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THE EFFECT OF MINIMUM WAGE POLICY ON MALAYSIA'S CPI & PPI: AN INTERVENTION ANALYSIS

(*Kesan Polisi Gaji Minimum ke Atas Indeks Harga Pengguna dan Indeks Harga Pengeluar Malaysia: Satu Analisis Intervensi*)

EMERZALINA EMERALDI & SITI NORAFIDAH MOHD RAMLI*

ABSTRACT

The minimum wage policy in Malaysia has been debatable due to contradicting perspectives among consumers and producers. While the consumers believe that the minimum wage policy is important to support their increasing cost of living, this policy has raised concerns among producers as they believe that this intervention might increase the cost of production, especially to producers who have been paying wages lesser than the policy's rate. Hence it is important to numerically assess the impact of the policy on Malaysia's consumer price index (CPI) and producer price index (PPI). To achieve this main objective, we built an intervention model using time series analysis and multiple linear regression. Based on both analyses, we conclude that only the PPI shows significant changes following the minimum wage policy implementation, whereby a decrease of 97.3% occurred in every month of 2014. However, there was no significant effect on the CPI during the first year of its establishment. Our 3 months forecast for the year 2018 also shows that the forecast of both indices is within the 95% confidence interval, which could imply that both indices are following the same fundamental structure during the 3 months period, despite the change in the Malaysian government ruling party.

Keywords: intervention analysis; ARIMA; multiple linear regresion; producer price index

ABSTRAK

Dasar gaji minimum di Malaysia banyak diperdebatkan kerana perspektif yang bercanggah di kalangan pengguna dan pengeluar. Para pengguna mengalukan dasar gaji minimum bagi menyokong peningkatan kos sara hidup, dasar ini menimbulkan kebimbangan di kalangan pengeluar kerana kemungkinan peningkatkan kos pengeluaran, terutamanya bagi pengeluar yang membayar gaji lebih rendah daripada kadar dasar yang ditetapkan. Oleh itu, adalah penting untuk menilai kesan dasar ini terhadap indeks harga pengguna (CPI) dan indeks harga pengeluar (PPI) Malaysia. Untuk mencapai objektif utama ini, model intervensi dibina menggunakan analisis siri masa dan regresi linear berganda. Berdasarkan kedua-dua analisis, hanya IHPR menunjukkan perubahan ketara berikutan pelaksanaan dasar gaji minimum, yang mana penurunan sebanyak 97.3% berlaku pada setiap bulan 2014 secara purata. Walau bagaimanapun, tiada kesan ketara ke atas IHP pada tahun pertama pelaksanaannya. Ramalan 3 bulan kami untuk tahun 2018 juga menunjukkan bahawa ramalan kedua-dua indeks berada dalam selang keyakinan 95%, yang mana ia mungkin bermakna bahawa kedua-dua indeks mengikuti struktur asas yang sama bagi tempoh 3 bulan selepas perubahan parti pemerintah kerajaan Malaysia.

Kata kunci: analisis intervensi; ARIMA; regresi linear berganda; indeks harga pengeluar

1. Introduction and Literature Review

The prompting to implement a minimum wage policy in Malaysia has been going on since 1998 by the Malaysian Trade Union Congress (MTUC), (New Straits Times 2014) but the government did not take the initiative at that time. Eventually enforced in Malaysia in 2014 during the premiership of 6th Prime Minister Datuk Seri Mohd Najib Tun Abdul Razak, the minimum wage policy should be implemented as the percentage of workers' income to the

Gross Domestic Product (GDP) is very low (Saari 2016), indicating that the salary compensated to workers is relatively lower than the productivity contributed to a company. This is supported by the World Bank findings, which found that from 2003 to 2013, wages in Malaysia only increased slightly while productivity and cost of living increased more actively, with a percentage of 2.6% and 6.7%, respectively (Mahyut 2013). A Ministry of Human Resources study 2009 found that 33.8% of private sector workers were paid less than RM700 per month, lower than the Poverty Line Income, which was RM800. In formulating the suitable minimum wage rate level, the National Wages Consultative Council (NWCC), established under the NWCC Act 2011, is responsible for consulting the public as well as collecting and analysing the relevant data before making recommendations to the Malaysian government (International Labour Organization 2022).

Implementing the minimum wage policy resulted in a mixed response from employees and employers. A study by Panjawa and Soebagiyo (2014) on the factors affecting the level of unemployment in Surakarta, Indonesia, found that an increase in the minimum wage will significantly increase the unemployment rate due to wage rigidity that occurs as employers fail to meet the wage requirement. On the other hand, the minimum wage level has a positive effect on the labour productivity of unskilled workers in the field of electricity and electronics in Penang, Malaysia and no adverse effect on changes in fringe benefits received by employees (Senasi *et al.* 2021). A study by Cuong (2011) in Vietnam shows that the increase in the minimum wage rate does not lead to an increase in inflation as the change in the minimum wage level is often implemented during the Vietnamese New Year festival. Rather, increased inflation was caused by the increased consumer demand during the festival. The results of this study have found that the minimum wage has a positive relationship with labour productivity.

Mahyut (2013) argued that one of the challenges when implementing the minimum wage policy is the reluctance of some employers to implement the policy at the regulated time due to the allegedly discouraging economic environment post-Covid-19 pandemic stemming from the fear of potentially high production costs. Additionally, there is a belief that the increase will only benefit foreign workers resulting in increased money outflow to their country of origin (Harian Metro 2022). According to Mahyideen *et al.* (2022), among the important factors to be considered are the current Poverty Line Income, median salary, consumer price index (CPI) and inflation rate instead of factors such as gender, education and field of work. A study by Setyowati (2006) on the factors influencing the setting of the regional minimum wage in Central Java, Indonesia, found that the minimum wage level in the region was positively influenced by the need to live a minimum life, labour productivity, industry influence on the Regional Domestic Product and CPI.

In Malaysia, the CPI positively correlate with macroeconomic variables such as broad money, export of goods and services, GDP and consumption of goods and services by households (Venkadasalam 2015). Conversely, Zulkifli *et al.* (2021) found that CPI has a significant negative relationship with house prices in the long term, while only GDP and money supply as macroeconomic determinants significantly impact house prices in Malaysia in the immediate timeframe. Yusof *et al.* (2021) found a significant relationship between the exchange rate, government spending and the unemployment rate against inflation measured through CPI. Khamis *et al.* (2018) built a model to forecast the Malaysian CPI value over a period of one year by using time series and simple linear regression analyses that produce a model with low forecast errors.

The relationship between CPI and the producer price index (PPI) is important for economic policymakers in understanding and managing inflation within a nation. Using Johansen's cointegration method, Ghazali *et al.* (2008) found that the CPI and PPI of Malaysia will grow at the same rate in the long run. A study by Adebola *et al.* (2011) on macroeconomic variables of Malaysia on the influence of industrial production index, interest rate and PPI on non-

performing loans (NPL) of Islamic banks found that PPI has a significant negative effect on unpaid loans, implying that an increase in PPI results in the rate of NPL to decrease.

Implementing the minimum wage policy added to the total production costs, thereby affecting the ultimate price paid by the consumers if the labour costs component is significant. Hence the enforcement of the minimum wage policy can be seen as an economic intervention within a country. In the intervention analysis, two functions are utilized, which are the step and pulse functions. While step function analysis is used when an intervention occurs over a long period, the pulse function intervention analysis is used when the intervention takes place at a specific time only (Crystine *et al.* 2014). Bakar (2018) conducted a time series analysis to examine the impact of the goods and services tax (GST) on Malaysia's CPI and found that the GST impact on inflation is only temporary. The significance of the intervention coefficient was then assessed with hypothesis testing of regression coefficients. Afrah (2017) also used step function intervention analysis to estimate CPI values in Indonesia and found that the CPI value of Indonesia from August 2016 until March 2017 will experience a very small increase with a slight difference between the forecast data and the actual data. Nuralaina (2016) forecasted the exchange rate of the rupiah to the dollar and obtained a 30-day rupiah-USD exchange forecast using the built intervention analysis model. To measure the impact of the MH370 loss incident and the Bali bomb incident, Mukhlis *et al.* (2015) employed the pulse function on the related time series. It was found that while the loss of MH370 does not affect the sale of Malaysia Airlines (MAS) shares, the Bali bomb incident impacted the rate of foreign tourists entering Indonesia at the time of the incident and one month after the incident occurred. The best intervention model to forecast the stock price of Bank Negara Indonesia throughout the month of June 2019-July 2020 was obtained by Lorensya *et al.* (2022).

In a comparison between Malaysia's PPI forecasted using ARIMA against Grey modelling, Khamis and Xin (2020) found the ARIMA model to perform better. Jauhir *et al.* (2001) have also used time series analysis to produce an ARIMA model that can predict dissolved oxygen concentration in Sungai Langat, Hulu Langat Selangor. Ningsih and Andiny (2018) found that inflation and economic growth did not affect the poverty level of the Indonesian population at the same time. A study by Shafiee (2015) examined the implications of the minimum wage policy on Malaysia's economic growth and found that the CPI has a positive impact on Malaysia's economic growth along with the labour force participation rate. Additionally, Zainal (2021) conducted a regression analysis of panel data to examine the relationship between CPI and inflation in Indonesia and found that CPI has a significant influence on inflation. To the best of our knowledge, in the case of Malaysia, this study may be the first quantitative work applied on minimum wage policy, involving intervention analysis. The previous work applying intervention analysis was done on the GST policy (Bakar 2018), while the work by Shafiee (2015) on Malaysia minimum wage policy was done using multiple linear regression with low R^2 (i.e., the model didn't fit well). On the contrary, Mahyut (2013) examined the qualitative perspective, aiming to identify the challenges in reducing the unemployment rate through minimum wage.

The rest of the article is organised as follows: In section 2, we first introduce the data used, which are the monthly CPI and PPI in Malaysia for the period ranging from January 2007 until December 2017. We also introduce the models used in the intervention analysis, which are the time series analysis with dummy variable and multiple linear regression with hypothesis test. We start section 3 by presenting the summary statistics of both indices and highlighting the relation between the indices and a recession phase in the US during the period of 2007-2017. We then discuss the results and analysis after showing the parameter values of the time series and regression expressions. After forecasting both indices for 3 months in 2014 and 2018 to test the accuracy of models, we conclude the article in Section 4.

2. Data & Methodology

An intervention analysis is useful to analyse the effect of sudden events on time series data, assuming that the fundamental structure of the time series holds before and after the intervention. This study attempts to produce four time series models taking the nature of an ARIMA (*p*,*d*,*q*). Given that the minimum wage policy was enforced in 2014, we then developed a post-intervention model for each index while adding a dummy variable representing months in the intervention year 2014. The magnitude of the intervention effect is then identified by the value of the dummy variable coefficient β at the end of the study.

2.1. *Data*

The CPI is a measure of the percentage change in purchase costs for a fixed "basket" of goods over a period of time. An increasing purchase cost for the fixed "basket" indicates that the price of goods is also increasing. On the other hand, Producer Price Index (PPI) is an index based on production that measures changes in commodity prices for local market sales. A rise in PPI indicates that production costs are rising, which could be passed onto the consumers and subsequently affect the CPI. This makes the two indices popular macroeconomic indicators to monitor inflation, with the PPI as the leading indicator and the CPI as a lagging indicator.

While both CPI and PPI are used to measure inflation (Majaski n.d.), the PPI measures inflation from the producer's standpoint, which is the average selling price received for the output produced, and CPI is a measure of inflation from the consumer's perspective which is the price of goods and services paid. The Laspeyres formula of CPI and PPI are given by

$$CPI_t^{(L)} \; or \; PPI_t^{(L)} = \frac{\sum_{\forall i} P_t^{(i)} \cdot Q_0^{(i)}}{\sum_{\forall i} P_0^{(i)} \cdot Q_0^{(i)}} \tag{1}$$

while the inflation rate π_t is computed as follows

$$\pi_t = \left(\frac{CPI_t^{(L)} - CPI_{t-1}^{(L)}}{CPI_{t-1}^{(L)}}\right) \times 100 \;\; or \; \pi_t = \left(\frac{PPI_t^{(L)} - PPI_{t-1}^{(L)}}{PPI_t^{(L)}}\right) \times 100 \tag{2}$$

where $CPI^{(L)}_t$ or $PPI^{(L)}_t$ is the Laspeyres CPI or PPI price at time *t*, $P_t^{(i)}$ is the average price of good *i* at time *t*, $P_0^{(i)}$ is the average price of good *i* at time 0 (i.e., base price) and $Q_0^{(i)}$ is the quantity of product *i* purchased/sold at time 0 (i.e. base quantity).

We examine 132 Malaysia's CPI and PPI monthly data as secondary data obtained from the CEIC and DOSM websites. With a total of 264 monthly observations ranging for 11 years from January 2007 until December 2017, we divided the data into two timeframes showing pre-intervention (2007-2013) and post-intervention (2014-2017) phases.

2.2. *Time series analysis*

We conduct a time series data analysis using the ARIMA function in R software. After checking for stationarity with the Augmented Dickey-Fuller (ADF) test, we conduct parameter estimation and perform diagnostic checks with the Ljung-Box test for each dataset to check if the fitted model has autocorrelated residuals. The autoregressive integrated moving average (ARIMA) (*p*,*d*,*q*) model is an ARMA(*p*,*q*) model that goes through the differentiation process for *d* times to ensure stationarity. Its expression is given by

$$y_t^{(d)} = c + \emptyset_1 y_{t-1}^{(d)} + \emptyset_2 y_{t-2}^{(d)} + \cdots + \emptyset_p y_{t-p}^{(d)} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \cdots + \theta_q \varepsilon_{t-q} \tag{3}$$

with $y_t^{(d)}$ = CPI or PPI value at time *t*, c = constant variable, $\emptyset_i$ = regression parameter for AR at i = 1, 2, …, p, θ_i = regression parameter for MA at i = 1, …, q at i = 1, …, q, ε_t = error at time *t* and *d* = differentiation order. Among all the models considered, we will choose the model with the smallest AICc value as the best model.

To test the reliability of the model during the pre-intervention models, we forecast CPI and PPI values for January, February and March of 2014, and compared them with the actual data. Analogously, the reliability of the model during the post-intervention period will be tested on January, February and March 2018 data. We will also obtain the 95% confidence interval of our forecast using R software to see if the actual data is within the range of predictions. At the end of the study, we will produce two models for each index during the pre- and post-intervention period (see Table 1).

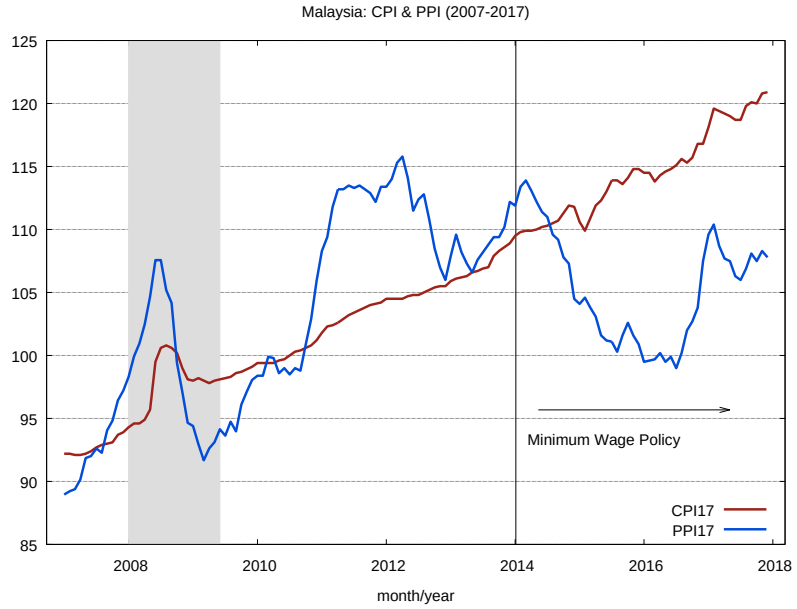

Figure 1: Malaysia's CPI and PPI (2007-2017)

Table 1: ARIMA models that will be produced after using time series analysis

Indices	**Pre-intervention** (2007-2013)	**Post-intervention** (2014-2017)
CPI	CPI1	CPI2
PPI	PPI1	PPI2

Once the ARIMA model is obtained, a dummy variable representing the year 2014 will be added to the two post-intervention ARIMA models (CPI2 & PPI2). The equation is given as

$$y_t^{(d)} = c + \emptyset_1 y_{t-1}^{(d)} + \emptyset_2 y_{t-2}^{(d)} + \cdots + \emptyset_p y_{t-p}^{(d)} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \cdots + \theta_q \varepsilon_{t-q} + \beta D_{14} \quad (4)$$

whereby $y_t^{(d)}$ = CPI or PPI value at time *t*, c = constant variable, $\emptyset_i$ = regression parameter for AR at i = 1, 2, …, *p*, θ_i = regression parameter for MA at i = 1, …, q ε_t = error at time *t*, *d* = differentiation order and D_{14} = 1 for every month in 2014, 0 for others.

2.3. *Multiple linear regression & intervention model*

We then conduct a multiple linear regression to analyse the influence of the policy on the monthly data in 2014, as represented by Eq. (4). The regression parameters, which are c, $\emptyset_1$, …, $\emptyset_p$, θ_1, …, θ_q and β, will be estimated using SPSS software together with the t-statistic and the p-value for each parameter.

We conduct hypothesis test to ascertain whether there exists a linear relationship between the dependent variable and at least one independent variable as given below:

$H_0: \emptyset_1 = \cdots = \emptyset_k = 0$

$H_1: \emptyset_k \neq 0$

for at least one k. The regression model is appropriate if there exists a linear relationship between the dependent variable and one of the independent variables. H_0 is rejected if the F-statistic test value obtained is greater than the critical value, which is $F_{\alpha,k,(n-k-1)}$ with k being the number of expected parameters. We then refer to the adjusted R^2 to determine the variation of the fitted model.

To examine the importance and significance of each coefficient, we conduct the individual coefficient test:

$H_0: \emptyset_j = 0 \; vs. H_1: \emptyset_j \neq 0$

and reject H_0 if the coefficient $\emptyset_j$ is not significant, as indicated by the t-statistic test value that is greater than the critical value ($t_{\frac{\alpha}{2},n-k-1}$) or by the p-value is being smaller than the significance level.

3. Results & Analysis

As illustrated in Figure 1, Malaysia's CPI trend was ever-increasing, while the PPI counterpart fluctuated during the period studied (January 2007 to December 2017). The shaded grey area indicates a recession in the US, as one of Malaysia's major trading partners, as defined by the National Bureau of Economic Research (NBER). The NBER recession periods lasted for more than a few months and occurred together with Global Financial Crisis in 2008. The significant decline in the US economic activity that spread across the economy could be one of the factors affecting Malaysia's CPI and PPI movements during that period.

We then obtain the descriptive analysis of both time series to identify specific points of interest in a quantitative format. Table 2 shows that the Malaysia CPI has increased by 31.3% in 11 years (from 2007 to 2017), while PPI has increased by 30.11% only in 5 years (from 2007 to 2012) before gradually decreasing afterwards (see Figure 1). Next, the value of CPI variance is also higher compared to PPI, indicating that the CPI data is more dispersed than the PPI data. From the statistical viewpoint, a high variance implies that the data is less consistent and hence it is more difficult to forecast.

Table 2: Descriptive analysis of CPI and PPI data of Malaysia

	CPI	**PPI**
Time range	2007 – 2017	
Mean	105.63	103.92
Standard Deviation	7.98	6.96
Variance	63.7	48.47
Range	28.8	26.8
Minimum	92.1 (Mar 2007)	89.0 (Jan 2007)
Maximum	120.9 (Dec 2017)	115.8 (Apr 2012)

3.1. *Time series analysis*

This analysis is performed to identify the original structure of the appropriate model before a dummy variable is included. This analysis consists of several steps known as tentative identification, parameter estimation, diagnostic checking and forecasting. As shown by Table 1, a total of four models are produced, which are the CPI model for pre-intervention (CPI1) and post-intervention (CPI2), and the PPI model for the pre-intervention (PPI1) and post-intervention (PPI2) periods.

In the tentative identification phase, we determined that the data are stationary with the respective difference order as in Table 3:

Table 3: CPI and PPI data after being differenced for *d* times

Data	Difference order, *d*	*p*-value	Implication
CPI1 (2007-2013)	1	0.01	Stationary
CPI2 (2014-2017)	1	0.01	Stationary
PPI1 (2007-2013)	2	0.01	Stationary
PPI2 (2014-2017)	2	0.01	Stationary

Upon the visual examination on ACF and PACF graphs for each stationary CPI1, CPI2, PPI1 and PPI2 data set, we determine that the best model is the one with the smallest corrected Akaike's Information Criteria (AICc) value among the candidates of the models computed by the ARIMA R-package as presented in Table 4.

Table 4: AICc values for potential model of CPI1, CPI2, PPI1 and PPI2 data

CPI1: Model	**AICc value**
ARIMA (0,1,1)	113.39
ARIMA (1,1,1)	110.13
ARIMA (2,1,1)	112.27
ARIMA (1,1,0)	108.12
ARIMA (1,1,2)	111.62
CPI2: Model	**AICc value**
ARIMA (0,1,0)	85.00
ARIMA (0,1,1)	76.27
ARIMA (1,1,0)	81.06
ARIMA (1,1,1)	77.58
PPI1: Model	**AICc value**
ARIMA (0,2,1)	279.07
ARIMA (1,2,0)	282.23
ARIMA (1,2,1)	274.08
ARIMA (1,2,2)	275.31
ARIMA (2,2,1)	275.12
PPI2: Model	**AICc value**
ARIMA (0,2,0)	154.03
ARIMA (0,2,1)	148.30
ARIMA (1,2,0)	151.50
ARIMA (1,2,1)	146.26
ARIMA (0,2,2)	147.48

Based on Table 4, the lowest AICc value for the stationary data set CPI1, CPI2, PPI1 and PPI2 are given by the models ARIMA(1,1,0), ARIMA(0,1,1), ARIMA(1,2,1) and ARIMA(1,2,1) respectively with the following form:

$$y_{t,1}^{(1)} = c + \emptyset_1 y_{t-1}^{(1)} + \varepsilon_t \tag{5}$$

$$y_{t,2}^{(1)} = c + \varepsilon_t + \theta_1 \varepsilon_{t-1} \quad (6)$$

$$z_{t,1}^{(2)} = c + \emptyset_1 y_{t-1}^{(2)} + \varepsilon_t + \theta_1 \varepsilon_{t-1} \quad (7)$$

$$z_{t,2}^{(2)} = c + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} \quad (8)$$

with the estimated parameters for each data set shown in Table 5. Stationary CPI1 and CPI2 after first differencing are denoted by $y_{t,1}^{(1)}$ and $y_{t,2}^{(1)}$, whereas stationary dataset of PPI1 and PPI2 after second differencing is denoted by $z_{t,1}^{(2)}$and $z_{t,2}^{(2)}$ respectively.

Table 5: CPI and PPI models before adding a dummy variable and the respective Ljung-Box test

Model	2007 – 2017 no int.	2007 – 2013 pre int.	2014 – 2017 post int.
CPI	$y_t^{(1)} = 0.217 + \varepsilon_t + 0.431\varepsilon_{t-1}$	$y_{t,1}^{(1)} = 0.2 + 0.445y_{t-1}^{(1)} + \varepsilon_t$	$y_{t,2}^{(1)} = 0.238 + 0.555\varepsilon_{t-1} + \varepsilon_t$
PPI	$z_t^{(1)} = 0.623z_{t-1}^{(1)} + \varepsilon_t$	$z_{t,1}^{(2)} = 0.514z_{t-1}^{(2)} + \varepsilon_t - \varepsilon_{t-1}$	$z_{t,2}^{(2)} = 0.38z_{t-1}^{(2)} + \varepsilon_t - \varepsilon_{t-1}$

As shown in Table 5, without period separation (2007-2017 no int.), the model for CPI is ARIMA(0,1,1). After separating the two periods to pre-intervention (2007-2013 pre-int.) and post-intervention (2014-2017 post int), the CPI shows an ARIMA(1,1,0) model before the minimum wage policy is implemented and an ARIMA(0,1,1) after the policy is implemented. PPI data shows the ARIMA(1,2,1) model for the period before the implementation of the policy and ARIMA(0,2,2) after the implementation of the policy, different from the ARIMA(1,1,0) model if the modeling is carried out without the separation of periods.

The Ljung-Box test conducted on all four models show that the model residuals do not have autocorrelation.

3.2. *Intervention model & multiple linear regression*

We then add a dummy variable to the time series models for CPI2 and PPI2 dataset to produce two intervention models and examine the numerical impact of the policy on the respective indices. The model takes the following form for CPI2 and PPI2, respectively:

$$y_t^{(1)} = c + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \beta D_{14} \quad (9)$$

$$y_t^{(2)} = c + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \beta D_{14} \quad (10)$$

where D_{14} = 1 for every month in 2014, 0 for others.

Table 6: Parameter estimation of CPI2 & PPI2 model

CPI2	**Coefficient**	**t-statistics**	**p-value**
Constant	0.223	2.598	0.013
MA(1)	0.379	2.528	0.015
D_{14}	-0.056	-0.328	0.744
PPI2	**Coefficient**	**t-statistics**	**p-value**
Constant	0.227	1.432	0.159
AR(1)	-0.408	-3.726	<0.001
MA(1)	-0.720	-5.344	<0.001
D_{14}	-0.973	-2.993	0.005

Based on Table 6, the policy resulted in following equations for CPI2 and PPI2 respectively,

$$y_t^{(1)} = 0.223 + \varepsilon_t + 0.379\varepsilon_{t-1} \tag{11}$$

$$y_t^{(2)} = \varepsilon_t - 0.408y_{t-1}^{(2)} - 0.72\varepsilon_{t-1} - 0.973D_{14} \tag{12}$$

In comparison to values in Table 5, it can be seen that the CPI and PPI models for 2014-2017 have different coefficient values from the model that includes intervention factors. The results show that the minimum wage policy that was implemented for the first time in 2014 overall did not have a significant impact on the CPI for one year of its implementation. This is evident by the findings of the study which show that the coefficient value of the quantitative variable representing the months for the year 2014 is not significant.

The results of the analysis done for the PPI2 model show that the coefficient of the dummy variable is significant after one year of implementation of the minimum wage policy. The result of parameter estimation shows a decrease of 97.3% against PPI for each month in 2014 after the implementation of the minimum wage policy. Nevertheless, we cannot be certain that the policy is the sole factor causing the reduction in PPI, as the index is also exposed to other factors, such as the price raw materials to account for items that undergo the stage of production ranging from raw materials, intermediate materials to finished goods.

We then forecasted the CPI and PPI indices for the first 3 months of the year 2014 and after the 14th general election in 2018 (see Table 7). The forecasted values are all within the 95% confidence interval indicating that the effect of a change in government ruling party in May 2018 and the 0% GST did not have an immediate effect on the two indices.

Table 7: First three months of 2014 CPI and PPI, 2018 CPI and PPI forecasts

Month	**Actual CPI 2014**	**Forecasted data**	**Difference**	**Confidence interval (95%)**
Jan	109.5	109.1	0.4	[108.2,109.9]
Feb	109.8	109.1	0.7	[107.5,110.8]
Mar	109.9	109.2	0.7	[106.9,111.5]
Month	**Actual CPI 2018**	**Forecasted data**	**Difference**	**Confidence interval (95%)**
Jun	119.6	120.7	-1.1	[116.8,124.5]
July	119.8	120.7	-0.9	[116.5,124.9]
Aug	120.0	120.7	-0.7	[116.2,125.2]
Month	**Actual PPI 2014**	**Forecasted data**	**Difference**	**Confidence interval (95%)**
Jan	111.9	113.4	-1.5	[110.9,115.8]
Feb	113.4	114.1	-0.7	[109.7,118.5]
Mar	113.9	114.7	-0.8	[108.4,120.9]
Month	**Actual PPI 2018**	**Forecasted data**	**Difference**	**Confidence interval (95%)**
Jun	106.4	107.5	-1.1	[98.6,116.4]
July	106.7	107.5	-0.8	[97.5,117.4]
Aug	106.6	107.5	-0.9	[96.5,118.5]

4. Conclusion

While implementing the Minimum Wage Policy is reasonable to provide social protection to employees, it may lead to increased production costs and inflation if the minimum wage is not accompanied by increased productivity. Hence, we examined the impact of the implementing minimum wage on national inflation, which can be measured through CPI and PPI values. We

first built a time series model for the period before and after the intervention, and then evaluated the effect of the intervention on CPI and PPI using multiple linear regression. Our study showed that the PPI, which reflects the price changes experienced by domestic producers, decreased by 97.3% for each month on average following the minimum wage policy implementation in 2014. While our work does not determine whether the policy has direct or indirect impact on PPI, the employers' concerns about higher production costs with the minimum wage policy is implemented may be refuted at least for the period under study (2014-2017). We also found that the minimum wage implementation policy does not affect the CPI during one year of its implementation, as shown by the insignificance of the dummy variable coefficient representing the months in 2014. While this could imply that the cost of living was not affected by the intervention during the period under study, this could be due to other national economic policies such as increasing BR1M aid from the government in 2014. The forecast for the months Jun-August 2018 fell within the 95% confidence interval indicating that a change in the government ruling party did not have an immediate effect on the two indices during the first 3 months for the economic performance could still be driven by the same fundamental then.

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Department of Mathematical Sciences
Faculty of Science and Technology
Universiti Kebangsaan Malaysia
43600 UKM Bangi
Selangor DE, MALAYSIA
*E-mail: A176900@siswa.ukm.edu.my, rafidah@ukm.edu.my**

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*Corresponding author