



***EFFECT OF OIL PRICE ON ECONOMIC GROWTH AND EXCHANGE RATE
IN MALAYSIA***

KRISKKUMAR A/L KARUNANITHI

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By

KRISKKUMAR A/L KARUNANITHI

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
Fulfilment of the Requirements for the Degree of Master of Science**

September 2019

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

EFFECT OF OIL PRICE ON ECONOMIC GROWTH AND EXCHANGE RATE IN MALAYSIA

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September 2019

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This study investigates the effect of oil price on the economic growth and exchange rate for the case of Malaysia. The recent innovative cointegrating nonlinear autoregressive distributed lag (NARDL) model of Shin et al. (2014), which is the extended version of the autoregressive distributed lag (ARDL) model of Pesaran et al. (2001), is used to analyse the relationships. This technique allows short-run and long-run nonlinearities through the decomposition of the oil price into partial sums of positive and negative changes while maintaining the advantages of a typical ARDL. For the oil price-growth nexus, annual data that covers from 1981 to 2014 is employed. Results show that the effect of oil price on growth is insignificant in a linear model. However, when a nonlinear model is estimated, the results revealed that the asymmetric effect does indeed exist. A decrease in oil price does contribute to economic growth, while an increase in oil price does not. The findings would suggest that Malaysia is not able to reap the benefit from an increase in oil price and at the same time, a decrease in oil price reduces the cost of production, thus spurring the economic activities. As such, policymakers should ensure that proper measures are in place to ensure that oil revenues are channelled to productive purposes while also ensuring that Malaysian will continue to benefit from the decrease in oil price.

In addition, for the oil price-exchange rate nexus, the ARDL and NARDL approach is employed as well. Using data from 1982: Q1 to 2016: Q4, results show that the asymmetric effect is not present in this case. However, for a linear model, the effect of oil price on the real effective exchange rate is positively significant, indicating that an increase in oil price leads to an appreciation of the Malaysian currency relative to other countries. This suggests that the oil markets play a vital role in influencing the movement of the exchange rate, particularly the Malaysian ringgit. As such, monetary policies should still take oil price into consideration to avoid extreme fluctuations in a case of large oil price shocks despite the non-existent of asymmetry. Overall, as an oil-exporting country, Malaysia is still reliant on crude oil and policymakers should account for the crude oil price in the

formulation of policies given the significance of crude oil as a determinant of economic growth and the exchange rate.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master of Science

KESAN HARGA MINYAK TERHADAP PERTUMBUHAN EKONOMI DAN KADAR PERTUKARAN MATA WANG DI MALAYSIA

Oleh

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September 2019

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Kajian ini mengkaji kesan harga minyak terhadap pertumbuhan ekonomi dan kadar pertukaran mata wang bagi kes Malaysia. Model inovatif terkini kointegrasi autoregresif lat tertabur tak-linear (NARDL) oleh Shin et al. (2014) yang mana merupakan versi lanjutan model autoregresif lat tertabur (ARDL) digunakan bagi menganalisis hubungan tersebut. Teknik ini membolehkan ketidaklinearan jangka pendek dan jangka panjang melalui penguraian harga minyak menjadi jumlah separa perubahan positif dan negatif disamping mengekalkan kelebihan ARDL biasa. Untuk hubungan harga minyak dan pertumbuhan ekonomi, data tahunan yang meliputi dari 1981 hingga 2014 digunakan. Keputusan bagi model linear menunjukkan bahawa kesan harga minyak terhadap pertumbuhan ekonomi adalah tidak signifikan. Bagaimanapun, apabila model tak-linear dianggarkan, keputusan kajian menunjukkan bahawa sememangnya wujud kesan asimetri. Penurunan harga minyak didapati menyumbang terhadap pertumbuhan ekonomi, manakala tidak bagi peningkatan harga minyak. Penemuan kajian juga mencadangkan bahawa Malaysia tidak memperolehi faedah kesan daripada kenaikan harga minyak dan pada masa yang sama, penurunan harga minyak mengurangkan kos pengeluaran, dengan demikian memacu aktiviti ekonomi. Oleh itu, penggubal dasar perlu memastikan langkah-langkah yang wajar diambil bagi memastikan hasil minyak dapat disalurkan untuk tujuan yang produktif sambil memastikan Malaysia akan terus menikmati faedah daripada penurunan harga minyak.

Disamping itu, bagi hubungan harga minyak dan kadar pertukaran mata wang, model ARDL dan NARDL juga digunakan. Dengan menggunakan data dari 1982: Q1 to 2016: Q4, keputusan kajian menunjukkan kesan asimetri tidak wujud. Bagaimanapun, model linear mendapati kesan harga minyak terhadap kadar pertukaran mata wang adalah positif dan signifikan, menunjukkan peningkatan harga minyak membawa mata wang Malaysia mengalami naik nilai berbanding negara lain. Ini mencadangkan harga minyak memainkan peranan yang penting dalam mempengaruhi pergerakan kadar pertukaran mata wang, terutamanya ringgit Malaysia. Oleh itu, pelaksanaan dasar monetari perlu memberikan

pertimbangan yang sewajarnya terhadap harga minyak bagi mengelak kesan melampau turun naik apabila berlakunya kejutan harga minyak disebalik ketidakwujudan kesan asimetri. Keseluruhannya, sebagai sebuah negara pengekspor minyak, Malaysia masih bergantung kepada harga minyak dan penggubal dasar perlulah mengambilkira harga minyak dalam pelaksanaan sesuatu dasar, berdasarkan yang mana harga minyak sebagai penentu penting pertumbuhan ekonomi dan kadar pertukaran mata wang



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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

OPEC	Organization of the Petroleum Exporting Countries
NARDL	Nonlinear Autoregressive Distributed Lag
ARDL	Autoregressive Distributed Lag
ASEAN	Association of Southeast Asian Nations
WTI	West Texas Intermediate
GNP	Gross National Product
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
VAR	Vector Autoregression
UAE	United Arab Emirates
GDP	Gross Domestic Product
OECD	Organisation for Economic Co-operation and Development
EIA	US Energy Information Agency
GCC	Gulf Cooperation Council
RGDPPC	Real Gross Domestic Product per Capita
OIL	Real Oil Revenue
HC	Human Capital
POP	Population Growth
GFCF	Gross Fixed Capital Formation
POS	Partial sum of positive changes
NEG	Partial sum of negative changes
WDI	World Development Indicator
PWT	Penn World Table
LCU	Local Currency Unit
MOF	Ministry of Finance, Malaysia
ECM	Error Correction Model
SIC	Schwarz Information Criterion
ADF	Augmented Dickey Fuller
KPSS	Kwiatkowski–Phillips–Schmidt–Shin
CUSUM	Cumulative Sum
CUSUMSQ	Cumulative Sum of Squares
REER	Real Effective Exchange Rate
GOV	Government Expenditures
OPEN	Openness
IMF	International Monetary Fund
MUV	Manufactures Unit Value
AIC	Akaike's information criterion
HQ	Hannan-Quinn information criterion
DOSM	Department of Statistics Malaysia

CHAPTER 1

INTRODUCTION

1.1 Research Background

Even with the ongoing race towards climate goals, coupled with the development and the advocating of electric cars and renewable energy sources, crude oil is without a doubt, still one of the most important commodities in the global energy market. Not merely confined to its direct usage for consumption of oil products, crude oil is also used indirectly with other commodities' consumption or as part of the production process of services that requires oil inputs. These various usages of crude oil leads the crude oil price to act as a benchmark for economic perspectives, currency movement, inflation and to determine the level of political unrest in the oil-exporting country, thus making it one of the most critical global macro indicators (Lang & Auer, 2019). As oil is a significant limited-resource, it is unsurprising that following the 1973 oil crisis, many research is conducted on the relationship between oil prices and various macroeconomic indicators.

Indeed, explaining the effect of oil price on the macroeconomic variables seems to be a complicated matter for which the generalizability of much-published research on this topic found to be indefinite while filled with controversies either technical or ideological in nature. Nonetheless, several studies identified that oil shocks play an essential role on macroeconomic variables, particularly economic growth and exchange rate in an oil-exporting country (Eltony & Al-Awadi, 2001; Jiménez-Rodríguez & Sánchez, 2005; Olomola & Adejumo, 2006; El Anshasy, 2009; Berument, Ceylan, & Dogan, 2010; Mohammadi & Jahan-Parvar, 2012; Aloui, Ben Aïssa, & Nguyen, 2013). For instance, researchers are divided on the impact of oil price shocks on economic growth and exchange rate, albeit, the theoretical predictions are strongly suggestive that oil price leads to a vital signal for the achievement of growth and the exchange rate movement. There is, however, a number of studies that corroborates an increase in oil prices lead to a better economic growth (El Anshasy, 2009; Berument et al., 2010) as well as an appreciation of exchange rate (Koranchelian, 2005; Zalduendo, 2006; Issa, Lafrance, & Murray, 2008; Hasanov, Mikayilov, Bulut, Suleymanov, & Aliyev, 2017) in the oil-exporting country.

Based on the conflicting impact of oil price on economic growth and exchange rate, several economists have investigated the effect of oil shocks on the economic growth and exchange rate may have asymmetric effect in nature (Mork, 1989; Akram, 2004). Arguably, the impact of oil price on economic growth and exchange rate may have differed or changed in response to the rising oil price as compared to falling oil price (Farzanegan & Markwardt, 2009; Moshiri & Banihashem, 2012; Nusair, 2016; Kisswani, Harraf, & Kisswani, 2018; Nusair & Olson, 2019). This attributes that the existence of a linear relationship on the effect of oil price on economic growth and exchange rate seems to be an inappropriate measurement, which is potentially misspecified. However, explicit studies on net oil exporters have been limited and inclined towards the Organization of the Petroleum Exporting Countries (OPEC) and Middle-East countries. As a result, studies on

the asymmetric effect for oil-exporting countries that acts as small-open-dynamic economies such as Malaysia remains inadequate and scant.

In this regard, to examine the asymmetric effect of oil price shocks on growth and exchange rate relationships, this dissertation contributes to the present literature by focusing on a small stock of evidence on the effects of oil price shocks on the Malaysian economic growth and exchange rate movement. Specifically, this study utilises the Nonlinear Autoregressive Distributed Lag (NARDL) model established by Shin, Yu, and Greenwood-Nimmo (2014), which is an extended version of the Autoregressive Distributed Lag (ARDL) model bound test approach as established by Pesaran, Shin, and Smith (2001). Most notably, this method allows the accommodation of economically meaningful probability to capture a more dynamic and vibrant short-run and long-run relationship, where the impact of oil price shocks is incorporated through the positive and negative partial sum decompositions on growth or exchange rate models. This technique incorporates the possibility of a nonlinear relationship, which has been largely ignored. In other words, the effect of oil price shocks on growth and exchange rate may differ or change due to rising or falling in oil price, which is precisely the type of relationship that this study is interested with. Previous studies often assume that an increase and decrease in oil price have the same magnitude on the macroeconomic variables. However, with the use of the NARDL model, it is now possible to see the differences in the increase and decrease of oil price on those macroeconomic variables.

In line with this apprehension, oil price shocks with economic growth and exchange rate could be nonlinear and characterised by the asymmetric effect. Therefore, understanding why such variations in oil price changes exist is an essential next step for both policymakers and academicians to draw out policy implications, since this knowledge may hold the key to discourse on the link of growth and exchange rate effect with the shocks of oil price. Hence, it is vital that the research on the dynamics of oil price on the economic growth and exchange rate for the case of Malaysia is pursued.

1.2 Problem Statement

The relationship between crude oil and macroeconomic variables have remained disputable despite the abundant research across countries with a range of econometric techniques. Hamilton (1983)'s influential seminal paper, for example, takes a first step in identifying the relationship between oil price changes and variations in macroeconomic variables. Since then, a growing number of studies began to query the potential effects of the fluctuations of oil price on the economic growth and exchange rate. Several empirical studies on the effect of oil price on economic growth and exchange rate have been conducted, particularly among developed oil-importing countries and among the Middle-East counties. However, most previous studies implicitly assumed that the effect of oil price on these macroeconomic indicators is linear, which yield contradictory results. Granger and Terasvirta (1993), for example, emphasised that most of the macroeconomic variables have nonlinear characteristics. Arguably, the impact of oil price on growth and exchange rate may have differed or changed in response to the rising oil price as compared to the falling oil price. Intrinsically, ignoring the nonlinear aspects in the analysis of the relationship between oil price and these macroeconomic indicators could yield results that

are far from its true nature. It is also worth mentioning here that empirical findings on asymmetric effects of oil price shocks on the economic growth and exchange rate, especially for developing and emerging economies that act as oil-exporting countries, like Malaysia seem to be inadequate and scant.

However, studies that engaged for a small-open-economy such as Malaysia appeared to be potentially misspecified, which are biased. Aziz and Dahalan (2015), for instance, focus on the asymmetric effect of oil price on economic growth for the ASEAN-5 countries, including Malaysia. Using a panel VAR, this study revealed that an asymmetric effect is present for the case of Malaysia. However, it is worth noting here that the ASEAN-5 countries consist of Indonesia, Malaysia, Philippines, Singapore and Thailand, and thus using a panel VAR for five countries that are a mixture of oil-exporting and oil-importing countries may suffer from heterogeneity problem and lead to biased results. Another research by Kisswani et al. (2018) and Nusair and Olson (2019) also analysed the nonlinear effect of oil price on the exchange rate of Malaysia. Results from the study also found a long-run asymmetric effect. Nevertheless, the model from this study is a simple bivariate model, which is prone to variable omission bias. Hence, there is a need to aptly perform an analysis on the nonlinear effect of oil price on the economic growth and exchange rate, specifically for Malaysia, which relies on crude oil as its main engine of economic progress.

On the effect of oil price on economic growth, explicit studies on net oil exporters are limited. An increase in oil price, despite being associated with improvement in the economy of oil-exporting countries, may not necessarily hold for all oil-exporting countries. Economic growth might, in fact, be impaired, following an increase in oil revenue through the increase in oil price due to worsening of the economic conditions favourable to economic growth via appreciation of exchange rates, rent-seeking, and poor policy-making as a result of an increase in oil revenues (Moshiri & Banihashem, 2012)

As such, an increase and decrease in oil prices may have a different impact on economic growth. This brings up an issue on how oil price shocks affect growth, as a positive oil price shock could be detrimental to economic activity of oil-exporting countries, like Malaysia. In other words, a linear relationship between oil price and macroeconomic variables may not be appropriate, as it is potentially misspecified.

For the effect of oil price on exchange rate, previous studies have examined using array of econometric techniques, like the co-integration theory, the Granger causality test, the vector autoregressive model and the vector error correction model, yet empirical evidence on the effect of oil price on exchange rate is far from conclusive (see Mohammadi & Jahan-Parvar, 2012; Aloui, Ben Aïssa, & Nguyen, 2013). Conflicting outcomes on how oil price shocks affect the exchange rate mean that a positive oil price shock could instead depreciate the exchange rate for oil-exporting countries, including Malaysia.

More importantly, the impact of oil price on the exchange rate may have differed or changed in response to rising oil as compare to falling oil price. The use of a linear model to scrutinise the relationship between oil price and exchange rate appears to be an

inappropriate measurement. In other words, a linear model is potentially misspecified. For instance, a study by Nusair and Olson (2019) found that the effect of oil price on the Malaysian exchange rate is asymmetric. However, that study employs a bivariate model, leading to potential variable omission bias. Thus, empirical findings on asymmetric effects of oil price shocks on the exchange rate, especially for developing and emerging economies that act as oil-exporting countries, like Malaysia seems to be limited.

1.3 Objectives of the Study

The general objective of this study is to examine the effect of oil price on the macroeconomics indicator (i.e. economic growth and exchange rate) of Malaysia. The specific objectives of this study are as follows:

- 1) To investigate whether oil price affects economic growth in Malaysia
- 2) To examine whether oil price affects exchange rate in Malaysia

1.4 Significance of the Study

This study contributes to the set of economics literature on the effect of oil price on economic growth and exchange rate in several significant ways. First, it contributes further empirical evidence on the limited studies on oil-exporting countries, specifically among developing economies such as Malaysia through the nonlinear analysis perspective. Given the limited empirical studies, hence this study is deemed relevant in bridging the gap by empirically scrutinising for a comparatively small stock of evidence on the effects of oil price shocks on the Malaysian economic growth and the Malaysian exchange rate. More importantly, previous empirical studies implicitly assume a linear relationship between oil price shocks and the macroeconomic indicators. Thus, there are limited studies that discern the oil shocks (i.e. positive and negative). This study leads to endeavour the validity of the nonlinear hypothesis on the relationship between oil price shocks and the macroeconomic indicators, namely economic growth and exchange rate.

Secondly, this study takes into account some relevant explanatory variables through a single time series analysis, which provides better estimation results on the effect of oil price on the economic growth and the exchange rate of Malaysia. Prior studies on the nonlinear analysis for the case of Malaysia had several limitations such as being prone to variable omission bias (Bouoiyour, Selmi, Kumar, & Shahbaz, 2015) and the assumption that oil-exporting and oil-importing countries share similar characteristics in a panel data setting (Sun, Tong, & Yu, 2002). This highlights the significance of considering potential control variables to reach more precise and conclusive results. Thus, this study incorporates several control variables that may potentially explain the relationship between oil price and the macroeconomic indicators (i.e. economic growth and exchange rate) more effectively.

Thirdly, the effect of oil price on the economic growth utilises oil revenue as a proxy for crude oil price rather than Brent crude oil price or WTI crude oil price. Most past studies use Brent crude oil price as a proxy for the oil price, and this may result in inaccurate analysis. This inaccuracy stems from the idea that some oil-exporting countries may increase their exports when the oil price is low to obtain back higher revenue from the oil sector for better economic growth (Moshiri & Banihashem, 2012). In short, an oil-exporting country can nullify the negative effect that is often associated with low oil prices. As such, it is better to use oil revenue as a proxy in explaining the effect of crude oil on the economic performance of oil-exporting countries to circumvent this problem. The oil revenue is derived from the total petroleum income tax, petroleum royalty and PETRONAS dividend.

Finally, this study considers to be more comprehensive and may draw robust results as the study sample period is sufficiently large that spans over the year 1981 - 2016. Hence, the findings obtained in this study will lead to a new contribution to the development of the literature, which bridges the gap and shed some light on the effect of oil price on economic growth and exchange rate, particularly for a comparatively small stock of evidence, namely Malaysia.

1.5 Organisation of the Study

The rest of the study is organised as follows. Chapter 2 provides an overview of the theoretical and empirical literature. Chapter 3 describes the model specification, estimation techniques, and empirical results of the effect of oil price on the economic growth of Malaysia. Likewise, Chapter 4 explains the effect of oil price on the exchange rate in Malaysia. Finally, Chapter 5 concludes and summarises the findings of the study.

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