPI	196	119.38	2.5717	110.9	122.4
Foreign exchange	196	4.2377	0.0815	4.0885	4.3485
Stock market index	196	1494.11	91.179	1219.72	1611.42
COVID-19 active cases	196	676.62	779.82	0	2579

This Table 3 reports the summary descriptive statistics of key variables. The total observations were 196 days, which the data is from 1 January 2020 to 30 September 2020. The mean value of unemployment rate is 4.484, which shows that on an average sample, Malaysia experienced 4.484 per cent in unemployment. Maximum and minimum of 5.3 and 3.2, respectively, show that unemployment rate swung between 3.2% to 5.3%. The mean value of GDP, 330791.34, shows that the country recorded an average GDP of RM 330,791.34 with the volatility swung between RM 294,250 to RM 352,467. Also, Malaysia's CPI recorded an average of 119.38 based on the mean value. Hence, CPI fluctuated between 110.9 to 122.4. The foreign exchange recorded a mean value of 4.2377, which means Malaysia's daily average foreign exchange is RM 4.2377 per USD. Therefore, the foreign exchange swung between RM 4.0855 to RM 4.3485. The stock market moves volatilely between 1219.72 to 1611.42, with the average recorded as 1494.11. Finally, the average daily COVID-19 cases are 676.62 with a standard deviation of 779.82. The minimum of COVID-19 cases is 0 because there are few days that Malaysia did not record any single case.

4.1 The coefficient of correlation, r

The correlation among the variables was determined using the Pearson product-moment correlation. The purpose of conducting correlation analysis is to measure the degree of association among the variables. Gogtay and Thatte (2017) stated that the relationship's range of strength was declared as 0.4, 0.6 and 0.8, categorised as weak, moderate and strong.

Table 4 explained the summary of degree for correlations between COVID-19 with the dependent variables (FOREX, unemployment rate, GDP, CPI and KLCI) respectively. All correlations indicated with a positive magnitude of the relationships. Besides, according to Chin (1998) and Wong (2013), the path coefficient's value should be greater than 0.20 in orders to demonstrate it's significant. Thus, all the correlations were significant as the values greater than 0.20 as in Table 4.

4.2 The coefficient of determination, R^2

Hair, Ringle and Sarstedt (2011) suggested the levels of predictive accuracy of 0.75, 0.50, and 0.25, which were categorised as substantial, average and weak according to the rule of thumb in business

management practices rule of thumb. Figure 3 and Table 4 show the R^2 value for KLCI is 0.528, which implies that the number of active COVID-19 cases predicts 52.8% of KLCI. Also, the R^2 for CPI is 0.284, which means that the COVID-19 cases explain 28.4% of this dependent variable. Besides, 46.9% of the unemployment rate is defined by the number of COVID-19 active cases. Next, the R^2 for GDP is 0.302, which indicates that COVID-19 cases explain 30.02% of this dependent variable. Lastly, the R^2 for FOREX interpreted as 43.6% of this dependent variable is defined by the predictor variable, COVID-19 cases.

Table 4. Model Summary

Hypotheses	Causal Relationship	Coefficient of determination		Coefficient of correlation	
		R^2	Predictive accuracy	r	Interpretation
H1	COVID-19 -> KLCI	0.528	Average	0.726	Strong, positive correlation
H2	COVID-19 -> CPI	0.284	Weak	0.533	Moderate, positive correlation
H3	COVID-19 -> Unemployment rate	0.469	Weak	0.683	Moderate, positive correlation
H4	COVID-19 -> GDP	0.302	Weak	0.549	Moderate, positive correlation
H5	COVID-19 -> FOREX	0.436	Weak	0.660	Moderate, positive correlation

Thus, overall, the proportions of variance explained by each dependent variable from the independent variable (COVID-19) are permissible.

Table 5 displays a summary of individual hypothesis testing, which present the key findings in this study. This study's key findings suggested that COVID-19 has significantly impacted the unemployment rate, GDP, CPI, FOREX, and stock market index performance in Malaysia. This result is based on p-value result less than 0.05 with a two-tailed test.

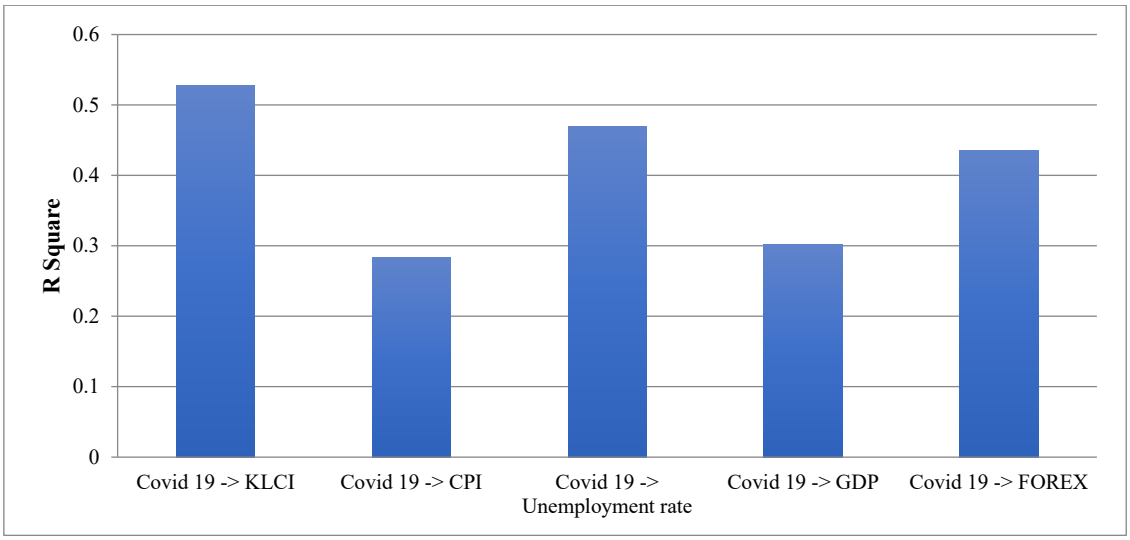

Fig. 3: Coefficient of determination R^2 of dependent variables

Another finding that considers in this study is by looking at beta (β). The beta in Table 5 indicates the significant predictor of the dependent variable. The beta for H1 (0.01) suggests that 1 unit of increasing COVID-19 case in Malaysia impacts the increment of 0.01% of the unemployment rate. In the other hand,

the beta of H2 (-18.219) indicates that 1 unit increasing of COVID-19 case in Malaysia will decrease by RM 18.22 of GDP. Besides, the beta of H3 (-0.002) shows that 1 unit of increase COVID-19 case in Malaysia will reduce CPI by 0.002. Similarly, the beta of H4 (0.660) provides insight that 1 unit of increase COVID-19 case in Malaysia will increase foreign exchange rate movement by RM 0.660 per USD. Finally, the beta of H5 (-0.085) demonstrates that the increase in 1-unit COVID-19 case in Malaysia will decrease stock market index performance by 0.085. The beta results conclude that GDP is the strongest predictor with beta value -18.219, and CPI is the weakest predictor with beta value -0.002 in predicting the impact of COVID-19 in this study. Table 6 shows the regression equations of every causal relationship in this study.

Table 5. Summary of hypothesis testing

	Statement	Y-intercept	β	t-value	p-value	Decision
H_1	COVID-19 has significant influenced on unemployment rate	4.097	0.01	13.079	0.000	Accept
H_2	COVID-19 has significant influenced on GDP	343.118	-18.219	-9.158	0.000	Accept
H_3	COVID-19 has significant influenced on CPI in Malaysia	120.572	-0.002	-8.777	0.000	Accept
H_4	COVID-19 has significant influenced on foreign exchange rate	4.191	0.660	12.251	0.000	Accept
H_5	COVID-19 has significant influenced on stock market index performance	1551.581	-0.085	-14.72	0.000	Accept

*Accepted hypothesis based on 95% confidence level (p-value < 0.05), two tailed tests.

Table 6. Relationships between independent and dependent variables with equations

Equations	Causal Relationship	Regression Equations
Equation 1	COVID-19 influences the unemployment rate	$Y1 = 4.097 + 0.01X$
Equation 2	COVID-19 influences GDP	$Y2 = 343.118 - 18.219X$
Equation 3	COVID-19 influences CPI	$Y3 = 120.572 - 0{,}002X$
Equation 4	COVID-19 influences Foreign Exchange rate	$Y4 = 4.191 + 0.660X$
Equation 5	COVID-19 influences stock market index performance	$Y5 = 1551.581 - 0.085X$

Note: Y_1 is the unemployment rate; Y_2 is GDP; Y_3 is CPI; Y_4 is the foreign exchange rate of RM/USD; Y_5 is stock market index performance (KLCI); X is COVID-19 cases as the independent variable.

Increases in COVID-19 cases positively influence the unemployment rate and Foreign exchange rate and adverse effect on GDP, CPI, and KLCI. This result means that due to the increase in COVID-19 outbreak, the country will face a higher unemployment rate and foreign exchange appreciation relative to RM. Besides, the country's GDP, CPI and stock market performance will be declining.

4.3 The three months' forecasting of Malaysia key economic performance impacted by COVID-19

Since all the key economic indicators resulted with significant impact by COVID-19, this section aims to project the trends for three months onward starting from 1 October 2020 until 31 December 2020. The

projections were based on the past nine months (196 days) time-series data from 1 January 2020 until September 2020.

4.3.1 Forecasting on Malaysia's unemployment rate

The forecasting on unemployment rate was assessed by using the linear trend model such, $Y = 3.8333 + 0.006t$.

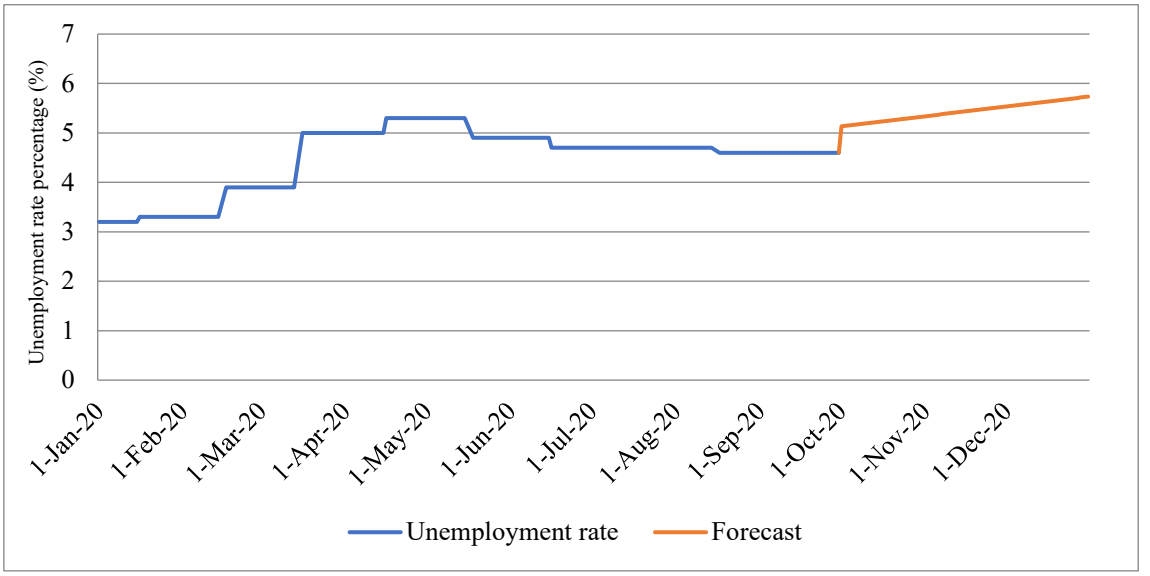

Fig. 4. 3 months' forecasting on the unemployment rate in Malaysia.

The previous data shows that upward and downward trend with the highest peak reaching was 5.3% between April and March 2020, as illustrated in Figure 4. The unemployment rate projection was predicted with increasing pattern in future until 5.7% at the end of the year 2020. The starting point of number cases began on 27 January 2020 and followed by implementing a movement control order on 18 March 2020. This lead to the economic trends becomes downward and the number of people expected to be retrenched going increased drastically, especially for aviation, and tourism industries in Malaysia.

4.3.2 Forecasting on Malaysia's GDP

GDP represents the measurement of the market value of all the final goods and services produced. Figure 5 shown the trend movement of actual data and projection of future trend. The projection trend yielded slightly increased in GDP value until the end of December 2020 by applying the linear trend model with the equation of Y=315056+159.7t

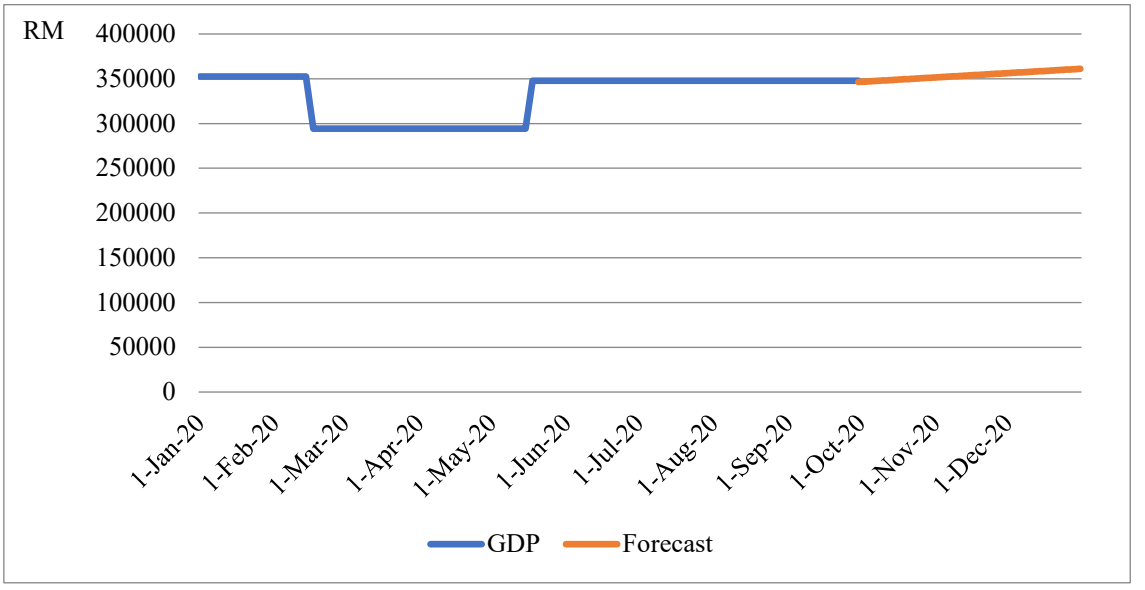

Fig. 5. 3 months' Forecasting on GDP in Malaysia

4.3.3 Forecasting on Malaysia's CPI

Next, Figure 6 presents for the trend projection of CPI in Malaysia during COVID-19 pandemic. CPI is crucial as the determination of the cost of living for consumer-based of the prices changes.

The previous CPI trend has shown the decreasing pattern until it drastically dropped at the end of September 2020. This forecasting contributed to estimating the future trend, which has been proved by using the linear trend foresting model. ($Y = 121.63 - 0.00228t$) Hence, it resulted in a decreasing pattern until the end of the year 2020. Therefore, the assumption of inflation would be rising in future.

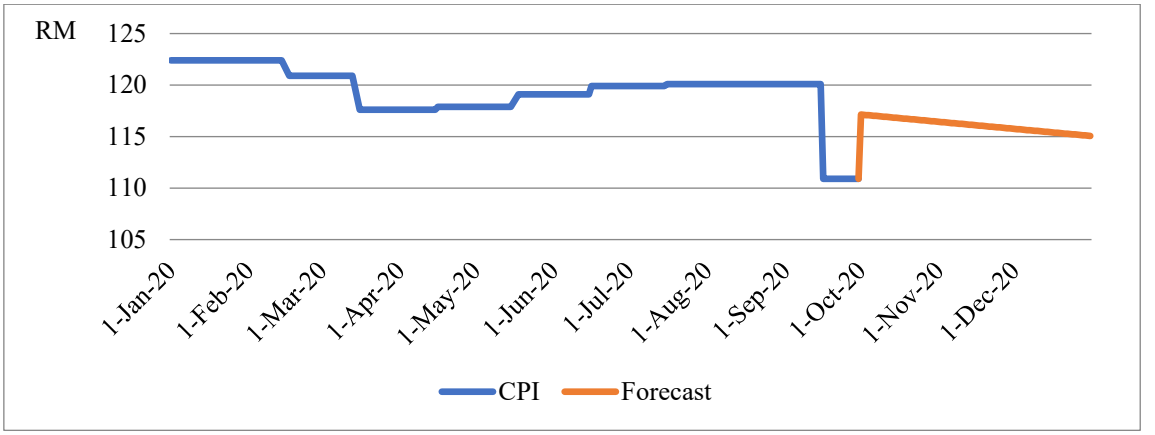

Fig. 6. 3 months' forecasting on CPI in Malaysia

4.3.4 Forecasting on Malaysia's foreign exchange rate movement

Figure 7 elaborated the foreign exchange rate movement of (Malaysian Ringgit) MYR towards (United States of Dollar) USD currency. The stability of MYR found before COVID-19 with 4.1 and the money rise to 4.3 per USD in May 2020. However, the trend decreases slightly until the end of September 2020.

The forecasting trend was projected with a small increment per month until the end of 2020 through the linear trend equation $Y = 4.2391 - 0.000005t$. Thus, it is expected that MYR money's value will be dropped in future if the COVID-19 cases still exist.

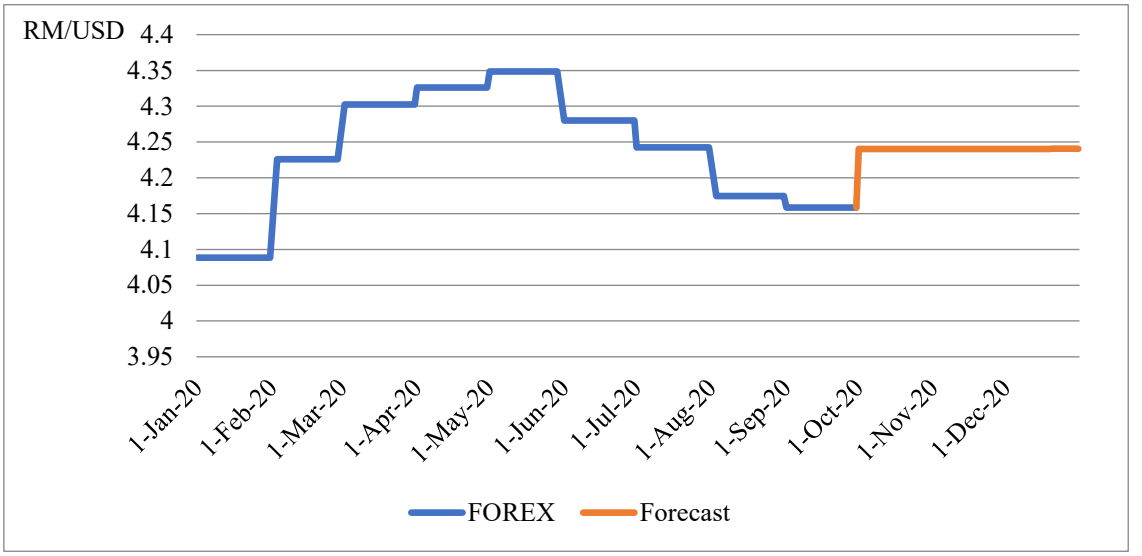

Fig. 7. 3 months' Forecasting on the foreign exchange rate in Malaysia (RM per USD)

4.3.5 Forecasting on Malaysia's stock market indices

Also, the critical factors that indicated influences significantly by COVID-19 cases were stock market indices. The trend projection for the stock market index has been shown, as depicted in Figure 8.

The past trend was experienced with the irregularity of drop value in stock market indices (16 March 2020, 1280.63). Then, following the trend turned to uniformly up and down until the end of September 2020. The future trend predicted a little increment for stock market indices by using linear trend forecasting model $= 1.2163 - 0.0028t$. This prediction is beneficial to the investors in comparing the current price levels with the past prices to calculate the market performance.

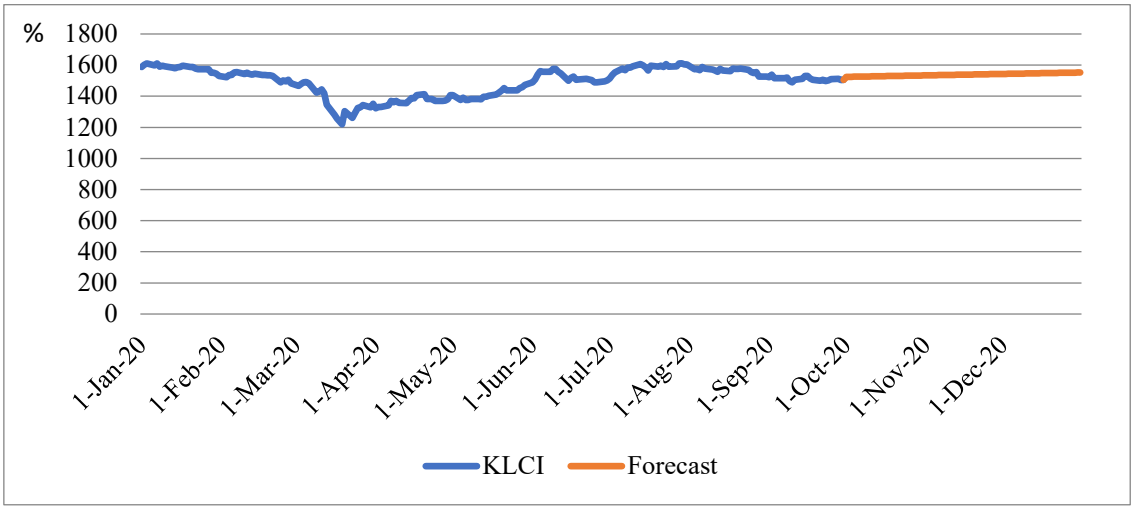

Fig. 8. 3 months' forecasting on stock market indices in Malaysia

5. Conclusions

This study examines the role of COVID-19 active cases in influencing key economic indicators' performances in Malaysia. The researchers collected data from Thomson Reuters DataStream from 1 January 2020 to 30 September 2020. Using simple linear regression and linear trend forecasting model, there are several exciting results to highlight here.

This study reveals that Malaysia's COVID-19 cases statistically influence all the five key economic performance indicators – unemployment rate, GDP, CPI, foreign exchange rate movement, and stock market index performance. Based on the results, it seems that COVID-19 cases affected the KLCI market performance the most as its coefficient is the most enormous relative to the other dependent variables. The findings also indicated that GDP deemed as the strongest predictor, and CPI is the weakest predictor in measuring the impact of COVID-19 in this study. The results of projecting the upcoming three months trends were forecasted to increase unemployment, GDP, FOREX, and stock market index performance. Instead, the CPI is expected to decrease.

Furthermore, this study provides four contributions. First, this study would fill the gap by providing the statistical test for COVID-19 impact on Malaysia's selected vital economic indicators. Hence, this paper will contribute towards the development of the relationship between COVID-19 cases versus economic performance. Secondly, this study is recent research and kept updating the latest economic situations since January 2020. It is expecting that COVID-19 cases are still ongoing, possibly within one year or two. Third, other researchers have the opportunity either to apply the framework of this study or to strengthen it. This framework can be tested by other researchers from different contexts and different country. Finally, the findings of this paper will reflect the Government's policy implementation. Therefore, Figure 9 indicates the validated framework of this study.

5.1 Managerial implication

Due to pandemic COVID-19, many employees were retrenched, loss jobs, and lost their main income to support the family. On the other hand, if the unemployment keeps rising for many months to come, it will put downward pressure to wages (Larue, 2020) to either delay the salary or pay cuts (Ning and Wang, 2020). Therefore, in terms of reducing the unemployment burden faced by most of the employee, it is

suggested by Che, Du and Chan (2020) and Larue (2020), that Government should come out with the initiative of Unemployment Insurance Scheme (UIS). This initiative is one-off subsidies for the purpose to stimulate their financial management to avoid the constraints.

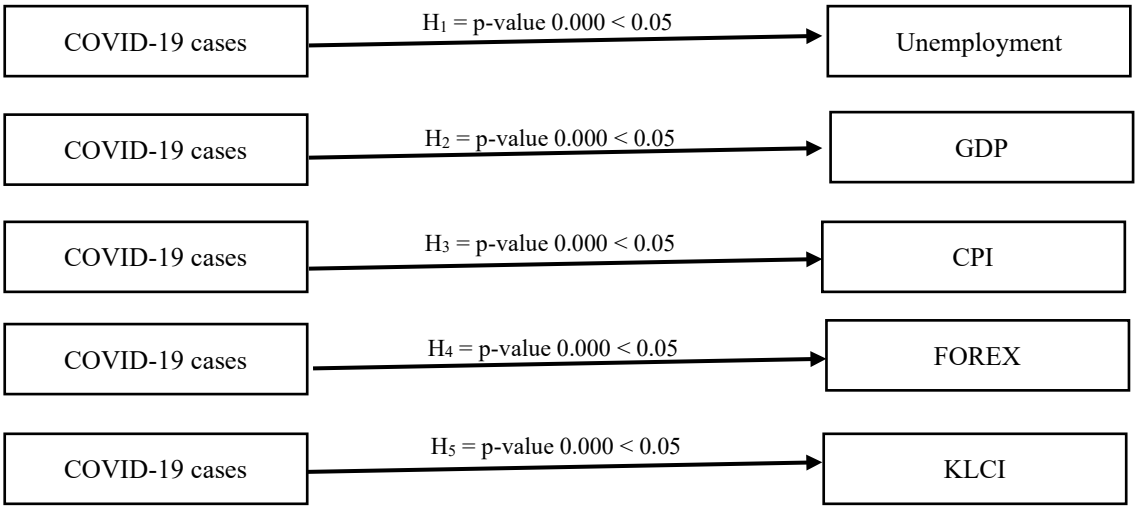

Fig. 9. A validated framework for the role of COVID-19 active cases in Malaysia in influencing key economic indicators

COVID-19 cases are impacting GDP significantly. The Government can increase GDP through investment, especially towards the health sector. It can also expand through domestic borrowing (Adam, Henstridge and Lee, 2020). The Government will use the investment to purchase medicine, add more medical facilities, and buy vaccine with the hope of reducing COVID-19 cases and heading towards full recovery. Domestic borrowing can be done through Government's borrowing in treasury securities or securities borrowed from Central Bank. However, there is a risk that public debt will increase as well.

Since COVID-19 provides a significant impact on CPI, there are few suggestions to improve CPI. One of them is balancing between demand and supply. By doing that, the goods' price will be stabilised, the inflation rate will be maintained, and the CPI will be consistent.

COVID-19 cases are significantly impacting foreign exchange movement. However, foreign exchange can still play an essential role as a key economic indicator. Foreign exchange is also sensitive and quickly react towards any events such as natural disasters and pandemics. Investors and currency trader should not become panic when COVID-19 cases in still ongoing. They can have a look at other different foreign exchange investment strategy such as hedging and forward contract. Thus, it will reduce the investor's risk towards the exposure of exchange rate risk. There is a possibility that COVID-19 has a significant impact on foreign exchange in the future if foreign investors are taking away their money out of Malaysia in the future. If it happens, the value of Ringgit Malaysia will be drop massively.

Stock market index performance has a severe impact from COVID-19 massacre. To improve stock market performance stability, it is advisable for investors to not react with panic on any uncertain business and economic news. Investors are encouraged to hold their share investment for the time being until the pandemic is over.

5.2 Limitations and Future Research

Indeed, there are a few limitations of this study. First, due to COVID-19 cases is still ongoing and considered at the growth phase. The remaining unanswered question is, what will happen if COVID-19 still impacting the key economics after one year or two? Therefore, the researchers will expect that the cases will continue for another 12 months and more. Currently, this study collected data for nine months from January 2020 to the end of September 2020. Hence, future research can be conducted by extent, this study towards a longer duration for another 12 months to 24 months. It will expect that the result might be better.

Second, this study might answer the question related to COVID-19 cases towards unemployment, GDP, CPI, foreign exchange, and CPI. However, there is a remaining unanswered question - Is unemployment rate, GDP, CPI, FOREX, and stock market index performance is the only key indicators in measuring the impact of COVID-19? Hence, there will be more key economic indicators can be calculated together with the nexus of COVID-19 such as foreign direct investment, net trade balances, price of crude oil, inflation rate, and economic growth rate. Those constructs can be used as a suggestion to conduct further research. Furthermore, the proposal is to test and expand this study to other countries as well.

Besides, this study only uses simple linear regression to examine the impact of COVID-19 on key economic indicators. Hence, there is a suggestion for future research. To find the minimal error of forecasting method analysis, few other methods can be applied such as moving average method, exponential smoothing techniques and Holt's methods. Furthermore, the tools could be employed using e-views or R studio, since those tools are related to time series analysis.

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