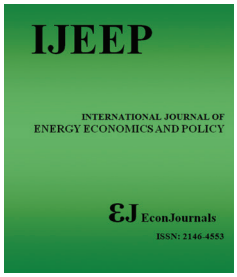

International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2015, 5(3), 731-737.

The Role of Monetary Policy in Macroeconomic Volatility of Association of Southeast Asian Nations-4 Countries against Oil Price Shock over Time

Fatemeh Razmi[1]*, Azali Mohamed[2], Lee Chin[3], Muzafar Shah Habibullah[4]

[1]Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, Malaysia, [2]Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, Malaysia, [3]Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, Malaysia, [4]Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, Malaysia. *Email: sfrazmy@yahoo.com

ABSTRACT

This paper examines the impact of oil price, as a cause of economic crisis, and monetary policy through the four known channels of monetary transmission mechanism (interest rate, exchange rate, domestic credit, and stock price). Using a structural vector autoregression model based on monthly data from 2002 to 2013 for Association of Southeast Asian Nations-4 countries, oil price and monetary transmission channels are compared pre- and post-crisis. The result indicates oil price remains an important factor in explaining price volatility, even though oil price has a weaker effect compared to a stronger effect of monetary transmission mechanism on prices. Stock price for Malaysia and domestic credit for the three others can affect the prices against oil price shock. Unlike prices, the output of all countries except Thailand is more affected by oil price post-crisis compared to pre-crisis. Different monetary transmission tools affecting industrial production are compared for the four countries.

Keywords: Monetary Transmission, Global Financial Crisis, Oil Price Shock
JEL Classifications: E52; N70

1. INTRODUCTION

Any factor that distracts the economy from reaching the objectives of output growth and price stability will be met with a response of monetary policy, For example, monetary policy contracts in the face of a positive shock to oil price to counteract it (Cologni and Manera, 2008; Rahman and Serletis, 2010). Oil price as a factor distracting the economy from reaching economic objectives has been the subject of interest of many economic studies. For instance, Ali Ahmed and Wadud (2011) as well as Álvarez et al. (2011) considered the impact of oil price on macroeconomic variables such as output and inflation. Therefore, monetary policy must be effective on output and inflation counteracting negative effects of oil price. Monetary policy transmits to output and prices through four well known-channels of transmission mechanism including interest rate, exchange rate, credit, and asset prices (Mishkin, 1995; 1996; 2001; Taylor, 1995). Thus, many economic studies examine the impact of monetary policy on economic objectives by considering the effect of this mechanism on output and prices. For example, the effects of interest rate on prices was the subject of Kose et al. (2012); Tillmann (2008), while Smets and Peersman (2001) considered the effects of interest rate on output, prices, and other macroeconomic variables. Azali and Matthews (1999); Wulandari (2012) researched how credit affects output and inflation. Some studies, such as Mehrotra (2007); Takhtamanova (2010) focused on the exchange rate channel by considering the impact of the exchange rate on inflation. Some studies consider the effect of asset price on output and prices: Elbourne and Salomons (2004); Gregoriou and Kontonikas (2010); Nisticò (2012) considered this channel via stock price. Since oil price is one of the causes of global crisis such as the crisis of 2007-2009, the evaluation of the effectiveness of the monetary transmission mechanism along with oil price can help policymakers make correct decisions in the face of oil price shocks.

Monetary policy achieves the goals of sustainable economic growth and price stability when the monetary transmission mechanism is efficient enough. A well-functioning monetary transmission mechanism can protect the economy from the damaging effects of oil price shocks. An evaluation of the effectiveness of the monetary transmission mechanism before the crisis shows to what extent the crisis relates to the poor performance of the monetary transmission mechanism. The study of the monetary transmission mechanism after the crisis shows if there is any improvement in the mechanism to keep the economy safe in the face of similar shocks.

The comparison between the effectiveness of monetary transmission and oil price shocks on output and prices during the periods before and after the crisis shows to what extent this mechanism is protective against oil price shocks. This study examines whether the monetary authority is able to reduce the negative impact of external shocks with the use of the monetary transmission mechanism.

This study compares the role of oil price and monetary policy in the fluctuations of output and inflation. The study of the effects of monetary policy via monetary transmission mechanism distinguishes the present study from other research on the role of external variables and monetary policy in macroeconomics. This study comprehensively compares monetary policy regarding the channels of transmission mechanism and oil price on output and inflation. Such a comparison in economic research mainly revolves around the impact of monetary aggregate and external variables on output and inflation (Cushman and Zha, 1997; Kim and Roubini, 2000). To achieve this purpose, the study considers the periods before and after the crisis of 2007-2009 in Association of Southeast Asian Nations (ASEAN)-4 countries: Indonesia, Malaysia, the Philippines, and Thailand. Taking into account the recent crisis, there is a gap in the literature about monetary policy in ASEAN countries. Although these countries have been heavily affected by the global crisis, to the best of the author's knowledge, no study has focused on comparing monetary policy and external shocks during the periods before and after crisis. The economic history of the selected countries shows that the global recession and supply side shocks have had a profound impact on their growth and inflation. Based on normalized data from the World Bank (2012), Figures 1 and 2 shows that these countries reached their lowest rate of growth and highest rate of inflation during the 2007-2009 crisis.

2. MODEL AND METHODOLOGY

The model of this research contains nine variables, as shown in equation (1).

$$y_t = [int \quad m2 \quad cpi \quad ip \quad oil \quad USip \quad dc \quad eer \quad sp] \qquad (1)$$

y_t Contains the internal variables interest rate (*int*), aggregate money (*m2*), domestic credit (*dc*), effective exchange rate (*eer*), and stock price (*sp*) and the external variables oil price (*oil*) and US industrial production (*USip*) as a proxy of US economy, as two causes of the crisis of 2007-2009. According to Bagliano and Morana (2012), the US economic shocks more deeply transmit to East Asia's economies through US output. This study seeks to find the effect of four monetary transmission channels on industrial production (*ip*) and consumer price index (*cpi*) as the two objectives of economic policy for reaching sustainable growth and price stability. All data are in logarithmic form except interest rate, seasonally adjusted and in level. Using the Bayesian inference of Kim and Roubini (2000), the study ignores the unit root test, as Sims (1988) expressed unit root test was not important in economic models especially Bayesian models. Kim and Roubini (2000) stated the non-stationary of the variables do not affect the statistical inference since the model is based on Bayesian inference. Table 1 shows the description of the variables.

Figure 1: Inflation rate of Association of Southeast Asian Nations-4 countries

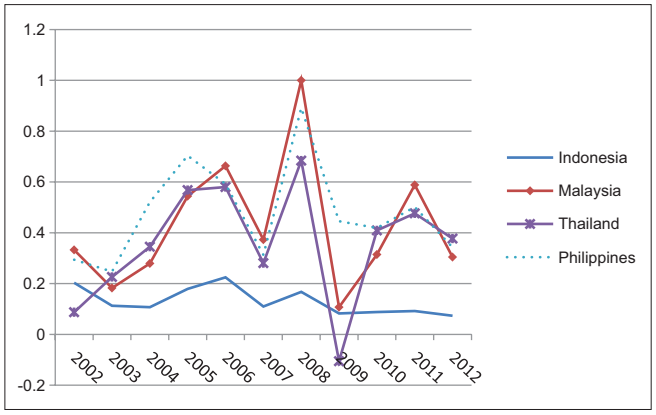

Figure 2: Gross domestic product growth of Association of Southeast Asian Nations-4 countries

Table 1: Description of variables

Label	Description
int	Interest rates: Money market rate
m2	Broad money
oil	World commodity prices: Crude oil
USip	US industrial production - total index
ip	Manufacturing production index
cpi	Consumer price index
dc	Depository corporations survey: Claims on private sector
eer	Effective exchange rate
sp	Share prices, total

oil: Oil price, *USip*: US industrial production, *ip*: Industrial production, *cpi*: Consumer price index, *m2*: Aggregate money, *int*: Interest rate, *eer*: Effective exchange rate, *dc*: Domestic credit, *sp*: Stock price

The study employs monthly data from January 2002, after the crisis of 2001, to April 2013, using a structural vector autoregression (VAR) model. Each variable is individually tested for structural break, instead of joint variables, to find the variables most affected by the crisis. Moreover, testing the structural break in series improves the VAR performance and the quality of forecasting (Hassani et al., 2009). Several studies divided their sample based on the existence of structural break in each series (Baek and Koo, 2010; Bayrak and Esen, 2013; Narayan, 2004; Okunev et al., 2002; Pala, 2013). Gerlach et al. (2006) divided their sample similar to the process of this study.

Table 2 presents the results of the three models of the Zivot and Andrews (1992) test: Intercept, trend, and intercept and trend. In this study, the pre-crisis period ends with the first statistically significant date of structural break during 2007-2009, and the post-crisis period starts with the last statistically significant date of structural break during the global crisis period. For example, 2007:12 is the first statistically significant date of structural break and 2008:08 is the last one during the period 2007-2009 in Indonesia, so the pre-crisis period covers data from 2002:01 until 2007:11 and the post-crisis period from 2008:09 until 2013:04, with dummy variable for 2005:10. The samples of other countries are as follows: Malaysia: 2002:01-2008:07 and 2009:01-2013:04, Thailand 2002:01-2007:12 and 2008:11-2013:04 with dummy variable for 2011:10, The Philippines 2002:01-2008:07 and 2008:12-2013:04.

Table 2: Zivot-Andrews structural break results

Variable	Intercept	Trend	Both (intercept and trend)
OP	2008:08***	2007:11	2008:08***
USIP	2008:08***	2004:11	2008:08***
Indonesia			
ip	2005:11	2009:06	2005:11
cpi	2005:10***	2008:09	2005:10***
m2	2011:05	2009:08	2010:03
int	2005:08	2009:04	2005:01
eer	2009:10	2008:11	2009:10
dc	2007:12***	2004:05	2007:12**
sp	2010:06	2009:09	2008:08**
Malaysia			
ip	2008:09**	2005:09	2008:09
cpi	2008:04	2003:10	2008:04
m2	2011:08	2010:08	2010:04
int	2008:12*	2006:04	2008:12***
eer	2010:03	2004:01	2010:03
dc	2011:03	2009:05	2009:05
sp	2008:03	2009:01	2008:06
The Philippines			
ip	2010:03	2009:05	2008:11**
cpi	2008:01	2011:08	2008:03
m2	2005:02	2005:11	2006:02
int	2007:05	2005:11	2007:05
eer	2006:06	2011:08	2005:10
dc	2011:04	2009:08	2009:11
sp	2007:11	2010:01	2008:10
Thailand			
ip	2011:10**	2008:01**	2007:09
cpi	2008:10**	2008:02	2008:10**
m2	2010:10	2009:07	2008:01
int	2008:10*	2005:11	2008:10
eer	2006:06	2004:07	2006:01
dc	2010:10	2010:05***	2010:01
sp	2007:08	2009:12	2008:06*

***,** and * show the significant level at 1%, 5% and 10%, *oil*: Oil price, *USip*: US industrial production, *ip*: Industrial production, *cpi*: Consumer price index, *m2*: Aggregate money, *int*: Interest rate, *eer*: Effective exchange rate, *dc*: Domestic credit, *sp*: Stock price

2.1. Model and Identification

VAR models are consistent with the objectives of studies about monetary policy, since these studies are based on assessing the responses of variables to monetary policy shocks. However, economists have criticized the property of VAR models claiming that they are free of theory. The structural VAR approach is preferable to VAR due to the economic restrictions on the independence of this model on Choleskey decomposition in the VAR approach based on partial identification (Elbourne, 2008).

Equation (2) shows the reduced form of VAR.

$$A_0 X_t = A(L) X_{t-1} + v_t \quad (2)$$

Where X_t displays endogenous variables, X_{t-1} is lagged valued, and v_t is a vector of error terms. The VAR in reduced form is shown in equation (3):

$$X_t = C(L) X_{t-1} + u_t \quad (3)$$

Where,

$C(L) = A_0^{(-1)} A(L)$ indicates the coefficients of lagged variables, $u_t = A_0^{-1} e_t$ is the observed vector of residuals that are linked to the structural shocks so,

$$\varepsilon_t = A u_t \quad (4)$$

The variance-covariance between an observed element, u_t, and a non-observed element, ε_t, is shown in equation (5).

$$\Omega = \begin{bmatrix} \sigma_{11} & \sigma_{12} & . & . & . & . & \sigma_{1n} \\ \sigma_{21} & \sigma_{22} & . & . & . & . & \sigma_{2n} \\ \sigma_{31} & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ \sigma_{n1} & \sigma_{n2} & . & . & . & . & \sigma_{nn} \end{bmatrix} \quad (5)$$

The σ_{ij} in the matrix Ω can be calculated as $\sigma_{ij} = 1/T \sum_{t=1}^{T} u_{it} u_{jt}$. The variance-covariance of Ω includes $(n^2+n)/2$ distinct elements, A includes n^2-n unknown values, and $var\varepsilon_{ij}$ contains n unknowns, so $n^2-n+n=n^2$ unknown and $(n^2+n)/2$ known; consequently the restrictions on the system is $n^2 - \frac{n^2+n}{2} = \frac{n^2-n}{2}$. Therefore, the nine variables structural VAR of this study needs 36 restrictions to be identified.

2.1.1. Identification

Equation (6) shows the identification. The system needs at least n^2-n/2 = 81-9/2=36. The different identifications will be explained in the pages ahead.

$$\begin{bmatrix} \varepsilon_{oil} \\ \varepsilon_{usip} \\ \varepsilon_{ip} \\ \varepsilon_{cpi} \\ \varepsilon_{m2} \\ \varepsilon_{int} \\ \varepsilon_{dc} \\ \varepsilon_{eer} \\ \varepsilon_{sp} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{21} & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{31} & \alpha_{32} & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{41} & 0 & \alpha_{43} & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \alpha_{53} & \alpha_{54} & 1 & \alpha_{56} & 0 & 0 & 0 \\ \alpha_{61} & 0 & 0 & 0 & \alpha_{65} & 1 & 0 & 0 & 0 \\ \alpha_{71} & 0 & \alpha_{73} & 0 & 0 & \alpha_{76} & 1 & 0 & 0 \\ \alpha_{81} & \alpha_{82} & \alpha_{83} & \alpha_{84} & \alpha_{85} & \alpha_{86} & \alpha_{87} & 1 & 0 \\ \alpha_{91} & \alpha_{92} & \alpha_{93} & \alpha_{94} & \alpha_{95} & \alpha_{96} & \alpha_{97} & \alpha_{98} & 1 \end{bmatrix} \begin{bmatrix} oil \\ usip \\ ip \\ cpi \\ m_2 \\ int \\ dc \\ eer \\ sp \end{bmatrix} \quad (6)$$

oil and *USip*: Similar to Kim and Roubini's (2000) model, the study uses two exogenous variables, *oil* and *USip*; the domestic variables do not influence these two variables. The oil price is included to the system to isolate the effects of monetary policy from supply shocks. The monetary contraction following the negative supply shock will have an (increase in oil price) impact on output and inflation, while the effect of an increase in oil price will have a similar effect on output and inflation, so the oil price separates the effects of monetary policy from oil price. The industrial production of the US is included, because of the important trade relationship between these countries and the US.

cpi and ip are supply and demand, illustrating the equilibrium in commodity markets. Oil price as a price expectation instead of copy enter the *ip* equation. *cpi* does not enter the *ip* equation since the inflation information is not available within month. US as the most important trade partner of ASEAN countries affects the production through US industrial production.

m2 and *int* are money demand and money supply indicating equilibrium in money market. *int*, *cpi* and *ip* affect money demand based on the theory. Oil price as price expectation and money enter the reaction function of these countries. The selected countries use interest rate as monetary policy stance to reach price stability.

Domestic credit *dc* contemporaneously reacts to the shocks of industrial production inflation and policy rate, since the real cost of credit (real interest rate) is an important factor for borrowers for all countries (Wulandari, 2012).

eer and SP are effective exchange rate and stock price. Similar to Kim and Roubini (2000), the exchange rate is an arbitrage equation that shows the financial market equilibrium. The forward looking property of exchange rate and asset price makes them sensitive to the news, so all the variables in the system affect them. However, the study assumes a one-way contemporaneous effect of exchange rate on stock price. The studies of Elbourne and Salomons (2004) and Li et al. (2010), are examples where equity price is contemporaneously affected by shocks of other variables. Liang et al. (2013) achieved the same results by re-examining the relationship between stock index and exchange rate in ASEAN-5 countries.

3. EMPIRICAL RESULTS

The empirical results are based on VAR with three lags for the pre-crisis period, and two lags for the post-crisis period according to the Akaike information criterion, Bayesian information criterion, and likelihood ratio tests and least serial correlation in the residuals. Table 3 indicates Chi-squared for over-identifying restriction in this study is not rejected for all countries except the Philippines during the pre-crisis period. Kim and Roubini (2000) found a similar result for Italy in their research and proceeded to the next steps.

The study compares the effective channel of monetary transmission with oil price shock to understand to what extent the country is robust against oil price shock through monetary transmission mechanism. Table 4 indicates that the maximum amount of the explanatory level of domestic variables and oil price for *cpi* fluctuation in Indonesia during the pre-crisis period relates to the stock price with 8%, while the role of oil price is negligible, so neither internal nor external shocks have a large impact on price volatility during the pre-crisis period in this country. The maximum contributions in explaining *cpi* fluctuations relates to domestic credit among the internal variables, with about 18% against oil price with maximum 17% during the post-crisis period in Indonesia, so the oil price plays an important role in influencing *cpi* during post-crisis period. The results of variance decomposition in Table 4 for Malaysia imply the sensitivity of *cpi* to oil price shock among all variables during pre-crisis. Oil price loses impact on Malaysian *cpi* fluctuation while stock price as effective channel of monetary transmission mechanism explains a maximum of about 17% during the post-crisis period.

The contribution of oil price and exchange rate as effective channels of monetary transmission in explaining fluctuations in *cpi* are 18% and 11.85%, respectively, in the Philippines during the pre-crisis period. Therefore, oil price is the most important factor among all variables during the pre-crisis period. During the post-crisis period, stock price highly explains *cpi* fluctuations up to 23%, more than all other variables in the Philippines, although oil price still is an important factor by explaining maximum about 14% of *cpi* fluctuations.

According to results of variance decomposition for Thailand, none of the four channels of monetary variables is effective enough to impact on *cpi* during the pre-crisis period, while up to about 40% of fluctuations in *cpi* is explained by oil price. The role of oil price in accounting for *cpi* variations declines to maximum 24% during

Table 3: Chi-squared for over-identifying restrictions

Country	Pre-crisis	Significant level	Post-crisis	Significant level
Indonesia	12.49	0.130	7.30	0.504
Malaysia	9.52	0.300	10.75	0.215
The Philippines	26.86	0.007	6.25	0.618
Thailand	8.16	0.417	3.70	0.882

Table 4: Variance decomposition of *cpi* due to oil price and monetary transmission channels

Month	Pre-crisis			Post-crisis		
variable	1	6	12	1	6	12
Indonesia						
int	1.36	1.58	1.23	1.92	2.74	2.28
exc	0.16	0.29	0.67	0.03	1.29	8.45
dc	0.42	0.44	0.89	1.67	9.79	18.24
sp	0.06	1.76	8.06	0.51	4.82	3.22
oil	0.14	0.39	0.29	1.24	11.17	16.86
Malaysia						
int	0.04	3.94	2.35	0.39	1.62	4.02
exc	0.00	2.81	8.90	0.05	0.57	1.75
dc	1.95	6.57	8.81	0.04	2.49	6.84
sp	0.43	4.30	3.12	0.33	11.93	16.76
oil	7.54	11.44	12.42	3.13	2.31	1.85
The Philippines						
int	0.20	1.67	1.02	3.59	2.33	1.46
exc	0.34	1.23	11.85	8.44	14.87	8.41
dc	0.11	0.12	4.63	1.60	7.11	19.09
sp	0.06	0.22	0.12	0.18	23.29	16.52
oil	3.02	18.23	16.09	0.62	5.89	13.85
Thailand						
int	0.00	1.08	1.13	11.58	12.95	13.52
exc	1.05	1.28	2.90	4.39	20.67	17.89
dc	1.54	1.80	1.81	4.01	18.46	19.68
sp	0.33	2.11	3.59	1.05	2.11	0.97
oil	26.72	37.68	39.95	3.44	13.29	24.05

oil: Oil price, *USip*: US industrial production, *ip*: Industrial production, *cpi*: Consumer price index, *m2*: Aggregate money, *int*: Interest rate, *eer*: Effective exchange rate, *dc*: Domestic credit, *sp*: Stock price

Table 5: Variance decomposition of *ip* due to oil price and monetary transmission channels

Month variable	Pre-crisis			Post-crisis		
	1	6	12	1	6	12
Indonesia						
int	32.94	35.64	33.72	8.91	10.93	10.06
exc	0.03	1.83	1.95	0.00	0.90	1.25
dc	0.71	6.56	6.46	0.92	9.11	8.87
sp	2.18	4.10	4.28	0.00	2.04	2.19
oil	1.21	4.99	5.08	7.69	8.79	9.32
Malaysia						
int	1.72	4.11	4.48	0.06	2.75	4.60
exc	1.01	14.14	11.62	4.93	4.77	4.77
dc	7.26	12.86	9.75	0.92	6.46	6.62
sp	1.11	1.73	1.87	13.08	10.04	9.56
oil	0.29	2.02	4.30	1.35	11.75	13.58
The Philippines						
int	0.02	7.77	8.27	0.62	5.31	6.65
exc	2.87	5.31	5.93	0.61	4.32	3.89
dc	2.04	7.24	9.24	7.44	9.35	9.24
sp	0.62	0.96	0.96	0.18	0.51	3.31
oil	5.52	5.48	4.93	12.75	17.21	15.89
Thailand						
int	4.53	6.25	7.13	1.07	2.47	2.34
exc	2.70	7.77	6.66	0.09	3.85	9.02
dc	6.01	4.41	3.76	0.11	3.37	4.41
sp	2.79	6.13	6.10	14.17	15.67	14.52
oil	7.63	18.81	24.13	2.48	6.00	5.58

oil: Oil price, *USip*: US industrial production, *ip*: Industrial production, *cpi*: Consumer price index, *m2*: Aggregate money, *int*: Interest rate, *eer*: Effective exchange rate, *dc*: Domestic credit, *sp*: Stock price

the post-crisis period, while the role of the exchange rate increases from 3% during the pre-crisis period to a maximum 20% during the post-crisis period. Therefore, during both periods, oil price plays the dominant role in *cpi* fluctuations in Thailand.

As a general conclusion, the *cpi* of all countries except Indonesia is most significantly affected by stock price during the pre-crisis period. After the crisis, although oil price is less effective on price volatility compared to the pre-crisis period, it still greatly explains inflation volatilities in all the countries except Malaysia. This may be due to the expansionary monetary policy in all ASEAN countries except Malaysia. Oil price accounts for very small values of the variations of *cpi* in Malaysia during the post-crisis period.

The results of variance decomposition in the Table 5 show during pre-crisis oil price explain the *ip* fluctuations around 5% while interest rate accounts for a maximum about 36% of fluctuations in *ip* in Indonesia. Before the crisis, monetary authority using internal tools could affect industrial production. The variance decomposition in Table 5 shows interest rate and oil price account for the fluctuations in *ip* up to about 11% and 9.5% during post-crisis. The contribution of oil price in *ip* fluctuations is almost equal to interest rate during post-crisis period in Indonesia. The results for Malaysia indicate the maximum about 4.5% of fluctuations in *ip* is explained by oil price shocks during pre-crisis whereas exchange rate and domestic credit accounts a maximum about 14% and 13%, correspondingly, of fluctuations in *ip* during pre-crisis. Malaysia's stock price is the most effective channel on *ip* during post-crisis by accounting for about 13% of fluctuations in *ip* in 1st month. Oil price explain around 13% of Malaysia' ip fluctuation by the end of the year during post-crisis period. The variance decomposition of the Philippines in Table 5 for *ip* indicate the share of interest rate and domestic credit in explaining the *ip* fluctuations is more than oil price during pre-crisis. Each of interest rate and domestic credit contributes for *ip* fluctuations about 8-9% at the peak while oil price accounts a maximum around 5% for fluctuations in this variable during pre-crisis. Up to 17% and 9% of *ip* fluctuations can be explained by oil price and domestic credit, as effective monetary transmission channels, during post-crisis. The oil price is the most effective factor in explaining *ip* fluctuation among all variables during post-crisis in the Philippines. During pre-crisis up to 24% of fluctuations in *ip* is explained by oil price that is relatively equal with the sum of explanations domestic variables so during pre-crisis external shocks are more effective on *ip* than domestic monetary variables in Thailand. The role of oil price in affecting *ip* highly decreases during post-crisis whereas the monetary channels are more effective during post-crisis compared with pre-crisis. During post-crisis, the role of oil price in explaining Thailand's *ip* fluctuations decreases stock price accounts for most of fluctuations. In general, before the crisis monetary transmission channel are more important than oil price shock in explaining *ip* fluctuations for all countries except Thailand. After the crisis *ip* fluctuations greatly explains by oil price for all countries except Thailand.

4. CONCLUSION

Although the importance of external variables in explaining *cpi* fluctuations is decreased during the post-crisis period compared to the pre-crisis period, oil price still greatly explains inflation

volatilities in all four countries except Malaysia. This may be due to the expansionary monetary policy in all ASEAN countries except Malaysia. The result indicates that the monetary authorities in ASEAN-4 can affect *cpi* through the two channels, stock price and domestic. For all countries except Malaysia, domestic credit can be used as a tool affecting price volatility. In Malaysia as well as in the Philippines, price stability can be influenced through stock price during the post-crisis period. Oil price plays a more important role in *ip* volatility during the post-crisis period for all countries except Thailand. As a general conclusion from the effects of the studied variables on industrial production, proper performance in one or two channels of monetary transmission mechanism is associated with a reduced effect of oil price on industrial production. The strong performance of the monetary transmission mechanism in Indonesia through interest rate, in Malaysia through domestic credit and exchange rate, and in the Philippines through interest rate and domestic credit reduces the share of the oil price in explaining the variation in industrial production. In contrast, the inefficiency of the monetary transmission mechanism in Thailand results in raising the contribution of oil price during the pre-crisis period. Unlike before the crisis, after the crisis, the efficiency of Thailand's monetary transmission mechanism through the stock price is increased and the share of the effect of the oil price is reduced. In the three other countries, in proportion to the decrease in the efficiency of the most effective channels, the share of the oil price is increased. Interest rate for Indonesia, stock price for Malaysia and Thailand, and domestic credit for the Philippines can assist the monetary authorities to decrease the effects of oil price shock to industrial production.

REFERENCES

Ali Ahmed, H.J., Wadud, I. (2011), Role of oil price shocks on macroeconomic activities: An SVAR approach to the Malaysian economy and monetary responses. Energy Policy, 39(12), 8062-8069.

Álvarez, L.J., Hurtado, S., Sánchez, I., Thomas, C. (2011), The impact of oil price changes on Spanish and euro area consumer price inflation. Economic Modelling, 28(1), 422-431.

Azali, M., Matthews, K.G.P. (1999), Money-income and credit-income relationships during the pre- and the post-liberalization periods: Evidence from Malaysia. Applied Economics, 31(10), 1161-1170. doi: 10.1080/000368499323382.

Baek, J., Koo, W.W. (2010), Analyzing factors affecting US food price inflation. Canadian Journal of Agricultural Economics/Revue Canadienne D'agroeconomie, 58(3), 303-320.

Bayrak, M., Esen, Ö. (2013), Examining the policies in Turkey that have been implemented during the structural reform process from the standpoint of growth-unemployment. International Journal of Economics and Finance, 5(6), 134.

Bagliano, F. C., and Morana, C. (2012). *The Great Recession: US dynamics and spillovers to the world economy*. Journal of Banking and Finance, 36(1), 1-13.

Cologni, A., Manera, M. (2008), Oil prices, inflation and interest rates in a structural cointegrated VAR model for the G-7 countries. Energy Economics, 30(3), 856-888.

Cushman, D.O., Zha, T. (1997), Identifying monetary policy in a small open economy under flexible exchange rates. Journal of Monetary Economics, 39(3), 433-448.

Elbourne, A. (2008), The UK housing market and the monetary policy transmission mechanism: An SVAR approach. Journal of Housing Economics, 17(1), 65-87. doi: 10.1016/j.jhe.2007.09.002.

Elbourne, A., Salomons, R. (2004), Monetary transmission and equity markets in the EU (No. 04E15). University of Groningen, Research Institute SOM (Systems, Organisations and Management).

Gerlach, R., Wilson, P., Zurbruegg, R. (2006), Structural breaks and diversification: The impact of the 1997 Asian financial crisis on the integration of Asia-Pacific real estate markets. Journal of International Money and Finance, 25(6), 974-991.

Gregoriou, A., Kontonikas, A. (2010), The long-run relationship between stock prices and goods prices: New evidence from panel cointegration. Journal of International Financial Markets, Institutions and Money, 20(2), 166-176.

Hassani, H., Heravi, S., Zhigljavsky, A. (2009), Forecasting European industrial production with singular spectrum analysis. International Journal of Forecasting, 25(1), 103-118.

Kim, S., Roubini, N. (2000), Exchange rate anomalies in the industrial countries: A solution with a structural VAR approach. Journal of Monetary Economics, 45(3), 561-586.

Kose, N., Emirmahmutoglu, F., Aksoy, S. (2012), The interest rate – Inflation relationship under an inflation targeting regime: The case of Turkey. Journal of Asian Economics, 23(4), 476-485.

Li, Y.D., İşcan, T.B., Xu, K. (2010), The impact of monetary policy shocks on stock prices: Evidence from Canada and the United States. Journal of International Money and Finance, 29(5), 876-896.

Liang, C.C., Lin, J.B., Hsu, H.C. (2013), Reexamining the relationships between stock prices and exchange rates in ASEAN-5 using panel Granger causality approach. Economic Modelling, 32, 560-563.

Mehrotra, A.N. (2007), Exchange and interest rate channels during a deflationary era – Evidence from Japan, Hong Kong and China. Journal of Comparative Economics, 35(1), 188-210.

Mishkin, F.S. (1995), Symposium on the monetary transmission mechanism. The Journal of Economic Perspectives, 9(4), 3-10.

Mishkin, F.S. (1996). The channels of monetary transmission: Lessons for monetary policy (NBER Working Paper No.5464): National Bureau of Economic Research.

Mishkin, F.S. (2001), The transmission mechanism and the role of asset prices in monetary policy. No. w8617. National Bureau of Economic Research.

Narayan, P.K. (2004), Do public investments crowd out private investments? Fresh evidence from Fiji. Journal of Policy modeling, 26(6), 747-753.

Nisticò, S. (2012), Monetary policy and stock-price dynamics in a DSGE framework. Journal of Macroeconomics, 34(1), 126-146.

Okunev, J., Wilson, P., Zurbruegg, R. (2002), Relationships between Australian real estate and stock market – A case of market inefficiency. Journal of Forecasting, 21(3), 181-192.

Pala, A. (2013), Structural breaks, cointegration, and causality by VECM analysis of crude oil and food price. International Journal of Energy Economics and Policy, 3(3), 238-246.

Rahman, S., Serletis, A. (2010), The asymmetric effects of oil price and monetary policy shocks: A nonlinear VAR approach. Energy Economics, 32(6), 1460-1466.

Sims, C. A. (1988). *Bayesian skepticism on unit root econometrics*. Journal of Economic dynamics and Control, 12(2), 463-474.

Smets, F.R., Peersman, G. (2001), The monetary transmission mechanism in the euro area: More evidence from VAR analysis (MTN Conference Paper) (No. 091). European Central Bank.

Takhtamanova, Y.F. (2010), Understanding changes in exchange rate pass-through. Journal of Macroeconomics, 32(4), 1118-1130.

Taylor, J.B. (1995), The monetary transmission mechanism: An empirical framework. The Journal of Economic Perspectives, 9(4), 11-26.

Tillmann, P. (2008), Do interest rates drive inflation dynamics? An analysis of the cost channel of monetary transmission. Journal of

Economic dynamics and Control, 32(9), 2723-2744.
World Bank. (2012), World Data Bank: World Development Indicators (WDI) and Global Development Finance (GDF). Available from: http://www.worldbank.org/. [Last retrieved on 2012 Feb].
Wulandari, R. (2012), Do credit channel and interest rate channel play important role in monetary transmission mechanism in Indonesia? A structural vector autoregression model. Procedia – Social and Behavioral Sciences, 65, 557-563. Available from: http://www.dx.doi.org/10.1016/j.sbspro.2012.11.165.
Zivot, E., Andrews, D.W. (1992), Further evidence on the great crash, the oil-price shock, and the unit-root. Journal of Business and Economic Statistics, 10, 3.