Inflation-Unemployment Trade-Offs In ASEAN-10

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Abstract

This study empirically explores the nature of inflation-unemployment dynamic causal relationships both in the short and long-run in the ASEAN-10 over the 1989-2018 period. Based on the panel cointegration test, the study documented a long-run equilibrium between inflation and unemployment. Using the Vector Error Correction Model (VECM) analysis, the study found an insignificant inflation-unemployment relationship in the short-run. However, in the long-run, inflation is found to affect the unemployment rate positively. Our results from the Variance Decompositions (VDCs) analysis also supported these findings, where the unemployment responded at the more significant percentage to shocks in inflation compared to the response of inflation to shocks in unemployment. These findings only supported the relevance of the Phillips curve theory in the long-run. Overall, these findings imply that although inflation targeting policy is not relevant to the short-run, it becomes crucial and effective to reduce the unemployment rate in ASEAN-10 in the long-run.

Keywords: inflation, unemployment, Phillips’ curve, trade-off relationship

JEL Classifications: E52, E58, J64

How to Cite:

Introduction

Inflation and unemployment are twin-economic problems being faced by both developed and developing countries. Inflation and unemployment shall cause a reduction in the level of individual welfare as it deteriorates the real money value; thus, it must be controlled to stabilize the economy. Bhattarai (2016) and Ruprah & Luengas (2011) found that inflation and unemployment had reduced the well-being and the level of happiness ranging from 1 to 8 points in Latin American countries and it doubled in the Organization for Economic Co-operation and Development (OECD) countries. Inflation has also affected the level of welfare and unemployment between age groups and the characteristics of the labour market. Becchetti et al. (2010) documented that the social costs arise due to inflation and unemployment were higher in the middle age group and countries with weak labour law protection. In other words, the level of welfare for the middle age group was lower compared to different age groups due to the adverse effects of inflation and unemployment.

Inflation and unemployment have also been referred to as indicators to measure the economic health of a country. Inflation has proven to be a significant determinant for economic growth. High inflation reduces economic growth, causes fewer jobs available, and increases the unemployment rate. These facts show the existence of a trade-off between inflation and economic growth (Thanh, 2015). High inflation rates cause investment becoming riskier because it is more difficult to anticipate future interest rates and nominal wage growth rates. Inflation also increases some of the costs of the prices of other goods such as prices of foods, raw materials, etc. Consequently, an increasing trend of labour forces was not supported by expanding the availability of job opportunities would, in turn, contribute to an increase in the unemployment rate (Hassouneh et al. 2018).

The problem of inflation and unemployment is also facing by developing countries, such as in ASEAN. Apart from Singapore, which is categorized as a developed country, ten other ASEAN countries are still classified as the developing countries, including Indonesia. These countries have dissimilar economic performances, characterized by differences in levels of income, inflation, unemployment, and other macroeconomic variables. Generally, countries with medium and low incomes have higher inflation rates compared to high-income countries. The high level of inflation is often not accompanied by the addition of aggregate output. Thus, offering more job opportunities to reduce unemployment through increasing in inflation would not be made possible. Finally, the high level of inflation causes an increase in the unemployment rate.

The inflation rates in ASEAN from 1989 to 2018 have significantly fluctuated where the highest inflation rate occurred in 1998, reaching 21.8% due to the 1997 East Asian economic crisis (World Bank Report, 2019). The 1997 economic crisis has caused the value of the currencies to plummet so that demand and investor confidence declined throughout the world. The global financial crisis has re-occurred in 2008, centered in the United States and has caused inflation to increase to 13.5% (World Bank Report, 2019). This crisis has caused a simultaneous decline in all sectors of economic activity such as employment and investment, and company profits. The adverse effect of the global crisis continued until 2009
and caused the deflation rate reaching 2.3%. Instability of the rate of inflation in ASEAN in few last decades has been a significant factor inhibiting economic growth and economic welfare (World Bank Report, 2019).

Although inflation in ASEAN countries has been very volatile a few decades ago, the unemployment rate in ASEAN has been reasonably stable, ranging from 2.7% to 3.5%. This fact shows that changes in the inflation rates were not entirely followed by changes in the rates of unemployment. This fact has made the topic of the relationship between inflation and unemployment becoming one of the most critical issues discussed in economic theory. For example, Phillips’ (1958) curve shows a negative relationship between the unemployment rate and the inflation rate. This implies that as inflation rises, the unemployment falls, and vice versa. The trade-off between inflation and unemployment, from the perspective of economic policy-makers, shows that efforts to reduce the unemployment rate in the short term could be made by increasing inflation through expansionary economic policies (Bhattarai, 2016). However, an increase in prices due to workers demanding higher wages causes the unemployment rate to increase. This is in line with the study by Sachsida et al. (2011) when a government intends to reduce unemployment using monetary policy; people expect inflation to increase in the long-run. The inflation-unemployment trade-off might only occur in the short term, but a high inflation rate will not be followed by a reduction in the unemployment rate in the long-run.

According to Palley (2012), the Phillips curve only relevant to explain the relationship between inflation and unemployment in the short run. Besides, previous studies have shown that Phillips curve theory is not entirely consistent across countries. For example, Bhattarai (2016) recorded a Phillips curve relevancy in explaining inflation-unemployment relationships for 28 of the 37 OECD countries, especially countries in the European Union, but it was not relevant in countries such as Austria, Brazil, Germany, Ireland, Israel, and Norway. Moise (2015) explored the suitability of the Phillips curve in Romania over the 1996-2012 periods. He found that the Phillips curve was only able to explain the relationship between inflation and unemployment among the workforce aged 15-19 years old in the 2008-2012 periods, but it was irrelevant for the entire study period.

According to Grammy (2019), the existence of prolonged inflation-unemployment trade-off might create a problem for policy-makers. If there a continuous implementation of trade-off policy, a lower unemployment rate will accelerate the already rapid inflation rate and efforts to curb inflation tend to increase the unemployment rate that remains high. This is evidence in the studies by Karanassou & Sala (2010), Ruprah & Luengas (2011), Sachsida et al. (2011), Dritsaki & Dritsaki (2012), Tesfaselassie & Wolters (2018), Donayre & Panovska (2018), and Hindrayanto et al. (2019). They recorded an adverse effect of inflation on unemployment. Likewise, this happens for a country that implements inflation targeting and economic activity targeting policies; its unemployment rate tends to reduce.

Phillips curve theory is unable to explain the nature of the inflation-unemployment relationship entirely. Chletsos et al. (2016), for example, found that the Phillips curve
model is suitable for the United States, but it is irrelevant in Canada. Safdari (2016) also found mixed findings of the relationship between inflation and unemployment. The relationship between the two is usually negative on a specific time scale, but positive on another time scale. Haug & King (2014) also found a positive relationship between inflation and unemployment in the long-run. Likewise, Louis & Balli (2013) showed that inflation shocks, viewed from the differential interest rates, had no impact on unemployment in the short-term.

Many previous studies have explored the relationship between inflation and unemployment relationship for the case of developed countries. However, those studies only focused their analyses only on a specific country (Karanassou & Sala, 2010; Dritsaki & Dritsaki, 2012; Haug & King, 2014; Putnam & Azzarello, 2015; and Grammy, 2019). Overall, the findings of their studies implied that in anticipating the negative impact inflation, labour protection, and improvement of the investment ecosystem must be done to increase production.

Likewise, with the studies of the inflation-unemployment relationship in Indonesia, in general, they focused on a particular city and province and documented mixed empirical evidence. For example, Siregar (2015) examined the effect of inflation on unemployment in Medan City over the period from 2000 to 2014 and found a positive impact of inflation on the unemployment rate. A similar finding was also found by Prayuda et al. (2016) in the province of Bali over the 1994-2013 period. Although, inflation was seen to have a positive effect on educated unemployment in Central Java in the 2009-2013 period (Putri, 2015), but its effect was insignificant during the 2017-2019 period (Al-Umar, 2020).

Furthermore, an insignificant effect of inflation on unemployment was also found by Podi et al. (2020) in Jambi City during the period 2000-2017, in Indonesia by Setyowati (2017) and Astuti et al. (2020), respectively, during the period 1987-2015 and 1986-2017, in the provinces of West, Central, South, East and North Kalimantan by Rochaida & Fitriadi (2020) during 2014-2018, and by Elviani et al. (2020) in East Kalimantan over the period 2008-2017. Conversely, in Samarinda City, inflation was found to have a negative effect on unemployment during 2005-2014 (Susanto et al. 2018) and the 2001-2016 periods (Faisal et al. 2019).

The mixed empirical evidence of the inflation-unemployment relationship in other countries and also in cities and provinces in Indonesia has motivated our study to be carried out at the ASEAN level so that it can test the overall causality of inflation-unemployment in ASEAN. In contrast to previous studies which generally only explored the long-term effects of inflation on unemployment in Indonesia by using regression analysis, this study examines the existence of a long-run equilibrium between inflation and unemployment in ASEAN by using panel cointegration analysis.

Furthermore, the purpose of this study is not only to explore the effect of inflation on unemployment in the short term, but it also to examine it in the long-run perspective using the Vector Error Correction Model (VECM). To support our findings related to the interaction between inflation and unemployment, and the test of variance decomposition...
to assess how the investigated variables will respond to the shock that occurs in another variable. This is the main novelty of our study. The results of this study are expected to be a reference for the government in setting economic policies to manage inflation to reduce the unemployment rate. The rest of this research is organized into several sections. Section 2 discusses the research method, followed by a discussion of the results and their implications in Section 3. Finally, Section 4 concludes the study.

Methods

This study explore inflation-unemployment trade-offs in the ASEAN-10. These countries include Indonesia, Malaysia, Singapore, Thailand, the Philippines, Brunei Darussalam, Vietnam, Laos, Myanmar, and Cambodia. This study utilizes an annual panel data of consumer price index and the unemployment rate of ten ASEAN countries from the period 1989 to 2018 for the analysis. These data are sourced from the World Bank report. Inflation is measured by the changes in the consumer price index, while unemployment is measured in the percentage of unemployed labour forces.

To test the existence of a long-run equilibrium between inflation and unemployment in ASEAN, this study uses a panel cointegration test. Meanwhile, to examine the short- and long-term relationships between inflation and unemployment and their dynamic causalities, this study uses a panel model Vector Error Correction Model (VECM). Finally, to test the extent to which a shock in a variable is responded to by another variable, this study uses Variance Decompositions (VDCs) approach. However, before estimating our proposed models, the panel stationarity and determination of the optimal lag-length to be included in the model will be determined in advance. Specifically, six stages of estimation are involved in the study.

In the first stage, to test the stationarity of the investigated variables, this study uses the Augmented Dickey-Fuller (ADF), Levin Lin Chu (LLC), and Phillip Peron (PP) techniques. If the probability value of the test is less than 5%, then the null hypothesis of unit root is rejected, implying the non-stationarity of the variables, and vice versa. In the second stage, Johansen’s cointegration test is estimated if the variables have a unit root at the level, but they become stationary on the same order of integration after taking differenced.

In the third stage, to determine the optimal lag-length to be included in the estimated model of the panel Vector Auto-Regressive (VAR) model, the study uses criteria of Final Prediction Error (FPE), Akaike Information Criteria (AIC), and Schwartz Information Criterion (SC).

In the next stage, the VECM is estimated to explore the short- and long-run relationship between inflation and unemployment and their dynamic causalities. This model can also measure the speed of adjustment of the short-run imbalance moving towards the long-run equilibrium. This study adopts the panel VECM technique proposed by the studies of Hassouneh et al. (2018) and Liang & Schienle (2019). In general form, the equation of panel VECM can be written as follows:
\[ \Delta Y_t = \mu + a\beta'Y_{t-1} + \sum_{i=1}^{p-1} \theta_i Y_{t-1} + \varepsilon_t \]  \hspace{1cm} (1)

where \( \Delta \) is the first differentiation of the variable; \( Y_t \) is a vector of inflation and unemployment variables; \( \mu \) is the VECM model parameter; \( a\beta'Y_{t-1} \) is an error correction term; \( \alpha \) is an adjustment term that measures the speed of variable correction from short-term deviation to long-term equilibrium. \( \beta' \) is a vector of cointegration; \( p \) is the order in integration; \( \theta \) is the short-term dynamic adjustment for variable changes in the system, and \( \varepsilon_t \) is the error term.

Meanwhile, to test the causality relationship between inflation and unemployment, the panel dynamic causality model of Mandal & Madheswaran (2010) and Amountzias, Dagdeviren, and Patokos (2017) is adopted. The estimated model can be written in the following equations:

\[ \Delta \ln f_t = \mu + a\beta'Y_{1,t-1} + \sum_{i=1}^{p-1} \theta_i \Delta \ln f_{t-1} + \sum_{i=1}^{p-1} \theta_i \Delta \ln u_{t-1} + \varepsilon_t \]  \hspace{1cm} (2)

\[ \Delta \ln u_t = \mu + a\beta'Y_{2,t-1} + \sum_{i=1}^{p-1} \theta_i \Delta \ln u_{t-1} + \sum_{i=1}^{p-1} \theta_i \Delta \ln f_{t-1} + \varepsilon_t \]  \hspace{1cm} (3)

Where, \( a\beta'Y_1 \) and \( a\beta'Y_2 \), \( t-1 \) are the error correction terms. The existence of causal relationships between inflation and unemployment can be identified through the statistical significance of estimated variable coefficients. To measure the short-run causality, the null hypothesis of \( \theta_i = 0 \) is tested against its alternative hypothesis, \( \theta_i \neq 0 \), while to identify the long-term causality; it can be viewed from the statistical significance of error correction term. The null-hypothesis of \( \alpha = 0 \) is tested against its alternative hypothesis of \( \alpha \neq 0 \) (Mandal & Madheswaran, 2010).

Finally, Variance Decompositions (VDCs) is used to evaluate dynamic relationships between inflation and unemployment. Possible inflation change is contemporary associated with changes in unemployment. This implies that shocks in unemployment are likely to work throughout contemporary connections to shocks in inflation. The VDCs can identify changes in unemployment respond to the relative strength of shocks in inflation, and vice versa (Kassim & Majid, 2010; and Majid, 2018). It also enables us to identify how long the shocks in inflation could affect the unemployment rate before it returned back to normal position. Finally, VDCs also provides us how big is the effect of shocks in one variable causing other variables to change before it returned back to normal condition (Majid, 2018; and Mohd Yusof et al., 2009).

**Results and Discussion**

Before the study reports the short- and long-run relationships and their dynamic causal interaction between inflation and unemployment in ASEAN, the unit root test is firstly conducted.

**Unit root test**

To ensure the stationarity of data, the unit root tests are conducted using the Augmented Dickey-Fuller (ADF), Levin Lin Chu (LLC), and Phillip Peron (PP) approaches. This is performed to find out whether the variance of data is constant over time and its co-variance
between time series data only depends on the lagging time periods. Table 1 report the findings of the unit root tests.

As illustrated in Table 1, both variables of inflation and unemployment rate were found to contain unit root at the level, implying the non-stationarity of data. This is indicated by the insignificant p-value of greater than 5% or stationary tests, ADF, LLC, and PP. Thus, to arrive at the data stationarity, the first difference is taken. The study found that, at the first difference, the data becomes stationary, as indicated by the significant p-value of 1%. These findings fulfill the necessary condition for the cointegration test to be conducted as the data having non-stationary at the level, but they become stationary at the order of integration, I(1).

<table>
<thead>
<tr>
<th>Variable</th>
<th>LLC</th>
<th>ADF</th>
<th>PP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>0.2360</td>
<td>0.2467</td>
<td>0.2111</td>
</tr>
<tr>
<td>Unemployment</td>
<td>0.4203</td>
<td>0.9139</td>
<td>0.9265</td>
</tr>
<tr>
<td></td>
<td>At First Difference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>0.000***</td>
<td>0.000***</td>
<td>0.000***</td>
</tr>
<tr>
<td>Unemployment</td>
<td>0.000***</td>
<td>0.000***</td>
<td>0.000***</td>
</tr>
</tbody>
</table>

Note: *** indicates significance at the 1% level.

Since the cointegration test takes into consideration the effect of lag values in the model, thus the study firstly determines the optimal lag-length to be included in the model. This would eliminate the autocorrelation problem in the VAR panel system. In this study, the optimal lag-length is determined using the Final Prediction Error (FPE), Akaike Information Criterion (AIC), and Schwartz Information Criterion (SIC). All these criteria confirmed that the optimal lag-length of equal to one should be included in the estimation as these lag produced the smallest prediction errors.

**Long-run equilibrium**

To identify the existence of a long-run equilibrium between inflation and unemployment, the Johansen cointegration is performed. Table 2 reports the findings of maximum Eigenvalue and trace statistics of the cointegration test. As observed from Table 2, two cointegrating vectors were found in Model 1 (i.e., inflation-unemployment relationship), as indicated by significances of both maximum Eigenvalue and trace statistic value at the 1% level. Similarly, two cointegrating vectors were also found in Model 2 (i.e., unemployment-inflation relationship), as shown by significances of both maximum Eigenvalue and trace statistic value at the 1% level. This finding is supported by previous studies, such as Ho and Iyke (2019) in the Euro zone, Stamatiou and Dritsaki (2019) in Poland, Abu (2019) in Nigeria, and Gomis-Porqueras et al. (2020) in 76 countries.
Table 2. Johansen Panel Cointegration Test (Lag = 1)

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Eigenvalue</th>
<th>Trace Statistic</th>
<th>5% Critical Value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1: Inflation, Unemployment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0.5730***</td>
<td>485.7290***</td>
<td>15.4947</td>
<td>0.0001</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.5437***</td>
<td>233.0180***</td>
<td>3.8415</td>
<td>0.0000</td>
</tr>
<tr>
<td>Model 2: Unemployment, Inflation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0.5729***</td>
<td>252.7110***</td>
<td>14.2646</td>
<td>0.0001</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.5436***</td>
<td>233.0180***</td>
<td>3.8415</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Note: *** indicates significance at the 1% level.

The presence of cointegration shows the tendency of variables in the models to move together in the long-run (Majid, 2007; and Majid & Kassim, 2015). Thus, our findings further imply that the rates of inflation and unemployment in the ASEAN tend to move together in the long-run. To predict one variable, it might be used other variable. In other words, to predict the long-run movement in the unemployment rate, the policy-maker could be used inflation rate as the referral predictor. Having identified stationarity of the variable at the order of integration, I(1) and the cointegration between inflation and unemployment, thus the study could properly adopt and estimate VECM to identify short- and long-run and dynamic causalities between the variables.

Short-run, long-run, and dynamic causal relationships between inflation and unemployment

Table 3 illustrates the findings of the short- and long-run relationship between inflation and unemployment in ASEAN-10. Table 3 shows that, in the short-run, inflation has an insignificant effect on the unemployment rate. Similarly, unemployment is found to have an insignificant impact on inflation. These findings imply that any changes in inflation have caused no changes in unemployment, vice versa. In other words, the study documented a non-causal dynamic relationship between inflation and unemployment. This could be partially due to the relatively lower rate of inflation in the ASEAN-10 over the study period. On average, the inflation rates in the region have been last than two-digit. In addition, there might be a time lag of the effect of inflation on unemployment, which is only significant in the long-run.

The absence of a causal relationship between inflation and unemployment in ASEAN-10 shows the interdependence of the level of unemployment from inflation rate. This evidence demonstrated an inability of Phillips curve theory explain the nature of the inflation-unemployment relationship, finding similar to Chletsos et al. (2016). They found that the Phillips curve model is irrelevant in Canada. Similarly, Louis & Balli (2013) showed that inflation had no impact on unemployment in the short-term. However, the changes in unemployment rates in the ASEAN-10 could be contributed by several factors, such as high taxes, instability of monetary policy, low investment, and sustainable corruption (Dritsaki...
& Dritsaki, 2012); thus the goals of reducing unemployment rate through expansionary policies have been ineffective.

In addition, the findings of the insignificant trade-off between inflation and unemployment for the case of ASEAN-10 in the short-run are supported by the previous study by Bhattarai (2016), who documented insignificant inflation-unemployment trade-off in 32 OECD countries. Our findings are also in harmony with the studies by Podi et al. (2020) for the case of Jambi City, Indonesia, Setyowati (2017) and Astuti et al. (2020) for the case of the provinces of West, Central, South, East and North Kalimantan, Indonesia, Rochaida & Fitriadi (2020) and Elviani et al. (2020) for the case of East Kalimantan region.

Table 3 shows that the last-year disequilibrium in inflation in the short-run, it would be corrected with the speed of adjustment of -0.5065 to move towards the long-run equilibrium, as indicated by negative significance of error correction term (ECT). In other words, for any short-run disequilibrium, it takes half-year period for moving towards the long-run equilibrium. The negative ECT value shows the convergent trend of inflation and unemployment movement in the long-run, as indicated by the negative significance of the error correction term (ECT). In other words, for any short-run disequilibrium, it takes half-year period for moving towards the long-run equilibrium. The negative ECT value shows the converging trend of inflation and unemployment movement in the long-run. This further implies the existence of a long-run equilibrium between inflation and unemployment in the ASEAN-10.

Table 3. Short- and Long-run Inflation-Unemployment Relationship (Lag =1)

<table>
<thead>
<tr>
<th>Variable</th>
<th>D Variable</th>
<th>D Variable</th>
<th>ECT_{t-1}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short- and long-run relationship</td>
<td>D</td>
<td>-</td>
<td>-0.5969 (-0.5787)</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>-0.0012 (-0.3892)</td>
<td>0.0006 (0.4566)</td>
</tr>
<tr>
<td>Long-run relationship</td>
<td>D</td>
<td>-</td>
<td>0.4260 (0.5756)</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>2.3473 *** (9.1822)</td>
<td>n.r</td>
</tr>
</tbody>
</table>

Note: *** indicates significance at the 1% level. n.r is not relevant.

On the other hand, the study also finds inexistence of long-run equilibrium between unemployment and inflation, as indicated by the insignificance of error correction term (ECT). This finding is in line with the studies by Sayeed et al. (2019) in the US, Abu (2019) in Nigeria. This finding shows the importance of inflation to determine the movement of the unemployment rate in the long-run. Thus, to manage the level of unemployment, the inflation targeting policy is found to be effective. This further shows the importance of for
the ASEAN-20 government to control and keep inflation within tolerable rate as one of the strategic economic policies to reduce the unemployment rate in the ASEAN. Thus, macroeconomic coordination among ASEAN governments should be strengthened.

As for the long-run relationship, the study found a significant positive effect of inflation on unemployment rate in the ASEAN-10 with an estimated value of 2.3473 at the level of 1%. This, specifically, shows that an increase in inflation rate by 1% has also caused a rise in the unemployment rate of 2.3473%, *ceteris paribus*. On the other hand, changes in unemployment are documented to have an insignificant effect on inflation throughout the study period. These findings further show a significant unidirectional impact running from inflation to unemployment in the ASEAN-10, similar to the findings by Abu (2019) for the case of Nigeria and Sahnoun and Abdennadher (2019) for the case on North African countries.

Although the changes in inflation caused no effect on changes in unemployment in the short-run, but its effect turned to be significant in the long-run. This finding implies that, from the economic policy perspective, policy-makers should not ignore the role of inflation in creating public welfare as it has significant contribution to create job opportunities and thus reduce unemployment in the log-run (Drobyshevskiy et al., 2019). An increase in prices as the primary phenomenon of inflation causes a reduction in public purchasing power. Consequently, it causes a decline in the sales of goods and services of the firms. This, in turns, leads to lower corporate profits and causes the inability of firms to offer more jobs for the public (McLeay & Tenreyro, 2020). An increasing trend in labour force in ASEAN-10, which is not supported the growing job opportunities have caused more unemployment in the region.

This finding is similar to the discovery of the study by Haug & King (2014) who documented a significant positive effect of inflation on unemployment. Siregar (2015) also found a significant positive impact of inflation on unemployment in Medan City, Indonesia. A similar positive significant inflation-unemployment relationship is also recorded in the studies by Putri (2015) in Central Java and by Prayuda et al. (2016) in the province of Bali, Indonesia.

This positive causal relationship occurs because of an expansive policy undertaken to boost the economy. For example, by increasing the money supply to raise people's purchasing power by increasing the prices of goods and services is often not accompanied by increasing aggregate output. Thus, the initial goal of rising inflation to create more job opportunities and reduce unemployment rates could be materialized. Finally, the high level of inflation will only add to the unemployment rate. This positive causality between inflation and unemployment in the long-run also happened, *inter alia*, because of a more volatile global economic condition in the last few decades (Haug & King, 2014). Overall, our findings show the importance of macroeconomic harmonization to stabilize prices to reduce the unemployment rate within the ASEAN-10.
Findings of Variance Decompositions

To provide further evidence of the inflation-unemployment relationship, the analysis of Variance Decompositions (VDCs) is estimated to explain the relative importance of each variable in a VAR model. Thus, the VDCs measure the percentage change in a variable caused by a shock in another variable. The findings of the VDCs are reported in Table 4.

Table 4. Findings of Variance Decompositions

<table>
<thead>
<tr>
<th>Period</th>
<th>Inflation</th>
<th>Unemployment</th>
<th>Unemployment</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>99.9819</td>
<td>0.0180</td>
<td>100.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>2</td>
<td>99.9870</td>
<td>0.0129</td>
<td>99.8276</td>
<td>0.1724</td>
</tr>
<tr>
<td>3</td>
<td>99.9845</td>
<td>0.0155</td>
<td>99.7617</td>
<td>0.2383</td>
</tr>
<tr>
<td>4</td>
<td>99.9739</td>
<td>0.0261</td>
<td>99.7039</td>
<td>0.2961</td>
</tr>
<tr>
<td>5</td>
<td>99.9613</td>
<td>0.0387</td>
<td>99.6534</td>
<td>0.3466</td>
</tr>
<tr>
<td>6</td>
<td>99.9497</td>
<td>0.0503</td>
<td>99.6064</td>
<td>0.3936</td>
</tr>
<tr>
<td>7</td>
<td>99.9397</td>
<td>0.0603</td>
<td>99.5616</td>
<td>0.4384</td>
</tr>
<tr>
<td>8</td>
<td>99.9314</td>
<td>0.0685</td>
<td>99.5179</td>
<td>0.4821</td>
</tr>
<tr>
<td>9</td>
<td>99.9246</td>
<td>0.0754</td>
<td>99.4749</td>
<td>0.52514</td>
</tr>
<tr>
<td>10</td>
<td>99.9189</td>
<td>0.0811</td>
<td>99.4322</td>
<td>0.5678</td>
</tr>
</tbody>
</table>

As observed from Table 4, it revealed that changes in themselves mainly contributed to the changes in inflation and unemployment in the ASEAN-10 over the period from 1989 to 2018. Changes in inflation only explained by 1.80% changes in unemployment for the period 1, 1.29% (period 2), 1.55% (period 3), 2.61% (period 4), 3.87% (period 5), 5.03% (period 6), 6.03% (period 7), 6.85% (period 8), 7.54% (period 9), and 8.11% (period 10). Overall, the shock in unemployment rate contributed to changes in the inflation rate of less than 10%. This finding in harmony with previous studies by Wulandari et al. (2019) and Hongo et al. (2019), who found the lack of interdependent of inflation to the shock in unemployment in the Indonesian and Kenyan economies, respectively. These findings supported our earlier findings of the insignificant effect of unemployment on inflation and non-causal dynamic relationship between the two.

On the other hand, changes in unemployment are explained by changes in inflation by zero % changes in inflation for the period 1, 17.24% (period 2), 23.83% (period 3), 29.61% (period 4), 34.66% (period 5), 39.36% (period 6), 43.84% (period 7), 48.21% (period 8), 52.51% (period 9), and 56.78% (period 10). These findings showed that the changes in inflation have contributed to larger changes in unemployment, similar to the findings by Horvath & Zhong (2019) for the case of emerging economies and Ambrocio (2020) for the case of European countries. Overall, the changes in unemployment rate have been contributed by more than 55% shocks in inflation over the ten periods of the study. These
findings supported our earlier findings of significant effect of inflation on unemployment and a unidirectional causal dynamic relationship running from inflation to unemployment. From policy markers perspective, these findings confirmed the important role of inflation targeting policy to reduce unemployment within the ASEAN economic region.

Overall, our findings provide evidence that Phillips curve theory is unable to explain the nature of the inflation-unemployment relationship in the short-run entirely. However, in the long-run, the significant positive relationship is documented to support the Phillips curve trade-off in the ASEAN-10. These findings imply that although inflation is not a relevant economic policy to be focused on reducing unemployment in the short-run, but the inflation targeting policy turned becoming essential and useful measures to reduce unemployment in the ASEAN-10. As our study using panel data, thus it is utmost necessary for the countries to harmonize their macroeconomic policies to stabilize price as it has a significant influence on the reduction of unemployment rate in the ASEAN region.

**Conclusion**

This study empirically investigated the short-and long-run relationships between inflation and unemployment rate in the ASEAN-10 over the period from 1989 to 2018. It also attempted to assess the dynamic causal relationship between the variables. By using a panel cointegration test, the study documented a long-run equilibrium between inflation and unemployment. Besides, based on the Vector Error Correction Model (VECM) analysis, the study found insignificant inflation-unemployment relationship in the short-run, but the relationship turned to become positively and significantly related. Finally, using the Variance Decompositions (VDCs) analysis, the changes in the unemployment rate were primarily explained by the shocks in inflation compared to the inflation response to the shocks in the level of unemployment.

Our findings only supported the Phillips curve theory’s relevance in the long-run, but did not in the short-run. Overall, these findings imply that although inflation targeting policy is not relevant for the short-run, it becomes crucial and effective to reduce the unemployment rate in the ASEAN economies in the long-run. This further shows the Phillips curve theory’s ability to explain the nature of the inflation-unemployment relationship in the short-run entirely. However, in the long-run, the significant positive relationship is documented to support the Phillips curve trade-off in the ASEAN-10. Thus, to reduce unemployment in the ASEAN-10, macroeconomic policy harmonization, specifically, inflation-targeting policy is of utmost importance.

Future studies on inflation-unemployment trade-off are suggested to utilize more data frequency and cover a more extended data period to offer more conclusive empirical evidence. Incorporating more macroeconomic determinants of unemployment could provide more strategic economic policy to reduce unemployment in the ASEAN economies.

**References**


