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Impact of oil price shocks on stock returns: evidence from selected Southeast Asian economies

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Research Title

Impact of Oil Price Shocks on Stock Returns: Evidence from Selected Southeast Asian Economies

By

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(1259143)

Abstract

This paper investigates the impact of oil price shocks on stock market returns in selected Southeast Asian countries. We selected five countries, those are Indonesia, Singapore, Malaysia Thailand and Philippine. We employ autoregressive distributed lag model (ARDL) and VECM model in the analysis. We model both positive oil price shock and negative oil price shock. We find that the real Brent price is positively correlated with all the stock markets in the selected countries. The results of ARDL model indicate that positive oil price shock exhibits a negative impact on the stock market returns while lag one negative oil price shock exhibits a positive impact on the stock market returns in the short run. However, only Indonesia and Singapore exhibit a significant response to positive and negative oil shocks in the ARDL model. The cointegration analysis indicates a long run causal relationship from oil price to stock market returns for Malaysia and Singapore. This result is confirmed by the error correction model with significant and negative but low speed of adjustment.

DECLARATION

I, Siddiqui Ammar, declare that this research report is my own, except where otherwise indicated, referenced and acknowledged. It is submitted in fulfillment of the requirements for the degree of Master of Management in Finance and Investment at the University of the Witwatersrand, Johannesburg. This research report has not, either in whole or in part, been submitted for any degree, diploma or examination in this or any other universities.



_____

Ammar Siddiqui

Signed at ___WBS, Johannesburg _____

On the __31st March ____day of ____2017___

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Chapter 1: Introduction

1.1 Theoretical background

The breakdown of the relationship between inflation and unemployment in the 1970s has since set a new path of research for financial economists and macroeconomists. It is well established that in the long run, the growth rate of money is the main driver of inflation, but factors that drive the short run inflation dynamic are still receiving a great deal of research. While the debate is still on the stage, Jones et al. (2004) review the findings between 1970 and 1996 and conclude that, while nonlinear relationships are been established between oil price's shocks and gross domestic product, the impact of oil shock is asymmetric. Further, Ball and Mankiw (1995) say that relative prices play an important role in the short run dynamic of Philips curve, and oil prices shock of 1986 is a clear illustration of the higher inflation in the US in that period.

The financial market news reports the up and down movement in the price of financial market instruments such us gold, diamond, exchange rate, interest rate, and most importantly the price of oil which is an important factor in the supply side of the economy. Oil is considered as input in the production of good and services. Increase in oil prices with no inventory holding and everything else constant increases the cost of production and may result in lower industrial production which in turn leads to lower gross domestic product. However, Higher GDP indicates growing economy and has positive impact on the stock market. Given the importance of oil in the economy, the up and down movement of its price will surely affect other financial market instruments that are closely related to the economy. Thus, oil prices are expected to have an impact on assets, (Malik, 2010).

1.2 Empirical background

A good foundation and relationship have been established and empirical studies have utilized a set of methodology to pin down the impact of oil price on stock returns. As pointed out by Kanjilal and Ghosh (2014), the relationship between the two variables have been investigated extensively and some major findings have been established. The first accentuate on negative theoretical relationship between oil prices and stock returns while the second contradict the likely accepted negative relationship and found the relationship to be positive. This contradictory finding may be classified as *sign puzzle*.

Finally, the sign puzzle suffers from statistical significance and other conditions may be influential in the determination of correlation, causation and significance of oil price shocks on stock market returns. For instance, Filis (2010) examines the relationship between the cyclical components of oil price and stock returns in Greece. His study use Cointegration and VECM approaches and the results suggest that both stock market return and oil price have positive effect on the consumer price index in the long run while cyclical components analysis suggests that oil price has a negative impact on the stock returns. Other studies such as hooker (2002)

and Chiarella and Gao (2004) have also investigated the relationship between oil prices and stock returns.

1.2.1 Relationship between stock returns and oil prices

Other aspect of oil price analysis and its impact on the stock market have also been considered. Initially, Sadorsky (1999) investigate how oil prices shock affect stock market returns using a VAR model, he finds a change in the dynamic of oil prices and conclude that both the level of oil price and its volatility are significant in explaining variations in stock returns. Further, Sukcharoen et al. (2014) have adopted the Copula Approach to investigate the link between oil prices and general stock market indices, but the result indicates a weak relationship between the two variables which they conclude to be in line with the literature. Zhu et al. (2014) on the other hand investigate the dynamic dependence using Asian Pacific stock market returns and oil prices. They emphasized on the use of conditional and unconditional Copula Approach. They also establish a weak relationship between oil prices and Asian Pacific stock market returns.

Country level and regional evidence are also documented in the literature. For instance, Cunado and De Garcia (2014) study the impact of oil price for selected European countries. They employ VAR as well as VECM using data for the period 1973-2011, they further separate the supply shock from demand shock in order to specifically analyze the most influential shock of oil prices on stock market returns. They find differences in the response of stock returns to both demand and supply shock and documents a negative relationship between oil prices and stock market regardless the source of the shock. They conclude that the most affecting shock is oil supply shock. We have shown the movement in the nominal value of stock index of each of the selected 5 Southeast Asian countries and the global crude oil price on fig.1.1 below. We have drawn an ellipse to capture the impact of the 2008's financial crisis on these stock indexes.

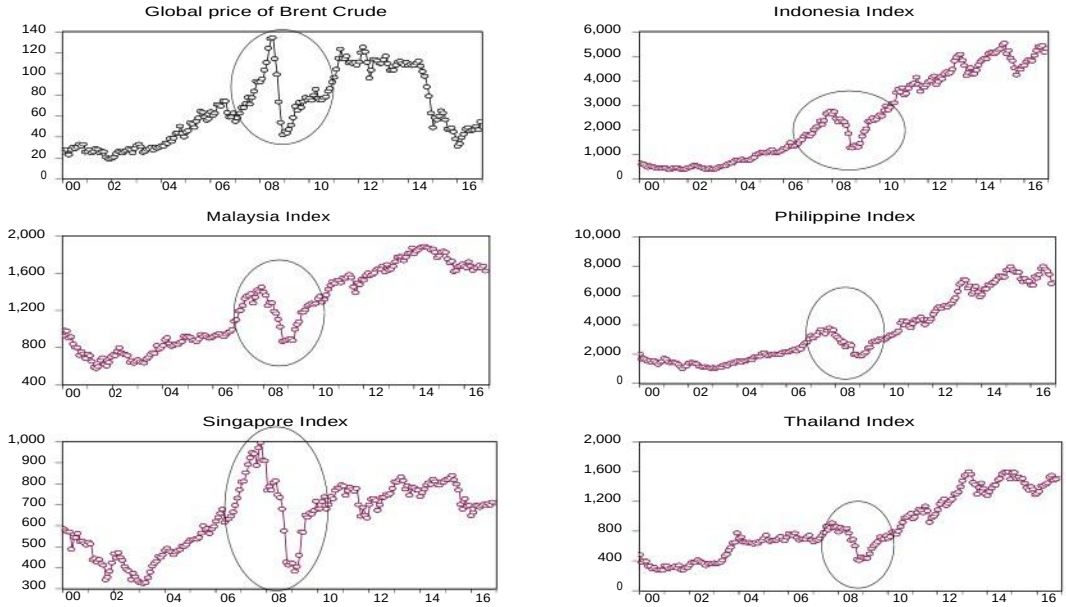

Fig 1.1 Stock index and Brent oil price

Most of the stock indexes seem to have a close relationship with the crude oil prices. Especially the Singapore stock market index moves closely with the crude global crude oil price and almost jump by the same amplitude. The financial crisis of 2008 shows almost the same amplitude in the global crude oil prices and the Singapore stock index. Indonesia, Philippine, Thailand and Malaysia did not react much to the crisis as Singapore did. The financial crisis of 2008 has a combination of causes. First, the investment of financial institutions in non-transparent portfolios in combination with the real estate market downfall all together shorten the credit supply on the financial market prior to 2008, this is an aspect of what lead to the crisis in 2008 (Garcia-Apendini, Montoriol-Garriga, 2012) . The Asian crisis is characterized as debt development crisis (Wade, 1998). The crisis started in July 1997 and is followed by a negative economic growth in most of the Southeast Asian economies until late 1988, (Mishkin, 1999). The purpose of this paper is not to investigate the crises, but we conducted a subsample analysis to see whether the region specific crisis (which is the Asian crisis) has any impact on the relationship between our chosen variables.

1.2.3 Economic impact of stock markets in Southeast Asia

As indicated by Ong and Lipinsky (2014), stock markets in Asia are boosting corporate financing, but are unreliable when it comes to their pricing fundamentals. He argues that most of the South East Asian stock exchange do not follow economic and corporate fundamentals. However, the region is seen as hidden investment destination by Indian and Chinese investors. The population of Southeast Asia is estimated to be around 7% in 2016 and the region contribution to the world gross domestic product was about 3% in 2016, (Deloitte annual report, 2016).

Suckharoensin and Suckcharoensin (2013) study the stock market development in Asia by emphasizing on a number of development indicators. They utilized the size, market efficiency, stability of the stock exchange and access to the stock exchange as development indicators. They report the most developed stock exchange in Asia to be Singapore exchange, followed by the stock exchange of Thailand while the Bursa of Malaysia is in the third position. The least developed stock exchange in the region is the Philippines stock exchange while Indonesia stands in the fourth position. Even though the Philippines stock exchange is classified as the least developed, Tan et al. (2012) however reports that the Thailand stock market is integrated with major stock exchanges in the U.S, UK, Japan and Singapore.

Among the five stock exchanges, the stock exchange of Thailand was seen in 2012 as the most improved in term of corporate governance in Southeast Asia. The Asian corporate governance scorecard of 2012 reported 67.7% for Thailand, 62.3% for Malaysia 56.1% for Singapore, 48.9% for Philippines and 43.3% for Indonesia (Bangkok International Motor Show, 2014). The Boston Consulting Group (BCG) points out on the relaxation of barriers on international capital in Asia and demand for natural resource in the region has also picked up while consumption expenditure by households keep rising. In addition, Asia is now attracting manufacturers from china due to its competitive cost advantage, (BCG, 2012). In order to assess the size and

growth of the region stock exchange, we provide an overview of the five stock exchanges using data on the market capitalization as percentage of GDP from the Reserve Bank of Saint Louis.

No single Asian capital market managed to escape the 1997 Asian debt and currency crisis. The growth of the market capitalization as percentage of gdp dropped sharply between 1993 and 1998 except for Singapore. The same happened during the 2008 financial crisis, but the effect of the latter is less severe as compared to the 1997 crisis. The market capitalization did not fall below -2% for Singapore as compared to below -4% for Indonesia, Malaysia, Philippine and Thailand during 1997 crisis. Singapore managed both crises better than all the other capital markets, and the fall in its market capitalization growth during both crises is around -2%.

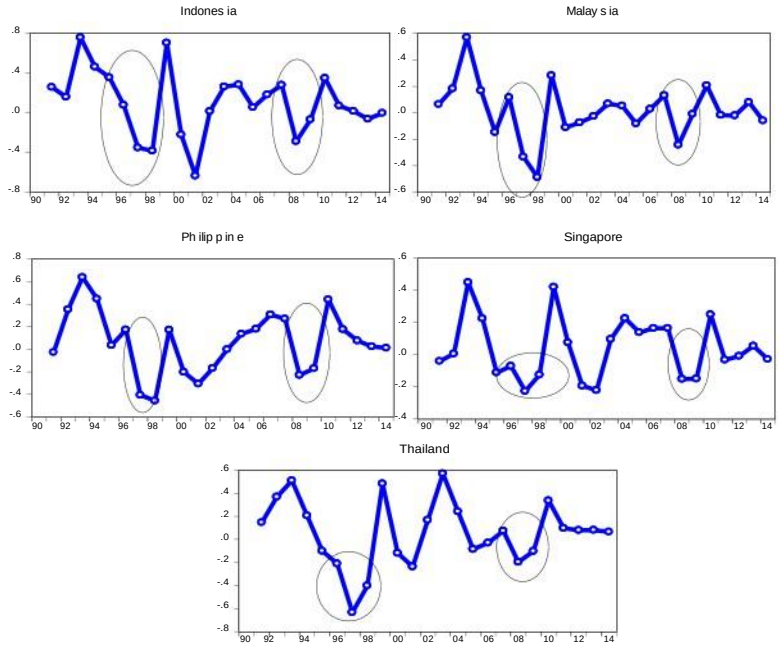

Figure 1.2: growth rate of market capitalization 1990-2014

1.3 Identified Gap and contribution

One of the first economists to try the empirical investigation of oil prices on the macroeconomics' variables was Hamilton (1983). Since then, many other financial economists have followed with a bulk of methodology. However, the purpose of the current study does not differ much from what has been done but has its source of contribution in the methodological approach and its focus on the emerging South East Asian economies. This paper intends to investigate the impact of oil prices on stock market returns in Malaysia, Singapore, Indonesia, Philippine, and Thailand.

The objective of this study is to investigate the impact of oil prices on Southeast Asia's stock exchanges. Southeast Asia markets are seen to be highly volatile in nature and therefore it is

observed that they are influenced by several sectors of companies' performance. This study particularly examines the dynamic linkage between crude oil price and stock market returns in Southeast Asian economies by answering the following question: "To what extent are price changes or returns in crude oil sector lead stock returns in Southeast Asian markets? Due to the Asian crisis of 1997 and the financial crisis of 2008, as crises create nonlinear relationship between oil prices and stock returns as documented by Jones et al. (2004), we employ Hamilton (2003) methodology which was used by Engemann et al. (2014) in the US, and separate positive oil shocks from negative oil shocks.

Chapter 2 literature review

2.1 Oil price and stock returns volatility

Sadorsky (2014) further models the interdependence and volatility of the stock market and the prices of copper, oil and wheat. He uses a combination of vector autoregressive as well as AGARCH and DCC-AGARCH and finds that emerging markets most of the time reveals leverage effect in their stock prices. Further, Basher and Sadorsky (2016) look at how emerging market stock prices can be hedged using oil prices, gold and bonds. They use the GO-GARCH model in combination with DDCC and ADCC. They focused on the use of oil and commodities to hedging equities and find that oil can be used as an appropriate hedging variable in emerging market economies.

Ewing and Malik (2016) study the spillover effect with structural break in stock returns for the United States; the methodology they adopted consists of both univariate and bivariate GARCH models. They find no spillover effect between oil prices and the United States' stock market returns when structural break is not yet tested. After testing for structural break, they find spillover effect to be present in both oil price and stock markets returns. Not to mention all, most of the above studies have been conducted in developed countries, while few of them consecrated their time to developing and emerging growing economies.

Balcilar (2013) employ a regime switching model to study the impact of crude oil price on the US stock market. They adopt the Markov-Switching VECM model and use monthly data for a very long period to separate low volatility regime from high volatility regime. Their empirical result suggests a presence of high volatility regime before the great depression. The same type of analysis has also been done by Bouri (2015) for the Lebanese stock market. Bouri investigates the relationship between return and volatility using oil prices and stock returns. He uses a vector autoregressive generalized autoregressive conditional heteroscedasticity (VAR-GARCH) on weekly data. A weak impact is found but its transmits from oil market to stock market and a strong relationship between oil and stock market is found during the financial crisis of 2008. Other models have also been used to investigation the relationship between oil price and stock market returns.

2.2 Equilibrium relationship between oil price and stock returns

Reboredo and Rivera-Castro (2014) study the relationship between oil and stock market in both Europe and USA, they considered both aggregate and sectoral level in their study and use Wavelet-decomposition analysis. When ignoring the 2008 financial crisis, they find no evidence of oil price impact on stock returns before the crisis at the exception of oil and gas stock returns. However, Oil price positively affected the stock returns of oil and gas industry at sectoral level. They also find contagion and positive correlation between oil and stock prices in both Europe and US after the financial crisis. Kang et al. (2015) also study the impact of global oil prices shocks on the stock market return and volatility using VAR model. They computed the covariance between the US stock market returns and the stock market volatility using daily data.

Disturbance in oil production or shock to oil supply has a positive impact on the covariance metric while demand shock is negatively and significantly related to the covariance between stock returns and stock volatility. Spillover effect is also found to be large and significant between the two variables. A VAR method analysis was also performed by Cong et Al. (2008) in China, and they find no significant relationship between oil price and stock market returns with the exception of the manufacturing sector.

Kilian (2009) has criticized most of the earlier conventional studies because that tends to treat all oil price shocks as exogenous. There have been studies arguing that oil price respond to factors also affecting stock prices and as a result, the aggregate oil price shock should be decomposed. Moreover, for emerging markets, Fang (2010) investigates how explicit structural shocks that characterize the endogenous character of oil price changes affect stock returns for Brazil, China, India and Russia. He shows that oil shocks have no significant impact on India's stock market, while for Russia, both global and oil specific demand shocks have significantly positive effects on the stock price. Not only VAR and GARCH models are used in the analysis of oil impact on stock return, but also Quantile regression analysis are also employed.

In Pakistan, oil prices and output are found to be strongly related, and to a great extent this relationship is non-linear, Malik (2010). As far as India is concerned, Ghosh and Kanjilal (2014) investigate the dynamic impact of linear and non-linear specifications of oil price shocks on macroeconomic fundamentals for India by employing Toda and Yamamoto version of extended vector autoregressive (VAR) model along with two-state Markov regime-switching VAR model, also the study finds that inflation and foreign exchange reserve are greatly impacted by oil price shocks. The next section of this paper presents the methodology we use and describes the source and the structure of the data we employ.

Chapter 3: Methodology and data

3.1 Methodology

This part of the study presents the model we use in this paper to investigate the impact of oil prices shocks on South East Asian stock market index. A bunch of methodology has been deployed in the literature and the later has documented puzzling sign behaviour on how stock market react to oil prices fluctuations. In order to disentangle a positive oil prices shock from a negative one, we first employ a bivariate autoregressive distributed lag model (ARDL) and follow Hamilton (1983) to computing the net oil price shock. This allows us to differentiate between positive shock and negative shock as per Engemann et al. (2014). Second we perform a residual based Granger cointegration by performing unit root test on the estimated residual from the assumed long run relationship between stock market prices and the price of Brent crude oil in each country. Third, we estimate the vector error correction for countries in which we found a long run causal relationship.

3.1.1 Model presentation

The assumption of asymmetric effect of oil price shock was first made by Hamilton (1983) and has since been the prime in the literature of the impact of oil fluctuations on macroeconomic variables. Engemann et al. (2014) investigated the impact of positive as well as negative oil price shock on country level employment and state level in the US. They examine the impact of both positive and negative oil price shock and find that, employment falls in the short run to a positive oil price shock while a negative shock seems to have no significant impact on employment in general. Tayebi and Yazdani (2014) have also used ARDL to investigate the relationship between financial crisis, oil price shock and the market of trade in Asia. They particularly focused on whether crises are leading oil shocks in Asia, but find that the relationship is bidirectional. In our paper, we include both level and first difference as independent variables as suggested by Sadorsky (1999) and the ARDL as follows:

$$\Delta = {}_0 + \sum_{11} {}_1\Delta_- \quad + \sum_{10} {}_2(\Delta_-)^+ \quad + \sum_{11}^{6} {}_3(\Delta_{-1})^- \quad + {}_4\log_{-1} + {}_5\log_- \qquad 1$$

In the above equation stands for stock price and Δ is the change in log of stock price. Our level variable is log variable. The variable is the price of Brent oil and Δ_- is the log change, is the minimum lag while is the maximum lag included in the model. We follow Hamilton (1983), Hamilton (2003) and Engemann et al. (2014) and model oil price shocks as follows:

$$\Delta_+ = ()\{0,100 * \ln \qquad \frac{}{\{-1ggg_{-12}\tilde{n}\Phi} \qquad 2$$

$$\Delta_- = \{0,100 * \ln \qquad \frac{}{\{-1ggg_{-12}\tilde{n}\Phi} \qquad 3$$

Equation 2 measures the positive oil price shock while equation 3 measures the negative oil price shock. Our data is a monthly data, the computation of positive and negative net oil price increase and decrease are plotted on fig3.3 below. The blue line is the positive net increase while the dark is the negative net decrease. The metrics are in percentage.

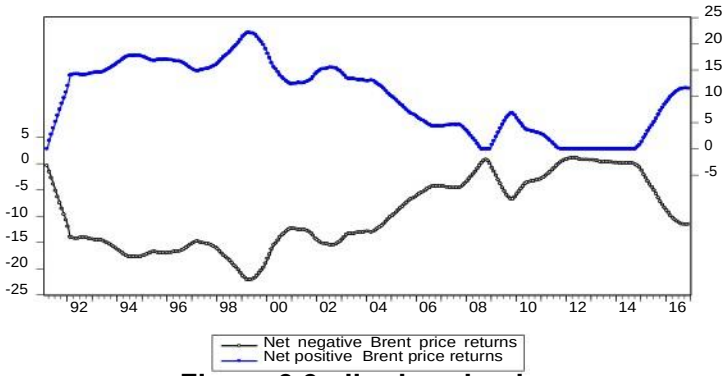

Figure 3.3 oil price shocks

After running a residual based cointegration (Engle and Granger, 1987), we estimate a VEC model for which confirm long run causal relationship. The vector error correction model allows for the determination of short run disequilibrium. In order to perform an EG cointegration test, we estimate a simple OLS regression between stock price and the price of crude oil and then perform a unit root test on the residual, if the presence of unit root is rejected, then there is a long run causal relationship between the two variables. Following Engle and Granger (1987) and Narayan and Narayan (2009), the mathematical formulation of the error correction model is as follows:

$$= _0 + \sum \quad \circ 10 - \quad + _{-1} + \qquad 4$$

Equation 4 illustrates both the short run and the long-run relationship between index returns and oil returns. The second term on the right hand side of equation 4 depicts the short run impact of oil fluctuation on index returns. If is negative and significant, this then implies long run causal relationship from oil price to stock market, with the speed of adjustment in the short run.

3.2 Data

The data we employ in the investigation are obtained from Bloomberg. The frequency of the data is monthly. The stock index of Malaysia, Philippine, Thailand, and Indonesia are from Jan-1991 to Dec 2016, while the stock index of Singapore is from January 1999 to December 2016. We decided to use such a long dataset for subsample analysis. In addition, we are able to capture the impact that the Asian crisis of 1997 may exhibit on the relationship between oil and stock markets in the region. All the variables are in real term, we use the consumer prices index of each country to compute the real value of stock index and use the consumer price of the US to compute the real Brent crude price as depicted in fig.3.4. As indicated by the market capitalization, the real price of Brent crude oil and the real stock price clearly indicate the impact

of the 1997 Asian currency crisis and the 2008 financial crises, we have drawn an eclipse to illustrate the impact of those crises on stock indexes as well as oil prices.

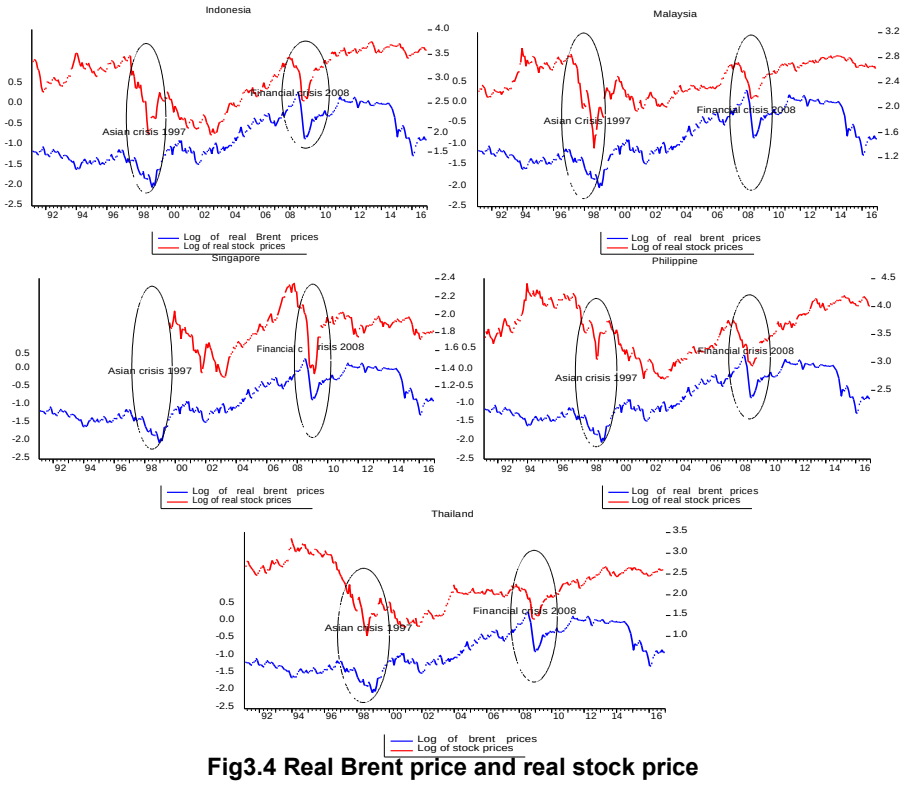

Fig3.4 Real Brent price and real stock price

The summary statistic and the correlation coefficients between the variables are presented in table 1 and 2 below. Every time we use Brent, we mean the price of Brent crude oil.

Table 3.1 Descriptive statistics of monthly index returns

Parameters	Brent	Indonesia	Malaysia	Philippine	Singapore	Thailand
Mean	-0.82	3.01	2.46	3.60	1.83	2.21
Median	-0.98	3.16	2.48	3.62	1.87	2.20
Maximum	0.29	3.76	2.95	4.41	2.35	3.36
Minimum	-2.04	1.85	1.36	2.70	1.30	1.02
Std. Dev.	0.57	0.52	0.28	0.43	0.21	0.52
Skewness	0.22	-0.53	-0.58	-0.22	-0.32	-0.08
Kurtosis	1.86	2.14	2.94	1.99	3.37	2.19
Jarque-Bera	19.28	24.24	17.70	15.70	4.86	8.91
Probability	0.00	0.00	0.00	0.00	0.09	0.01
Observations	311	311	310	311	209	310

Source: own computation

The correlation between the variables is quiet high and the coefficient of correlation are all positive. The stock market of Indonesia is highly correlated with those of Malaysia and Philippine with a coefficient of correlation of 0.96 and 0.92 respectively, while Philippine and Malaysia also exhibits a coefficient of correlation of 0.92. Thailand is highly correlated with all

the other countries and exhibits a correlation coefficient of 0.89 with Indonesia, 0.88 with Malaysia, 0.87 with Philippine and 0.54 with Singapore. The country that exhibits the lowest coefficient of correlation with other countries in the group is Singapore. The coefficient of correlation of Brent price with each country's stock market index is 0.75 for Indonesia, 0.71 for Malaysia, 0.62 for Singapore and 0.60 for Thailand.

Table 3.2 Correlation coefficients

	Brent	Indonesia	Malaysia	Philippine	Singapore	Thailand
Brent	1					
Indonesia	0.75	1				
Malaysia	0.71	0.96	1			
Philippine	0.52	0.92	0.92	1		
Singapore	0.62	0.66	0.70	0.62	1	
Thailand	0.60	0.89	0.88	0.87	0.54	1

Source: own computation

The last three are the least corrected with crude oil while Indonesia and Malaysia exhibit a coefficient above 70%. We have also presented the fluctuation of real stock value on fig 3.5.

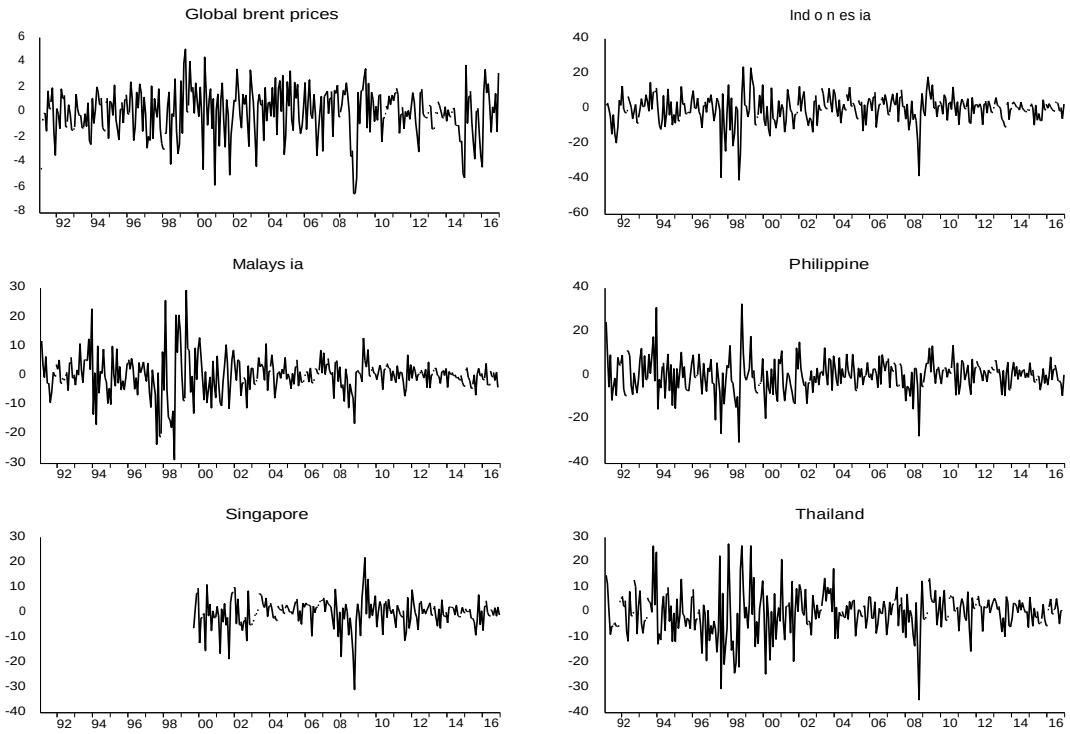

Fig 3.5 Real fluctuation of global Brent price and stock price of each country

Chapter 4: Estimation and results interpretation

We have described the methodology used in the estimation of the following results. Before any short or long run relationship investigation, the first step in the estimation presents the unit root test for both global Brent price and stock price of each country. The second step presents the EG cointegration results while the third step estimates the full sample autoregressive model as well as the subsample results. The fourth step estimates the vector error correction model for countries that exhibit a long run cointegration relation between stock returns and oil returns. In fifth and final step, we examine the response of stock returns to one standard deviation innovation in net oil price increase and decrease.

4.1 Unit root test

Three different unit root test are conducted, the first is the unit root without intercept term and no trend while the second include an intercept term and the third includes both intercept and a trend term. The results for unit root test are presented in table 4.3 .The level variables, which are log of oil and log of stock index, indicate the presence of unit root for all the variables and in all the five countries. After taking the first difference, both the return on oil prices as well as stock market returns are all significant at 1% level of significance. The results for unit root test is presented in table 4.3.

Table 4.3 Unit root test

	Indonesia	Malaysia	Singapore	Philippine	Thailand	Brent
Level						
None	-0.12	0.06	-0.33	0.19	-0.28	-1.18
Intercept	-1.57	-2.63***	-2.56	-1.52	-1.41	-1.52
Intercept & Trend	-2.12	-2.79	-2.76	-1.54	-1.31	-1.86
1st difference						
None	-14.10*	-5.19*	-8.37*	-16.47*	-16.61*	-26.58*
Interc	-14.08*	-5.19*	-8.35*	-16.44*	-16.58*	-26.51*
Intercept & Trend	-14.11*	-5.18*	-8.33*	-16.42*	-16.61*	-26.40*

'*' '' '***' indicate significance at 1%, 5% and 10% respectively.**

4.2 Cointegration analysis

In order to investigate the Engle Granger cointegration relationship between oil price and the stock market index, we assume a long run relationship between the two variables and perform a unit root test on the residual obtained from OLS regression. As indicated in the data section, only Singapore data starts from January 1999. We therefore perform two cointegration test. The first cointegration test is performed on the full sample while the second considered a sub-sample, the subsample considered here exclude the period of Asian debt and currency crisis that started in July 1997. The subsample cointegration is performed for all countries except Singapore, this is because Singapore's data already excludes the period of the Asian crisis. When the unit root test is performed using the full sample with no intercept and trend term, a

very weak cointegration relationship is found for Indonesia and Malaysia. The only country that exhibit a significant cointegration relationship is Singapore, while Philippine and Thailand show no sign of cointegration. The result for the full sample cointegration analysis is presented in table 4.4

Table 4.4 Full sample cointegration analysis

Level variable	Indonesia	Malaysia	Singapore	Philippine	Thailand
None	-1.75***	-2.25**	-3.70*	-1.48	-1.49
Intercept	-1.75	-2.24	-3.71*	-1.48	-1.48
Intercept & Trend	-1.78	-2.24	-3.71**	-1.50	-1.34

'*' '' '***'indicate significance at 1%, 5% and 10% respectively**

In order to see whether the 1997 crisis has any impact on the long run relationship between the stock market and oil price, the sub sample cointegration is performed by removing the period January 1991 to May 1998. The cointegration relationship did not change for Philippine and Thailand, we still have a weak cointegration relationship for Indonesia, but we find that there is a strong and significant cointegration long run relationship between oil and stock market in Malaysia. The unit root performed on the residual is significant at 1% percent level of significance. In summary, only the stock market of Singapore and Malaysia show a significant long run relationship with Brent crude oil. The subsample results are presented in table 4.5.

Table 4.5 Sub-sample Cointegration analysis

Level variables	Indonesia	Malaysia	Philippine	Thailand
None	-1.69***	-3.81*	-1.17	-1.32
Interc	-1.70	-3.79*	-1.16	-1.31
Interc &Trend	-3.32***	-4.11*	-2.31	-2.11

'*' '' '***'indicate significance at 1%, 5% and 10% respectively**

4.3 Full-sample and subsample ARDL results

The results for the autoregressive model are presented in table 4.6 below. The ARDL is estimated with only one lag for both full sample and subsample. The first parameter in table 4.6 is the constant term in our ARDL model. the second parameter is the coefficient for lag stock returns. the third and the fourth parameters are for actual positive oil price shock and lag positive oil price shock. The fifth and the six parameters are for actual negative oil price shock and lag negative oil price shock. The last two parameters in the table are the coefficients for level oil price and level stock price.

We find that a positive shock to oil price has a negative impact on the stock market for all the selected countries, but this negative impact is only significant at 5% for Indonesia and at 5% level of significance for Singapore. The negative oil price shock has a positive impact at lag 1 for all the countries, but the coefficient is significant at 5% for Indonesia, 5% for Thailand and 5% for Singapore. For a 1% increase in net oil price returns, the stock market return falls by 16.36% for Indonesia and 13.41% for Singapore. The negative oil price shock on the other

hand make the stock market return to increase by 17.32%, 17.43% and 14.25% respectively for Indonesia, Thailand and Singapore, but this impact is realized after a month.

The magnitude of reaction in the stock market returns to both positive and negative shock is almost the same because of the high correlation between the region stock markets, which we earlier presented in the data section. The level oil price is negative and significant at 5% for Malaysia and Singapore while weakly 10 % level of significance is found for Philippine and Thailand. The level oil is only positive for Indonesia. The results are further consistent when we perform the sub sample analysis. We find that the negative impact of positive oil shock is now weakly significant at 10% for Thailand while it is still significant at 5% for Indonesia and Singapore. The level oil price in the subsample analysis is negative and significant at 5% for both Malaysia and Philippine while weakly significant at 10% percent for Thailand. Thus, the Asian crisis did not change the results very much and a consistency exists in the relationship between oil and Southeast Asian economies. The results for full sample analysis are presented in table 4.6 and subsample analysis in table 4.7

Table 4.6 ARDL full sample results

Parameters	Indonesia		Malaysia		Philippine		Thailand		Singapore	
	7.42**	(2.05)	9.79**	(2.45)	7.04**	(1.90)	4.40***	(1.89)	9.13***	(1.71)
	0.21*	(3.74)	0.13**	(2.29)	0.06	(1.10)	0.05	(0.86)	0.14 **	(2.02)
$()^{+}$	-16.36**	(-2.22)	-6.15	(-1.02)	-2.07	(-0.29)	-12.51	(-1.59)	-13.41**	(-2.37)
$((-))^{+}$	15.11**	(2.09)	6.70	(1.13)	2.98	(0.43)	12.87***	(1.67)	11.68**	(2.07)
$()^{-}$	-18.93**	(-2.52)	-9.41	(-1.52)	-5.46	(-0.77)	-17.55**	(-2.23)	-16.14*	(-2.72)
$((-))^{-}$	17.32 **	(2.36)	9.59	(1.58)	6.13	(0.89)	17.43**	(-1.59)	14.25**	(2.44)
$((-))$	5.88	(1.54)	-3.73**	(-2.50)	-1.81***	(-1.80)	-1.82***	(-1.93)	-4.60**	(-1.77)
$((-))$	-2.00***	(-1.93)	5.35***	(1.72)	3.52	(0.99)	6.28	(1.56)	2.94	(077)
	DW= 1.99		DW= 2.05		DW= 2.00		DW= 2.04		DW= 2.07	

'*' '' '***'indicate significance at 1%, 5% and 10% respectively,** the bracket contains the t-statistics`

Table 4.7 ARDL Subsample results

Parameters	Indonesia		Malaysia		Philippine		Thailand	
	9.91***	(1.92)	15.39**	(2.49)	11.86**	(2.44)	6.80	(1.63)
	0.25*	(3.90)	0.20**	(3.09)	0.14**	(2.14)	0.08	(1.29)
$()^{+}$	-17.53**	(-2.36)	-6.28	(-1.09)	0.32	(0.05)	-13.98***	(-1.86)
$((-))^{+}$	16.16**	(2.18)	6.58	(1.14)	0.08	(0.013)	14.42***	(1.92)
$()^{-}$	-22.00*	(-2.82)	-10.40***	(-1.72)	-4.45	(-0.63)	-19.04**	(-2.41)
$((-))^{-}$	20.33*	(2.65)	10.39***	(1.74)	4.70	(0.67)	19.21**	(2.47)
$()$	6.15	(1.25)	-5.75**	(-2.55)	-3.02**	(-2.33)	-2.85***	(-1.66)
$()$	-2.65***	(-1.83)	5.49	(1.45)	3.75	(0.87)	4.14	(0.84)
	DW= 1.95		DW= 2.09		DW= 2.00		DW= 2.08	

'*' '**' '***'indicate significance at 1%, 5% and 10% respectively, the bracket contains the t-statistics

4.4 Vector error correction results

After the cointegration analysis we found a strong long run causal relationship between stock market and oil price movement in Singapore and Malaysia, we therefore present a vector error correction model for only those two countries. The results are presented in table 4.8. The first parameter in the table is the speed of adjustment while the second and the third are the short run coefficients of oil returns. The last two parameters in the table are the short run stock returns lag coefficients. Only two lags are included in the model and the results further confirm the long run relationship we found in the cointegration analysis.

The speed of adjustment is negative and significant at 5% for Malaysia and weakly 10% for Singapore. This proves that there is a long run causal relationship that runs from oil prices to stock market in both Singapore and Malaysia. The two Lags stock return are significant at 1% for Malaysia and 5% and 10% respectively for Singapore. Even though there is a long run causal relationship between stock market and oil price in Malaysia and Singapore, we found no significant short run causal relationship between these variables in both countries.

Table 4.8 Vector error correction results

Parameters of VECM	Malaysia			Singapore
	-0.03**	(-2.44)	-0.05***	(-1.94)
	0.12*	(2.07)	0.15**	(2.11)
	0.18*	(3.24)	0.14***	(1.93)
	-0.02	(-0.47)	0.02	(0.44)
	0.01	(0.43)	-0.05	(-1.08)
	0.004	(1.12)	0.00	(-0.01)

In order to deepen our analysis of the response of stock market to oil price movement, we further present the response of each stock market to positive and negative shocks. The results for impulse response analysis are illustrated by fig.7 below.

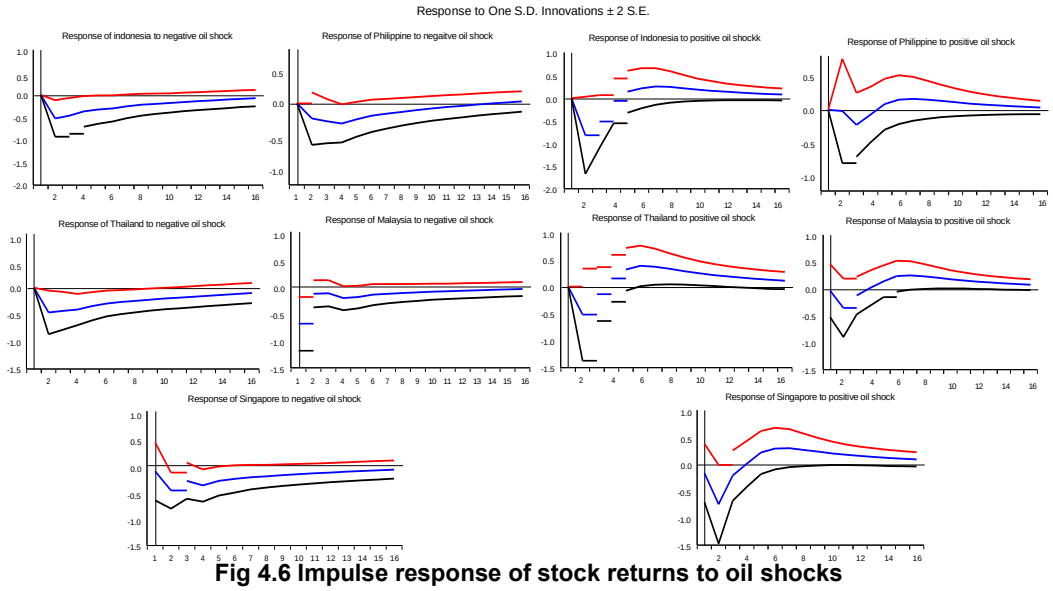

Fig 4.6 Impulse response of stock returns to oil shocks

The response of stock returns to positive shock is presented on the left and the response to positive shock is presented on the right. Looking at the positive oil shock, the stock returns for all the five countries felt sharply in response to a positive one standard innovation of positive oil returns. The through of the fall is realized during the second month after the shock. So the impact of positive oil shock last for at least a month. On the other hand, the negative oil shock on the left exhibits an increasing response for Malaysia and an unstable increasing response for Singapore. The response to negative shock is not significant for the other countries and is negative.

Our results are consistent with the work of Cunado and De Garcia (2013) as they employ a VAR-VEC model to examine the effect of oil shock on European stocks returns. They differentiate between production shock and oil price shock, which is also done by Kilian (2009). They find that oil shock has a negative and significant impact on real stock returns. Kang et al. (2014) point out that positive oil shocks has a negative impact on stock return and volatility in the US. The weak and nonexistent relationship that we found in other countries is also confirmed by Sukcharoen et al. (2014). They study the relationship that exists between stock market and oil price for the period 1982 and 2007 in the US and find a weak relationship between the two variables. Zhu et al. (2013) employ an AR (p)-GARCH (1, 1)-t, but find a weak relationship between crude oil price and stock market in Asia-Pacific.

Chapter 5 Conclusion

The main purpose of this paper is to investigate the impact of oil price shocks on stock market returns in selected Southeast Asian countries. We selected five countries, those are Indonesia, Singapore, Malaysia Thailand and Philippine. We employ two methodologies, the first is the autoregressive distributed lag model (ARDL) and the second is the vector error correction model (VECM). The contribution of our study is twofold. First it allows investors to seek for diversification opportunity in Southeast Asian countries and second it allows us to document on the impact of both positive and negative oil price shocks in the region.

We found that the real Brent price is positively correlated with all the stock markets in the countries we have investigated. The results of ARDL model indicate that positive oil price shock exhibits a negative impact on the stock market returns while lag one negative oil price shock exhibits a positive impact on the stock market returns in the short run. However, only Indonesia and Singapore exhibit a significant response to positive and negative oil price shocks in the ARDL model. We also consider a subsample analysis but found that, the Asian debt and currency crisis that started in July 1997 have no breaking impact on the relationship between oil price and stock market in the region.

The cointegration analysis indicates a long run causal relationship from oil price to stock market returns for Malaysia and Singapore. This result is confirmed by the error correction model with significant and negative but low speed of adjustment. However, no short run impact of oil price on stock market return is found. To deepen the investigation, we provide impulse response of stock market returns to both positive and negative oil shocks. The impulse response functions confirm the negative impact that positive oil shock has on the stock market returns. Our results are consistent with the one documented in the literature and they are similar to those found in Cunado and De Garcia (2013), Kang et al. (2014), Sukcharoen et al. (2014) and Zhu et al. (2013)

This study only uses data on global Brent oil price and investigates its impact on stock market returns. This may be the weakness of our study and we recommend that future studies consider the use of WTI oil prices and second, consider many other macroeconomics variables such us oil production, supply shock and decomposition of oil price shocks as proposed by Kilian (2009) for oil impact analysis. Most of the studies that investigate the impact of oil price on stock market returns only consider the positive oil price shocks but we recommend the consideration of both positive and negative oil shocks , as in Engemann (2014) and which we have also used in this paper.

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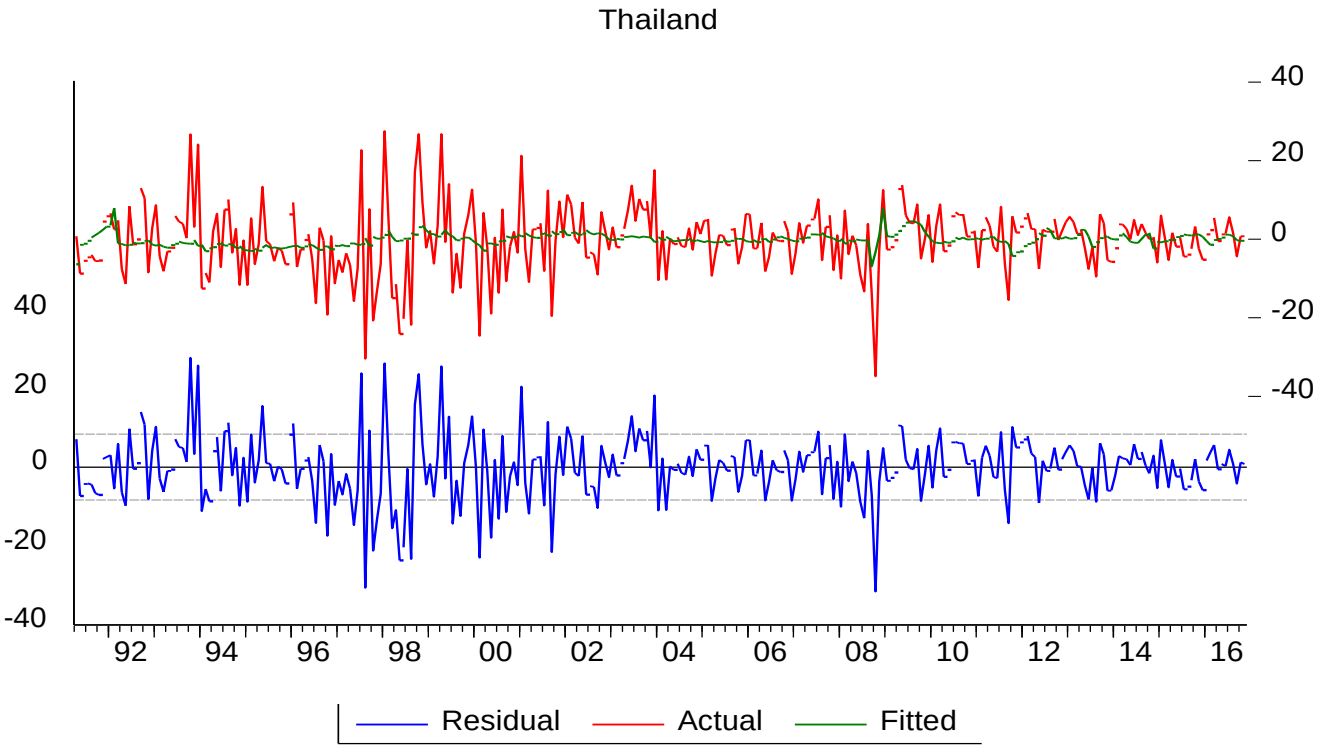
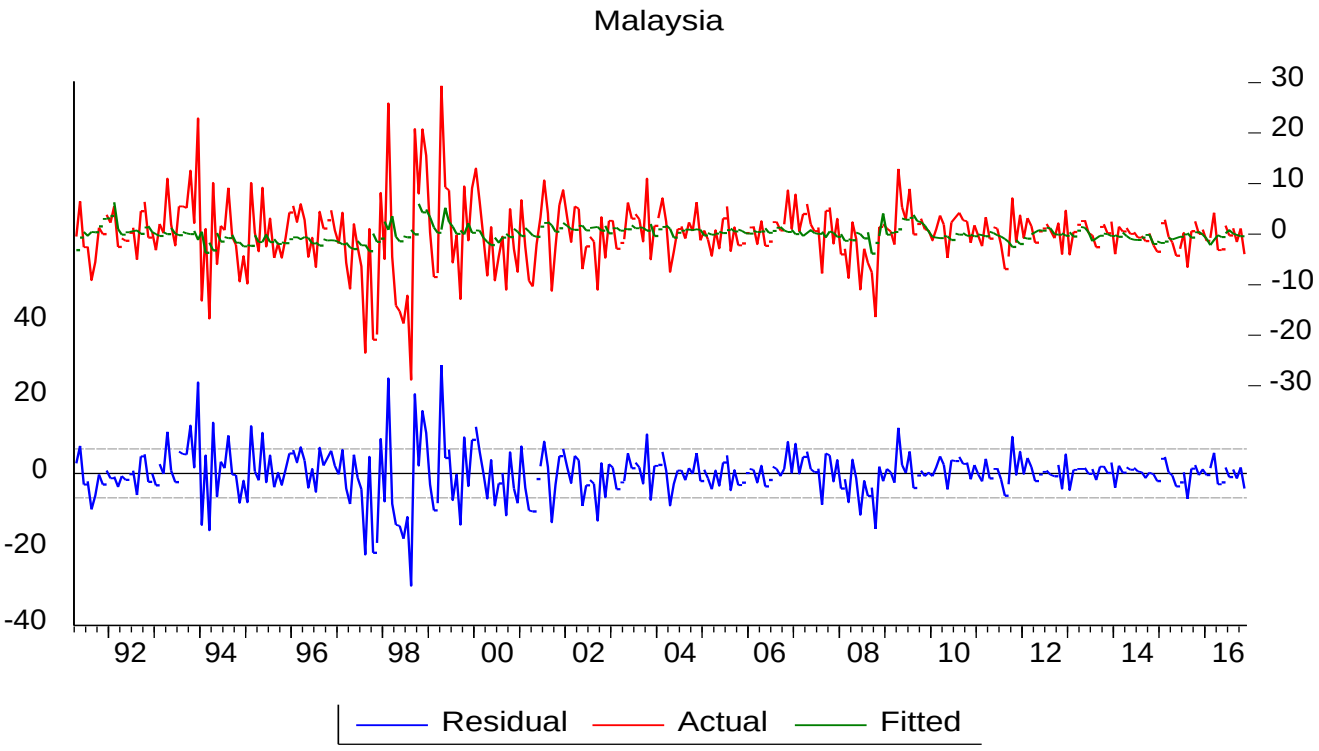
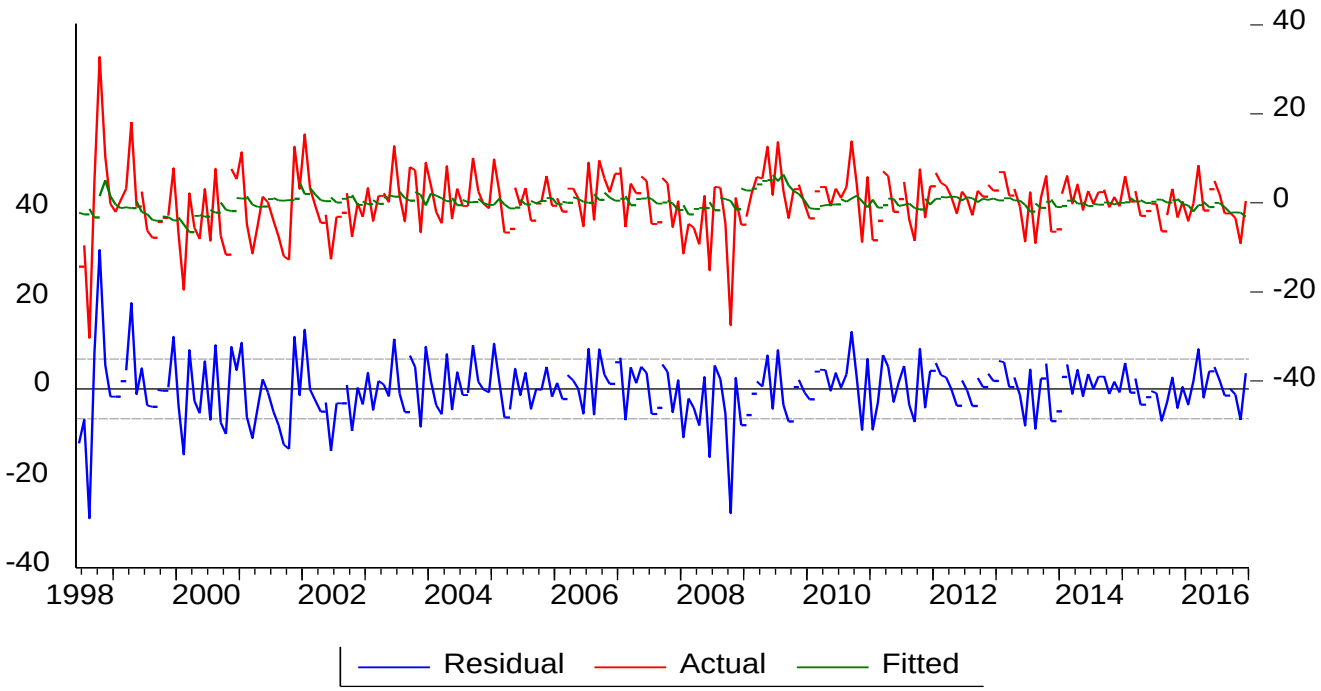
Appendix A: Actual, fitted and residual plots for the ADRL model

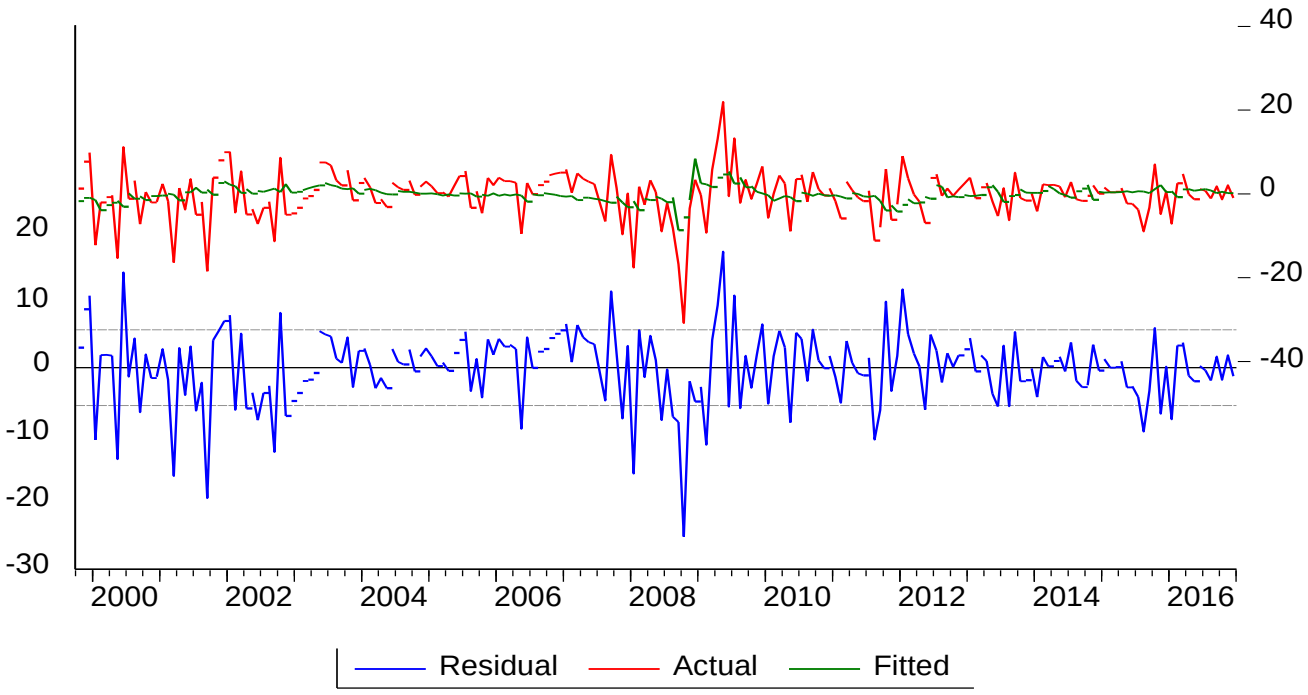


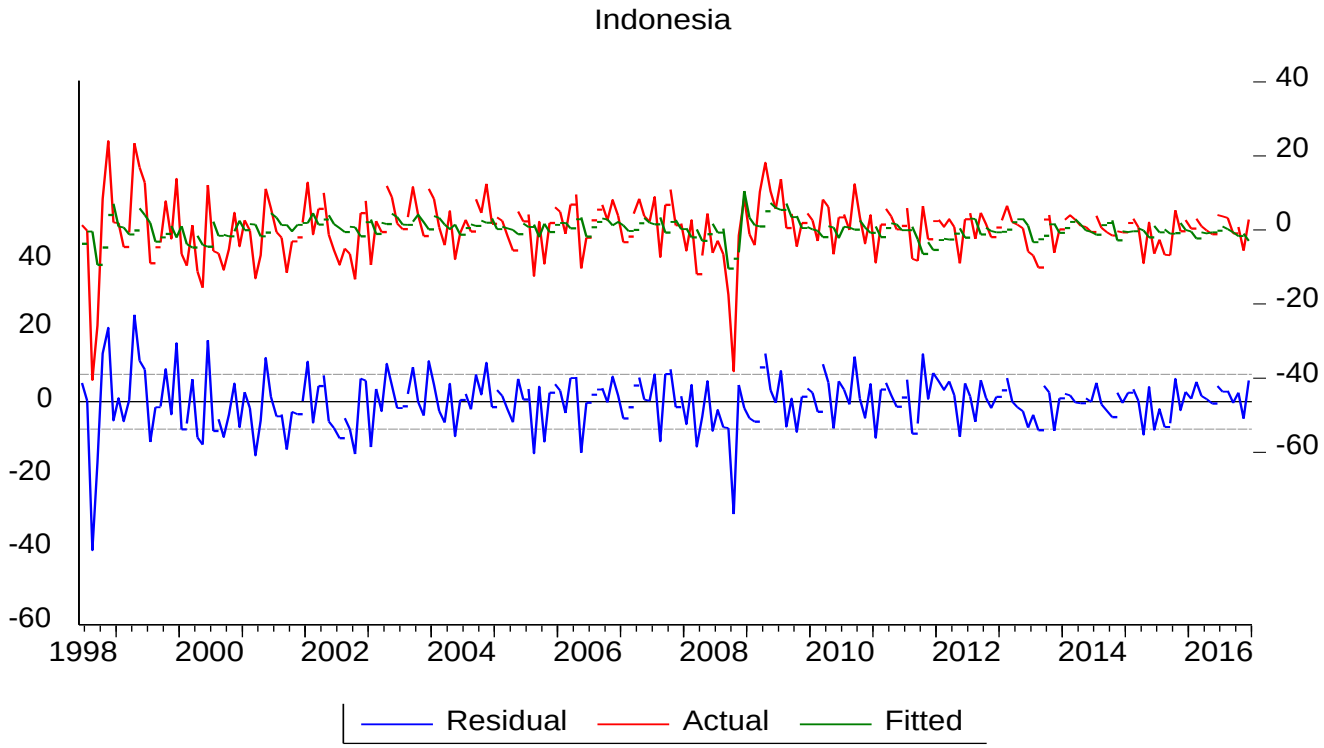


Philippine



Singapore




Indonesia
40
20
0
-20
-40
-60
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Residual
Actual
Fitted

Appendix B: Actual, fitted and residual plots for the vector error correction model

