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## Nonlinear Effects of Remittances Paid on Macroeconomics in Malaysia

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### Abstract

The remittances play a major and a very critical role in promoting economic growth and development activities in the developing countries. In this study, the relationship between per capita gross domestic product (GDP) and remittances paid has been investigated based on the case studies in Malaysia from 1987 to 2018. Data was collected from various sources namely statistical yearbook by World Bank and Asian Development Bank. All variables are expressed in natural logarithm form. The technique utilized is the nonlinear autoregressive distributed lags (hereafter NARDL) approach which was introduced by Shin et al.(2014) to examine both short run and long run relationships, as well as the direction of causality, due to the asymmetric relationship between GDP and remittances. The bound test verifies asymmetric cointegration among the variables. The empirical results show that the remittances paid has a momentous short-run and long-run effect towards capital accumulation in Malaysia. Remittances also increase a positive relationship with capital accumulation for Malaysia. We found that remittances form a significant source of external capital and investment for developing countries especially Malaysia which helps in promoting economic development. Furthermore, as a developing country, foreign workers are a source of income to the receiving countries and an indicator to boost sender countries.

**Keywords:** Remittances, NARDL, Growth, Capital, Malaysia

**JEL Classification Code:** O01, O11, H59

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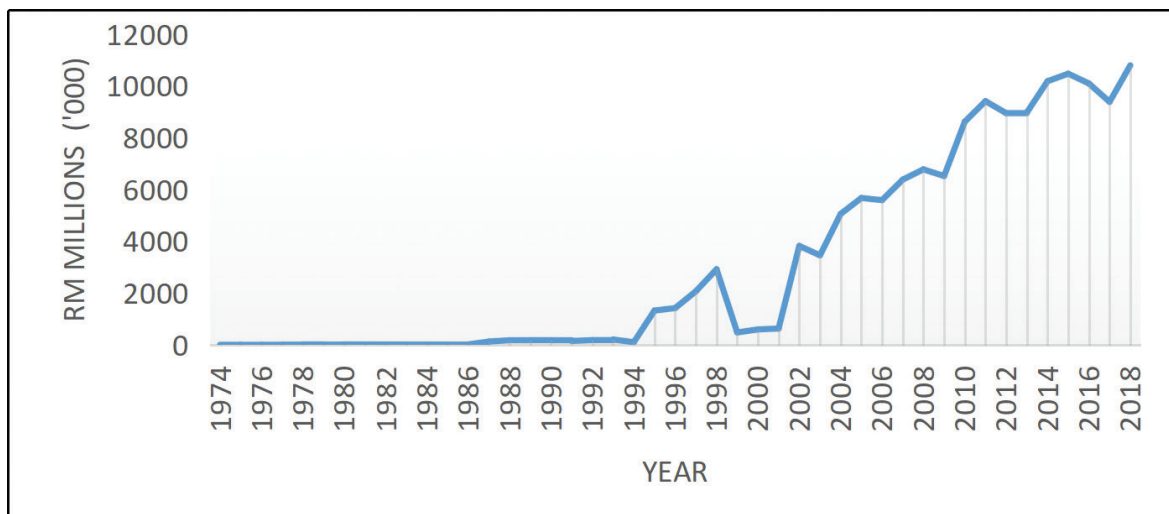
### 1. Introduction

Malaysia is a developing country in Southeast Asia with a moderate growth rate of 4.3 per cent in 2019 (Malaysia, 2019). From a momentum point of view, attractions and benefits of investment were the main policies created by the government to boost economic growth. However, over the past few decades, Malaysia has become a transit hub and a second home for foreign workers, migrants and refugees as they are attracted by the economic prosperity of the

country. In Malaysia (2019), the number of foreign workers in Malaysia were 2,002,427 people as of June 2019. As a result, this led to an increase in terms of value and volume remittances paid and money transfers made by people to their home countries. According to the definition by Hassan and Shakur (2017), remittances paid are the unrequited transfer of funds by the migrants to their families at home and it is a source of foreign exchange which is much needed in developing economies. Additionally, to define it further, personal remittances are the sum of two main components, namely “compensation of employees” and “personal transfers” (IMF, 2009). As an emerging country, Malaysia has implemented an open market economy which encourages foreign workers to contribute towards economic activity and acts as a turning point for the foreign direct investment. However, according to Adams and Page (2005), remittances have both positive and negative impacts on macroeconomic, household and community levels. Likewise, Hassan et al. (2016) initially stated that the growth impact of remittances is considered to be negative, but later becomes positive. (See Figure 1)

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**Figure 1:** Personal remittances Malaysia (current US\$)

**Source:** International Monetary Fund, 2019

In 1990, about 0.33% personal remittances received (% of GDP) were sent to developing countries through authorized channels; after 20 years, the volume of remittances had increased by 130% (World Bank, 2016). Since years 2000, remittances have been growing faster and data shows that after the 2009 recession, remittances in Malaysia continued to increase. Figure 1, illustrates the trend for remittances paid in Malaysia from 1974 until 2018. The volume of the remittances increased since 1994 but the trend decreased during the financial crisis of 1997/1998 and afterwards, the trend increased again. Financial liberalization and the open market economy encouraged a number of workers to shift from other countries. Something that is unique to Malaysia is that the per capita income in Malaysia increased 25 times from USD 402 in 1970 to USD 10,796 in 2014. This is a model to attract more workers, for investment as well as skilled and unskilled transfers of labor. Generally, registered foreigner workers in Malaysia participate in jobs from the 3D (dirty, dangerous and difficult) sector.

Remittance flows have become an increasingly important part of the global economy and a critical source of income for many low and middle income countries (Brown et al., 2020). According to Bayar (2015), remittances have become an important source of external capital and foreign exchange, especially in developing countries. For Malaysia, as a developing country, remittances are one of the indicators of economic performance. According to Hien et al. (2019), remittances have been an essential financial inflow for many developing countries. Most of the researchers focus on the positive impact of remittances for the receiving countries (Sobiech, 2019; Shakur, 2017; Randazzo & Piracha, 2019).

Countries that receive capital flow from sources need to care about the effects of sending to other countries. However, the motivation of this study is that remittances may have an asymmetric relationship with macroeconomic factors.

The main goal of this paper is to fill the gaps in the relationship between remittances and capital accumulation by answering the questions. What are the effects of remittances on macroeconomic factors in the sender countries? Thus, an examination of the relationship will have important policy implications. The symmetric mechanism decides whether remittances compensate against economic growth and macroeconomic factors. Hence, the response of remittances in increasing capital accumulation as macroeconomic indicator should be different from the response to decreasing price levels. This study highlights that remittances paid respond asymmetrically to the economic growth, thus suggesting an impact on macroeconomics. This paper is organized in four sections as follows. The first section covers remittances issues in Malaysia, second section discusses the literature review and models used in the previous studies, the third section discusses methodology and econometric results and the last section concludes by policies impact as the main finding of this study.

## 2. Literature Review

Many empirical studies have explored the impact of remittances on economic growth and social factors. The study by Bayar (2015) done in the European Union found that remittances have become an important source of external capital and foreign exchange with a positive relationship.

The author also mentioned this particularly for developing countries, along with the elimination of cross-border factor movement constraints. The positive relationship remittances to economic growth would have effects on developing countries, especially Malaysia. Furthermore, it can be concluded from the study by Giuliano and Arranz (2009) done in countries with less developed financial systems, remittances can boost growth by providing alternative means of financing investment and overcoming liquidity constraints. The data they evaluated came from the 100 developing countries that adopted the open market policy. Since the remittances from regional countries were main sources of income in the home-country, it would be influenced by the balance of payment and current economic situation (Dilanchiev and Sekreter, 2016). This has been addressed in numerous researches and this remittances phenomenon is known as “Dutch disease” (Hien et al., 2019; Shao et al., 2020). According to Hien (2019), huge remittances can lead to the overshooting of a country’s real exchange rate and hurt its competitiveness.

In developing countries with a large number of immigrants, studies were conducted by Hassan et al. (2016) to show that the remittances-growth relationship in Bangladesh need not be linear from the method of studies taken. They researched an approach based on production functions to estimate total factor productivity and then gauged the effect of remittances in order to estimate growth using NARDL method. However, Kadozi (2019) used a cross-sectional analysis for a group of countries from Sub-Saharan Africa to show the insignificant impact of remittances on economic growth in the region. The authors also noted that from an in-depth analysis of Rwanda as a case study, the remittance-growth impact is positively and statistically significant determinant of a country’s level of development, financial development and education, whereas remittance-growth is adversely affected by the consistency of institutional variables. Perhaps, it could be agreed that analysis needs to focus on micro-level analysis. In a recent study by Hien et al. (2019), they used panel data models from 32 countries in Asia and applied System Generalized Methods of Moment (S-GMM). The author pointed out the positive impact of the exchange rate with remittances per capita; this resulted in the impact and presence of Dutch disease in every Asian country.

In addition, according to Kumar and Vu (2014), the definition of personal remittances from a social perspective encompass personal transfer and employee compensation, where it includes incomes of the border, seasonal and other short-term workers who are living in a country where they are not citizens. Remittance studies and affected economic development among households were discussed by Randazzo and Piracha (2019) in their study conducted on Senegal using Senegal expenditure surveys. The authors mentioned that remittances play a role in the development

process but only have a common effort to ensure a minimum standard of living. In the analysis, they noted signs of a productive use of remittances for education. However, the effect of remittances disappeared after further investigation comparing expenditure logs with the sources of remittances. Additionally, Amuedo and Pozo (2010) conducted a study the Dominican Republic to evaluate remittances and preschoolers; the results positively related remittances with increased school attendance.

Another study by Hassan and Shakur (2017) used remittances and economic growth to investigate the growth rate of remittances in Bangladesh and found a non-linear relationship flow of inward remittances with economic growth. Analysis was conducted by the authors using nonlinear auto-regressive distributed lag. The authors mentioned that impact remittances were negative at first but became positive at a later stage as they engaged with financial development. However, a study by Kumar and Vu (2014) pointed that employed auto-regressive distributed lag is found to be positive in the long-run. The analysis was conducted with relationship information technology development, remittances and economic growth in Vietnam. Moreover, Kousar et al. (2019) study used ARDL-Bounds testing to examine the impact of financial development and foreign remittances on poverty and income inequality in the context of Pakistan. The results confirmed the significant impact of foreign remittances and financial development on poverty reduction and income inequality in Paksitan.

In terms of foreign direct investment and remittances, the economic growth from the implication of an open economy was explored in a recent study by Tahir et al. (2019). In this study, foreign aid and foreign direct investment were found to impact economic growth. The author employed panel data techniques for South Asian Association for Regional Cooperation (SAARC) as a sample for study. They also indicate a lack of relationship between the flow remittances and economic growth compared to foreign direct investment. However, Sobiech (2019) pointed that remittances can foster growth, but the effect is significant only at low levels of financial development. The study by Sobiech (2019) was conducted among emerging markets and developing countries. On the other hand, the analysis found that it is not enough for government to receive more remittances; in order to spend these transfers in a productive way and contribute to the economic growth, additional incentives are required. The results of a study by Hien et al. (2019) imply that a cooperation between the monetary policy and fiscal policy is needed to absorb the huge remittances to these Asian countries and reduce their negative impact on the real effective exchange rate.

To conclude this section, remittances have impact on social and economic factors as discussed above. In fact, the open economy would further boost and increase the incomes

of countries with friendly investor policies. Moreover, Malaysia as a developing country is becoming one of the destinations for foreign workers and investors due to attractive government policies.

### 3. Methodology

In this section, we discuss an explanation for the econometric analysis of the nexus remittances, per capita domestic product (GDP) and Gross Capital Formation (Y) defined as macroeconomic impact in Malaysia. The estimated NARDL model affirms the presence of asymmetries in the remittances. The asymmetric cointegration is implied if the time series is noted to have co-integration using their positive and negative components (Granger & Yoon, 2002). According to Shin et al. (2014) an advance nonlinear ARDL co-integration approach (NARDL) as an asymmetric extension to the well-known ARDL model of Pesaran and Shin (1999) and Pesaran et al. (2001) is required, to capture both long run and short run asymmetries in a variable of interest. In addition, based on Ahad and Dar (2017), these techniques are only applicable when data series are integrated at the same level, i.e. I(0) or I(1). This modelling approach has been adopted in this research. In our basic model of study, remittances affect economic growth as a standard linear ARDL (p,q) cointegration model. Remittance is denoted by  $rm_t$ , gross domestic product by  $GDP_t$ , intercept by C and residual by  $U_t$ . The simple OLS-three variable model takes the following form:

$$GDP_t = C + \beta_1 rm_t + Y_t + U_t \quad (1)$$

Three procedures were adapted for econometric ARDL. First, a time series unit root test was applied for the stationary test. Based on Taasim and Yusoff (2015), the stationary test was done on each variable to avoid spurious regression problems. In accordance with Gujarati (2003), the time series data is stationary if its mean and variance are constant over time. Second, co-integration was tested to determine the long run relationship. Third, the short-run test was done using the Wald test method. ARDL with two series has the following form:

$$x_t = x_0 + x_t^+ + x_t^- \quad (2)$$

Where:

$$\begin{aligned} x_t^+ &= \sum_{i=1}^t \Delta x_i^+ = \sum_{i=1}^t \max(\Delta x_i^+, 0), x_t^- \\ &= \sum_{i=1}^t \Delta x_i^- \min(\Delta x_i^-, 0) \end{aligned} \quad (3)$$

In the long run can be expressed as equation 4 and x represent as  $rm$ . Where  $z_t$  is a vector of deterministic regressors (trends, season, and other exogenous) (Altinas et al., 2016). Equation 2 shows symmetric adjustment in the long and short runs. When RM are nonlinear (asymmetric)

Shin et al. Greenwood-Nimmo (2014) proposed the NARDL model into positive and negative partial sums.

The possible asymmetric effects of  $rm$  on remittances NARDL techniques decomposes the  $rm$  rate series into two parts. Partial sum of positive change in  $rm$  rate is denoted by  $rm_t^+$  and partial sum of positive change in  $rm$  rate is denoted by  $rm_t^-$ . Both  $rm$  are included as separate regressors in the model, thus resulting in the following model;

$$GDP_t = C + \alpha_a Y_t + \alpha_1 rm_t^+ + \alpha_2 rm_t^- + U_t \quad (4)$$

Equation (4) is ARDL model proposed by Pesaran et al. (2001) and the final model is asymmetric model as mentioned below in the general form NARDL (Nonlinear Autoregressive Distributed Lag Model).

$$\begin{aligned} \Delta GDP_t &= \alpha + \beta_0 Y_{t-1} + \beta_a Y_{t-1} + \beta_1 \theta^+ rm_t^+ + \beta_2 \theta^- rm_t^- \\ &+ \sum_{j=1}^{p-1} \varphi_j \Delta Y_{t-j} + \sum_{j=0}^q (\pi_j^+ \Delta rm_{t-j}^+ \\ &+ (\pi_j^- \Delta rm_{t-j}^-)) + e_t, \text{ for } j = 1, \dots, q \end{aligned} \quad (5)$$

Where  $\theta^+ = p\beta^+$  and  $\theta^- = p\beta^-$

$\rho$  and  $q$  are lag orders and  $\alpha_1 = -\frac{\beta_1}{\beta_0}$ ,  $\alpha_2 = -\frac{\beta_2}{\beta_0}$ , the

aftermentioned long run impacts of respectively increasing foreign direct investment and reducing foreign direct investment on the remittances. Qamruzzaman et al. (2019) points that NARDL provides a flexible model framework by relaxing the restriction of the variable same order of integration, which holds true for ECM.

### 4. Empirical Findings

The Augmented Dickey Fulley (ADF) and Philips-Perron (PP) methods were used to examine the time series properties of the variables and compute the unit root statistic. This method identified no I (1) variables involved. The results are shown in Table 1. As the test results number of the variables was significant I (1), the analysis proceeded to the bound testing procedure.

To verify the suitability of the asymmetric model, the Wald test was applied for both long- (WLR) and short-run (WSR) symmetries. Pesaran et al. (2001) suggested the relevant table to use for unconstrained and no linear trends in the equation. The lower and upper bound tests are shown in table 2. From the results of the bound test F-statistic, we concluded that all variables co-moved in the long run for non-linear. The statistic of 13.507 exceeded the critical upper bound from the table by Pesaran et al. (2001). The remittances are a variable dynamic to real GDP as well as positive and negative changes in FDI.

Based on the results from our analysis, the variables which co-move in the long run are remittances and foreign

**Table 1:** Unit Root Test Results

Variables in Log Form (With Constant)	ADF		PP	
	Level	First Difference	Level	First Difference
GDP	-1.678	-4.856*	-1.624	-4.939*
Y	-1.195	-4.328*	-1.195	-4.267*
$rm^+$	-0.177	-5.362*	-0.005	-5.421*
$rm^-$	-0.079	-5.339*	-0.091	-5.376*

\*Significant at 1%.

Note: The optimal lag structure of the ADF test is chosen based on the Akaike Information Criterion, while  $k$  denotes lag order.

**Table 2:** Bound Test for Linear/Nonlinear Cointegration

Model specification	F-statistic	95% lower bound	95% upper bound	Conclusion
Linear	1.932	4.29	5.61	No-cointegration
Nonlinear	1148.01 <sup>a</sup>			Cointegration

Notes: the critical values are from Narayan (2005), given the small sample size.

**Table 3:** Personal Remittances Paid-Economic Growth using the NARDL Model

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	3.083	1.665	1.851	0.072 <sup>b</sup>
GDP	0.699	0.214	3.274	0.002 <sup>a</sup>
$rm^+$	0.190	0.026	7.206	0.000 <sup>a</sup>
$rm^-$	0.214	0.053	4.032	0.000 <sup>a</sup>
$Y(-1)$	0.227	0.071	3.193	0.002 <sup>a</sup>
$\Delta Y(-1)$	0.338	0.197	1.709	0.096 <sup>b</sup>
$\Delta rm(-1)$	-0.318	0.081	-3.950	0.000 <sup>a</sup>
Error metrics				
$R^2$	0.971	Durbin-watson stat		0.878
F-statistic	201.804	Log-likelihood		32.913
Breusch-Godfrey	8.829 <sup>a</sup>	Jarque-Bera		1.579 <sup>c</sup>

<sup>a,b,c</sup> and <sup>ns</sup> denotes significance at 1%, 5% and 10%.

**Table 4:** Long-Run Relations

Variable	Coefficient	t-statistic	P-value
Constant	3.767	1.987	0.053 <sup>b</sup>
Y	0.204	2.514	0.016 <sup>a</sup>
$rm^+$	0.175	5.876	0.000 <sup>a</sup>
$rm^-$	0.173	3.019	0.004 <sup>a</sup>

<sup>a,b,c</sup> and <sup>ns</sup> denotes significance at 1%, 5% and 10%.

direct investment. The bound test for the linear model showed no-cointegration and could not be employed for the next analysis. The next finding from our results was that remittances are defined as well as related to real GDP and positive and negative remittance value changes from the value statistic using NARDL. Clearly, the null of the hypothesis of equality is rejected as the p-value is less than 0.05. The Wald test showed that asymmetry exists in the long term impact of remittances paid on gross capital formation in Malaysia.

From the results presented in Table 3, we concluded the model has a co-integration and long run relationship. To validate the estimated NARDL model, we employed diagnostic tests, namely Durbin-Watson to test for first-order autocorrelation and Breusch-Pagan-Godfrey to test for heteroskedasticity. We also provided graphs to CUSUM and CUSUMSQ to test the structural stability of the model.

The long-run coefficients of Gross Domestic Product (GDP) are positive and significant at 1%. From our analysis, the 1% increase in gross domestic product is related to the increase in gross capital formation by 20.4%. The asymmetric analysis between gross domestic product and remittances paid were found to be significantly related with a positive relationship. Our findings indicate a pass-through effect of remittances on economic growth. From table 4, a 1% increase in remittances would account for the increase of 0.17% in the expected capital formation over the long run. We believe that after Malaysia implemented the open economy policy, it attracted foreign workers to fulfil our job sectors. Based on the chi-square test, the diagnostic test

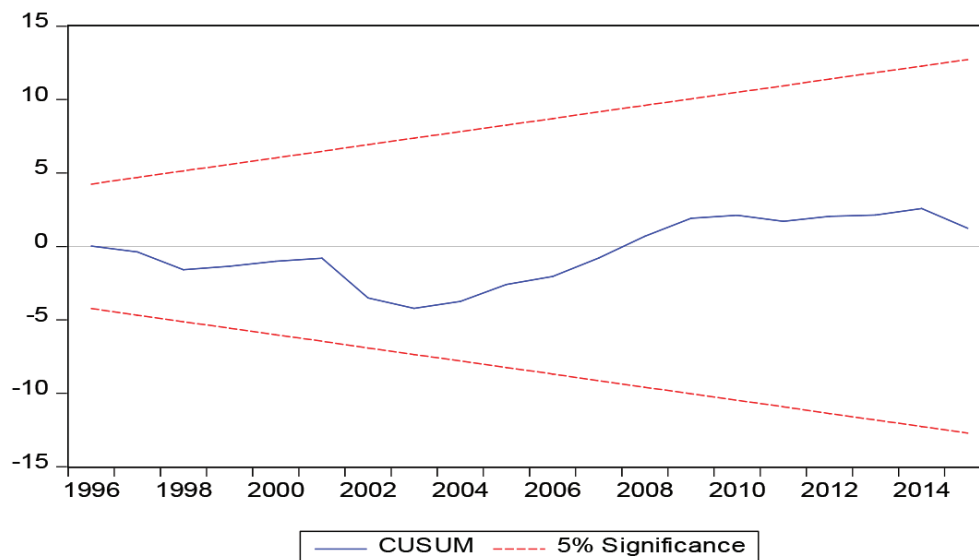


Chart 2: CUSUM

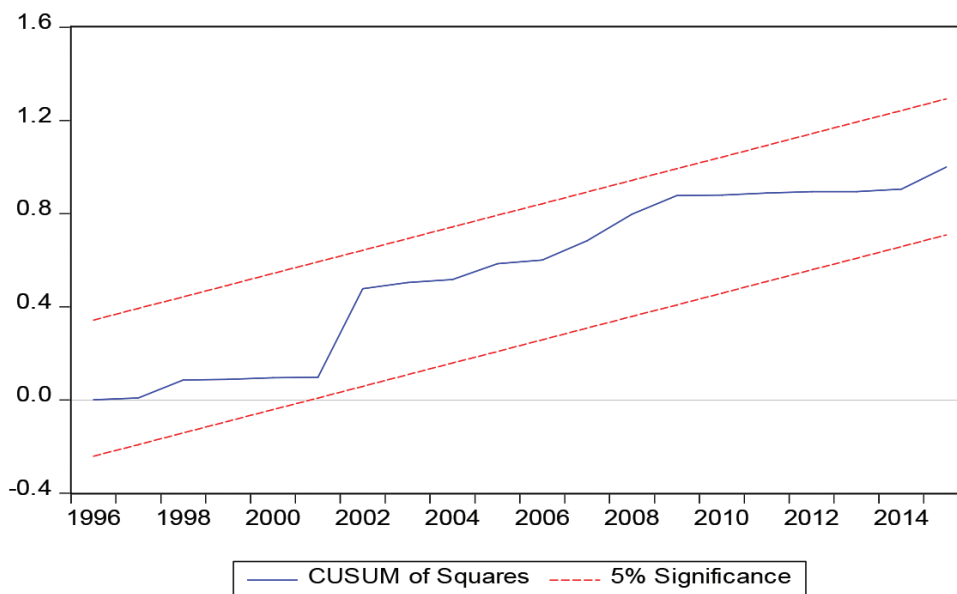


Chart 3: CUSUM of Square

shows that our equation performed well. The cumulative sum control chart (CUSUM) and CUSUM of squares plot, which measures the stability of the parameters of the model, indicated in Charts 2 and 3 that our model is indeed stable. The CUSUM and CUSUM of squares graphs (Figure 1) further confirm the stability of the regression. Vu and Huang (2020) the CUSUM and SQ-CUSUM control chart that are represented by blue lines staying inside 5% significance bounds ensure the structural stability of our regression

result and imply that the coefficients are proper for future prediction.

## 5. Conclusions

In this study, the relationship between remittances and economic growth for Malaysia was investigated. Analysis revealed the existence of a non-linear relationship between flows of remittances paid and economic growth in Malaysia.

The method of non-linear quantifies the respective response of economic growth to be positive and negative changes in the explanatory variables from the asymmetric dynamic multipliers. Remittances form a significant source of external capital and investment for developing countries. Our results hint at several aspects of this analysis which are confirmed with positive coefficients. The variable has shown that the positive coefficient relationship would have implications on instruments to boost economic growth. In addition, our discussion of the literature review is significant in this study as it confirmed that remittances paid result in benefits to the home and paid country. Even though the outflow remittances provide benefits to a developing country, dependence on the labour force over a long term period can have implications. An excess of foreign workers would cause a limitation in the opportunities for local workers. As a policy implication, the government should focus on welcoming foreign labour workers with high skills and knowledge as this would give the benefit of knowledge transfer within our country. From our data analysis, the number of remittances-paid was from the registered labour force and Malaysia immigrants were not included. To reduce outflow money with higher volumes, the most important part is border control. Foreign worker agents should be tightly regulated to prevent unregistered workers from entering Malaysia.

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