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(4), 1058-1064.

The Asymmetric Impact of Oil Price Shocks on Kazakhstan Macroeconomic Dynamics: A Structural Vector Autoregression Approach

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ABSTRACT

This paper assesses empirically the asymmetric effects of real oil price shocks on the industrial production, real exchange rate and inflation in Kazakhstan for the monthly period 2000-2013 by using a structural vector autoregression (SVAR) model. SVAR analysis is carried out using the scaled model. The empirical findings show that the negative oil price shocks have a larger impact on Kazakhstan economic performance.

Keywords: Oil Price Shocks, Structural Vector Autoregression, Asymmetric Effects, Kazakhstan
JEL Classifications: C22, C32, Q43

1. INTRODUCTION

There is an extensive literature about the effect of oil price shocks on economic performance. Specifically, the number of studies on the relationship between oil prices and economic growth has increased since the oil price shock in 1973 and the following stagnation in developed countries. The effects of oil price shocks on macroeconomic dynamics are expected to be different in oil importing and in oil exporting countries. Namely, an oil price increase (decrease) should be considered good (bad) news in oil exporting countries and bad (good) news in oil importing countries.

Hamilton (1983) claim that an increase in oil prices has been one of the primary causes of recessions owing to the fact that seven out of eight economic recessions in the US after World War II were preceded by oil price hikes. Therefore, the impact of oil price on economic performance has been investigated empirically by several researchers. Empirical studies generally show that increasing oil prices negatively affects the economic performance in oil-importing countries (Mork, 1989; Lee et al., 1995; Ferderer, 1996; Rotemberg and Woodford, 1996; Finn, 2000; Hamilton, 2003; Kilian, 2005; Hooker, 2002; Hamilton and Herrera, 2004; Jimenez-Rodriguez and Sanchez, 2005). In addition, the role of oil price on macroeconomic variables in oil-exporting countries has been examined in empirical studies. For instance, Olomola and Adejumo (2006) examine the effects of oil price shocks on output, inflation, real exchange rate and money supply in Nigeria. They argue that oil price shocks significantly affect the real exchange rate and in the long-run money supply. Similar works have been implemented for Indonesia (Ward and Siregar, 2001), Ecuador (Boye, 2001), Mexico (Boye, 2002) and Iran (Farzanegan and Markwardt, 2009). Furthermore, Berument et al. (2010) examine that the effects of oil price shocks on the output growth for Middle East and North African countries which are either oil exporters or importers. They show that the effects of the world oil price on gross domestic product (GDP) in most oil exporters such as Algeria, Iran, Iraq, Jordan, Kuwait, Oman, Qatar, Syria and UAE, as well as one oil importing country, Tunisia, are positive and significant. However, there are exceptions, including Bahrain, Egypt, Lebanon, Morocco and Yemen.

Oil revenues in oil-exporting developing countries have played an important role on economic performance. Therefore oil price shocks have also had a significant effect on economic growth since higher oil prices would lead to higher output in oil-exporting countries. However, higher oil prices have adverse effects on economic performance of oil-exporting countries. Because they change the structure of the economy in favor of the non-traded sectors and against the traded manufacturing and agriculture sectors. In addition, higher oil revenues during an oil boom will lead to an appreciation of the local currency and increasing imports of intermediate and consumer goods. The heavy reliance of oil-exporting developing economies on imports will in turn harm domestic industries as they cannot compete with imported goods when oil prices are high and cannot sustain their production levels when oil prices and imports decline. Therefore, according to Dutch disease theory, a temporary foreign exchange windfall will have a detrimental rather than beneficial effect on the economy (Moshiri and Banihashem, 2012).

According to US Energy Information Administration 2013 report for Kazakhstan, Kazakhstan is a major oil producer, and estimated total liquids production was 1.64 million barrels per day (bbl/d) in 2013. Kazakhstan, an oil producer since 1911, has the second largest oil reserves as well as the second largest oil production among the former Soviet republics after Russia. Despite the fact that the petroleum industry in Kazakhstan plays an important role in the health of the economy and continues to develop rapidly, there is limited research about the effect of oil prices on Kazakhstan macroeconomic dynamics.

Kuralbayeva et al. (2001) examine Kazakhstan's vulnerability to the Dutch disease by estimating a real exchange rate equation. The empirical findings of the econometric model and variance decompositions by using monthly data between 1994 and 2000 indicate that movements in the terms of trade have a significant effect on the real exchange rate with the expected sign only in the post-1996 period, providing evidence of the Dutch Disease. In addition, the vulnerability of Kazakhstan to the Dutch disease is examined in Kutan and Wyzan (2005) study. Some descriptive evidences and estimating a real exchange rate equation by based on monthly data between 1994 and 2003 indicate that changes in oil prices have significant effects on movements in the real exchange rate. The evidence presented by Kutan and Wyzan (2005) is highly consistent with the possibility that Kazakhstan is indeed vulnerable to the Dutch disease. The relationship between exchange rate appreciation and movements in oil prices and oil revenues is analyzed for Kazakh economy by Egert and Leonard (2007). Their econometric evidences from the monetary model of the exchange rate and a variety of real exchange rate models show that the rise in the price of oil and in oil revenues might be linked to an appreciation of the U.S. dollar exchange rate of the oil and non-oil sectors. But appreciation is mainly limited to the real effective exchange rate for oil sector and is statistically insignificant for non-oil manufacturing. The study by Korhonen and Mehrotra (2009) investigate the effects of oil price shocks on real exchange rate and output in Iran, Kazakhstan, Venezuela, and Russia. They estimate four-variable structural vector autoregression (SVAR) models by using quarterly data between 1995 and 2006. The empirical finding shows that higher real oil prices are associated with higher output. However, supply shocks are by far the most important driver of real output in all four countries, possibly due to ongoing transition and catching-up. Moreover, they indicate that oil shocks do not account for a large share of movements in the real exchange rate, although they are clearly more significant for Iran and Venezuela than for the other countries.

Econometric studies were used to estimate linear models for the relationship between oil prices and real activity until the mid-1980s. In fact, the declines in oil prices that occurred over the second half of the 1980s were found to have smaller positive effects on economic activity than predicted by linear models in oil-importing countries. Thus, some authors introduced non-linear transformations of oil prices to re-establish the negative relationship between increases in oil prices and economic downturns (Jimenez-Rodriguez and Sanchez, 2005). Lian et al. (2014) examine the asymmetric effect of oil price shocks on real economic activity in the US within the context of a non-linear factor-augmented vector autoregressive (AR) model. They show that the negative impacts of higher oil prices are larger than the positive effects of lower oil prices. And the asymmetric effects are more evident when the oil price shocks are larger.

The asymmetry is a very special case of a non-linear relationship between oil price shocks and economic performance. The asymmetric specifications allow us to compare the impact of rising and falling oil price. The literature has proposed three non-linear transformations for oil prices, namely: Asymmetric specification (Mork, 1989), scaled specification (Lee et al., 1995), and net specification (Hamilton, 1996).

In this study, the asymmetric effects of real Brent oil price shocks on the industrial production, real exchange rate and inflation in Kazakhstan are examined by using a SVAR model which is carried out using the scaled specification.

The paper is organized as follows. An economic overview of Kazakhstan is given in Section 2. Section 3 presents the empirical results. Concluding remarks are offered in Section 4.

2. ECONOMIC OVERVIEW OF KAZAKHSTAN

The recognized date of independence is December 16, 1991, when the Republic of Kazakhstan split from the Soviet Union. The first few years of Kazakhstan's independence were characterized by an economic decline. In 1995 real GDP in Kazakhstan dropped to 61.4% based on the 1990 level. The wide-ranging inflation observed in the early 1990s peaked at annual rate of up to 3000% in the mid-nineties.

After 1992, Kazakhstan chose to convert to a market economy. Since 1992, Kazakhstan has actively pursued a program of economic reform designed to establish a free market economy through privatization of state enterprises and deregulation. After the Russian crisis in 1998, increasing oil prices positively affected the Kazakh economy. Kazakhstan's GDP has increased every year since 2000.

The main economic indicators which are used in this study are presented as yearly time series data from 2000 to 2013 in Table 1. The average annual growth of real GDP for Kazakhstan over the period 2000-2007 has been almost 10%. Economic growth in Kazakhstan has decreased sharply to 3.3% in 2008 and 1.2% in 2009 because of decreasing oil prices during the global economic crisis. After the global crisis, Kazakhstan's real GDP rose 7.3% in 2010, 7.5% in 2011, 5.0% in 2012, and 6.0% in 2013.

In 1999, devaluation of the national currency caused inflation to rise dramatically, but the rate for 2000 was only 9.8%, and it has remained below that level since 2007. While Kazakhstan's inflation rate was 10.8% in 2007, 9.5% in 2008, 7.3% in 2009, 7.1% in 2010, and 8.3% in 2011, it fell 5.1% and 4.8% in 2012 and 2013, respectively.

The real exchange rate index is a multilateral exchange rate based on the specific weights of trading partner's countries of Kazakhstan. Increase in index means appreciation of the national currency, decrease means depreciation of it. After devaluation in 1999, while real exchange rate index is <100 until 2005, the index is always higher than 100 for the following years. This trend shows that the Tenge has gradually appreciated against the dollar since 2006. The correlation between Brent oil price and the real exchange rate index is calculated as 80% using data in Table 1. This finding points out that there is a strong positive linear relationship between oil price and real exchange rate in Kazakhstan.

3. EMPIRICAL RESULTS

3.1. Data

Real oil price is defined as Brent oil price in US dollars per barrel deflated by the consumer price index (CPI) of the US. Industrial production index (seasonally adjusted) of Kazakhstan is used as a proxy to measure real income at a monthly frequency. The CPI is used as aggregate price variable. The real effective exchange rate index is a weighted average change of the Tenge exchange rate against a 32-country currency basket of the main trade partners of Kazakhstan corrected for changes in relative prices. An increase in index means appreciation of the national currency, decrease means depreciation of it.

The study uses monthly data from 2000 to 2013. Data for CPI and real exchange rate are obtained from the electronic data delivery system of the National Bank of Kazakhstan. Databases for the industrial production index and Brent oil price are obtained from data-stream and energy information administration, respectively.

3.2. Time Series Properties of Data

The list of the variables used in this study will be as follows:
op: Real Brent oil price (barrel/US$)
ip: Industrial production index (1999 = 100)
cpi: Consumer price index (1999 = 100)
rer: Real effective exchange rate index (1999 = 100)

All data are in logarithmic form. Figure 1 shows time plots of the variables over the sample period. All variables except real exchange rate index appear to have an upward trend with a non-deterministic structure. Moreover, oil price and industrial production index include structural breaks in the global economic crises years.

In order to test whether the series has a unit root, augmented Dickey–Fuller (ADF, Dickey and Fuller, 1981) a unit root test is used. The results for the ADF unit root test are reported in Table 2.

According to the results in Table 2, the integrated order of each series in level is one. These results imply that the all series are stationary in the first difference. Therefore the short run analysis is conducted using the SVAR model in the first-difference form.

3.3. Asymmetric Specification for Oil Price

There are three non-linear transformations for oil prices in the literature. These are asymmetric specification (Mork, 1989), scaled specification (Lee et al., 1995), and net specification (Hamilton, 1996).

Table 1: Selected macroeconomic indicators, 2000-2013

Year	Inflation rate (%)	Economic growth (%)	Real exchange rate index	Brent oil price (Barrel/US$)
2000	9.8	9.8	100.3	28.66
2001	6.4	13.5	99.5	24.46
2002	6.6	9.8	94.5	24.99
2003	6.8	9.3	89.2	28.85
2004	6.7	9.6	93.2	38.26
2005	7.5	9.7	96.1	54.57
2006	8.4	10.7	103.6	65.16
2007	10.8	8.9	105.9	72.44
2008	9.5	3.3	111.8	96.94
2009	7.3	1.2	104.2	61.74
2010	7.1	7.3	107.7	79.61
2011	8.3	7.5	107.1	111.26
2012	5.1	5.0	112.7	111.63
2013	4.8	6.0	112.7	108.56

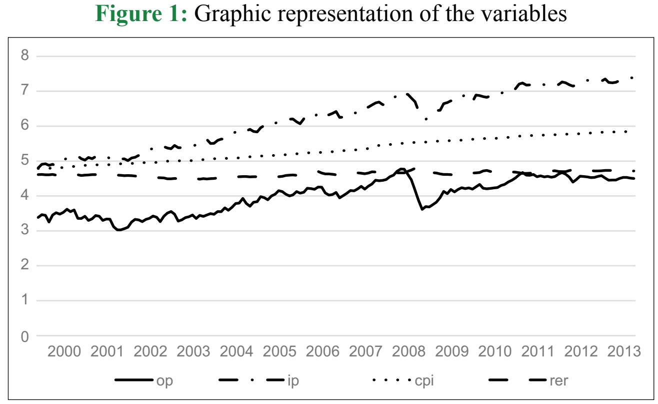
Sources: The National Bank of Kazakhstan and Energy Information Administration

Table 2: ADF unit root test results

Level				First order difference			
Variables	Lag	t-statistic	P value	Variables	Lag	t-statistic	P value
op	1	−1.3699	0.5959	Δ*op*	12	−4.6394	0.0002
ip	12	−0.8190	0.8106	Δ*ip*	12	−4.1271	0.0012
cpi	2	−0.5337	0.8803	Δ*cpi*	1	−6.7175	0.0000
rer	1	−1.9482	0.3097	Δ*rer*	0	−9.5764	0.0000

The appropriate lag length is determined through AIC. ADF regression equation includes only intercept term. Δ is the first order difference operator. AIC: Akaike information criteria, ADF: Augmented Dickey–Fuller

Figure 1: Graphic representation of the variables



The asymmetric specification distinguishes between the positive rate of change in the oil price, O_t^+ and the negative rate of change, O_t^-, which are defined as follows:

$$O_t^+ = \begin{cases} O_t & \text{if } O_t > 0 \\ 0 & \text{otherwise} \end{cases} \quad \text{and} \quad O_t^- = \begin{cases} O_t & \text{if } O_t < 0 \\ 0 & \text{otherwise} \end{cases}$$

Where, O_t is the rate of change in the real oil price.

Lee et al. (1995) proposed the following AR(4)-generalized AR conditional heteroskedasticity (GARCH) (1,1) representation of oil prices:

$$O_t = \alpha_0 + \alpha_1 O_{t-1} + \alpha_1 O_{t-2} + \alpha_1 O_{t-3} + \alpha_1 O_{t-4} + e_t$$

$$e_t \,/\, I_{t-1} \sim \mathrm{N}(0, h_t)$$

$$h_t = \gamma_0 + \gamma_1 e_{t-1}^2 + \gamma_2 h_{t-1}$$

$$SOPI_t = \max\left(0, \hat{e}_t \,/\, \sqrt{\hat{h}_t}\right)$$

$$SOPD_t = \min\left(0, \hat{e}_t \,/\, \sqrt{\hat{h}_t}\right)$$

Where, *SOPI* stands for scaled oil price increases, while *SOPD* for scaled oil price decreases.

Hamilton (1996) proposed a different non-linear transformation, by using as an explanatory variable what he calls net oil price increase (*NOPI*). This variable is defined to be the amount by which (the log of) oil prices in quarter t, p_t, exceed the maximum value over the previous 4 quarters; and 0 otherwise. That is:

$$NOPI_t = \left(0, \max(p_t - (p_{t-1}, p_{t-2}, p_{t-3}, p_{t-4})\right)$$

The scaled model builds on the asymmetric model, while it also employs a transformation of the oil price that standardizes the estimated residuals of the AR model by its time-varying (conditional) variability. This transformation seems very plausible in light of the pattern of oil price changes over time, with most changes being rather small and being punctuated by occasional sizeable shocks. Hamilton's definition is also asymmetric in the specific sense that it captures oil price increase-type shocks while neglecting the impact of oil price declines. This is inspired by earlier evidence that oil price decreases had played a smaller role in the US business cycle (Jimenez-Rodriguez and Sanchez, 2005). However, oil price decreases rather than oil price increases can play an important role on economic performance in Kazakhstan. Therefore we use the scaled model for asymmetric specification of oil price.

The appropriate lag length of AR model for the logarithmic first difference of real oil price (Δop) is determined as 1 by using the Akaike information criteria. The parameters of the AR(1) model are estimated by using the ordinary least square method. The first order ARCH effect is tested via the ARCH-Lagrange multiplier (LM) test, and the null hypothesis of the absence of ARCH effect is rejected at 1% significant level. This result means that the residuals of the AR(1) model have an ARCH effect. We specify the AR(1)-GARH(1,1) model for Δop as follows:

$$\Delta op_t = \alpha_0 + \alpha_1 \Delta op_{t-1} + e_t$$

$$e_t \,/\, I_{t-1} \sim \mathrm{N}(0, h_t)$$

$$h_t = \gamma_0 + \gamma_1 e_{t-1}^2 + \gamma_2 h_{t-1}$$

In Table 3, the estimates of the coefficients of mean and variance equations are given. According to the results, the estimated coefficients of variance equation are positive and their sum is <1. Therefore, the parameter restrictions for positivity and finiteness are satisfied. For the specification of the model, the presence of both autocorrelation and ARCH effect of residuals are tested by using Ljung-Box Q statistics and ARCH-LM for 1, 5 and 10 lags, respectively. Their p-values are given in Table 3. The null hypothesis that "the autocorrelation is not present in k-lags" is not rejected at 5% level of significance for all lags. Similarly, the null hypothesis that "the ARCH effect is not present in k-lags" is not rejected at 5% level of significance for all lags. Therefore, the AR(1)-GARCH(1,1) model residuals do not have any autocorrelations and the ARCH effect.

3.4. SVAR Model

A short-run SVAR(p) model without exogenous variables can be written as:

$$\mathrm{A}\left(I_K - \mathrm{A}_1 L - \mathrm{A}_2 L^2 - \cdots - \mathrm{A}_p L^p\right) y_t = A e_t = B u_t$$

Where, L is the lag operator. The vector e_t refers to the original shocks in the model, with covariance matrix Σ_e, while the vector u_t is a set of orthogonalized disturbances with covariance matrix I_K, K is the number of variables in the model. In a short-run SVAR, we obtain identification by placing restrictions on the matrices A and B, which are assumed to be non-singular. As there are $K(K+1)/2$ free parameters in Σ_e, given its symmetric nature, only that many parameters may be estimated in the A and B matrices. As there are $2K^2$ parameters in A and B, the order condition for identification requires that $2K^2 - \frac{1}{2}K\left(K+1\right)$ restrictions be placed on the elements of these matrices.

In order to identify the parameters and the shock of the structural model, some economic intuition must be used. The identifying restrictions in this study are given as below:

Table 3: AR(1)-GARCH(1,1) model results

Variable	Coefficient	z-statistic	P value
Mean equation			
Constant	0.0055	0.8482	0.3963
Δop_{t-1}	0.1175	1.3451	0.1786
Variance equation			
Constant	0.0005	1.0650	0.2869
e_{t-1}^2	0.1713	2.5622	0.0104
h_{t-1}	0.7669	9.1392	0.0000

Box-Q(1): 0.754, Box-Q(5): 0.958, Box-Q(10): 0.435. ARCH-LM(1): 0.426, ARCH-LM(5): 0.925, ARCH-LM(10):0.589. ARCH: Autoregression conditional heteroskedasticity, LM: Lagrange multiplier

- Shocks to other variables do not affect oil prices. In that sense, oil prices are exogenous. Given the fact that Kazakhstan is an oil-exporting small open economy, such an assumption is plausible.
- While reel exchange rate shocks affect contemporaneously both industrial production and inflation, it is not affected by their shocks. Since the exchange rate is a price for imported intermediate goods, it causes the cost inflation. Moreover trade balance is sensitive to movements in the real exchange rate. Given the fact that managed exchange rate regime is implemented by Kazakhstan, the assumption is plausible.
- According to Granger causality test results[1], the industrial production is Granger cause of the inflation but not *viz*. Therefore we assumed that industrial production shocks affect contemporaneously inflation but inflation shocks are not affected by industrial production.

In this study, the order condition for exact identification requires $2K^2 - \frac{1}{2}K(K+1) = 35$ restrictions in the A and B matrices. The Model-AB is specified as follows:

$$\begin{bmatrix} a_{11} & 0 & 0 & 0 & 0 \\ 0 & a_{22} & 0 & 0 & 0 \\ 0 & 0 & a_{33} & 0 & 0 \\ 0 & 0 & 0 & a_{44} & 0 \\ 0 & 0 & 0 & 0 & a_{55} \end{bmatrix} \begin{bmatrix} e_t^{\Delta ip} \\ e_t^{\Delta cpi} \\ e_t^{\Delta rer} \\ e_t^{sopi} \\ e_t^{sopd} \end{bmatrix} = \begin{bmatrix} 1 & 0 & b_{13} & b_{14} & b_{15} \\ b_{21} & 1 & b_{23} & b_{24} & b_{25} \\ 0 & 0 & 1 & b_{34} & b_{35} \\ 0 & 0 & 0 & 1 & b_{45} \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} u_t^{\Delta ip} \\ u_t^{\Delta cpi} \\ u_t^{\Delta rer} \\ u_t^{sopi} \\ u_t^{sopd} \end{bmatrix}$$

Lag length of VAR is estimated as 2 using the Akaike information criteria, while maximum lag length is 12.

3.5. Impulse response functions

Figure 2 shows the results of the impulse response functions of industrial production, inflation, and the real exchange rate to positive and negative real oil price shocks. Positive oil price shocks have a statistically significant positive impact on industrial production for the period of 2 months. The impacts of positive oil price shocks on industrial production for the following periods remain as positive but not statistically significant. However negative shocks affect as significantly for the period of 4 months that imposes a negative impact on industrial production, and becomes positive over following periods but not statistically significant. Secondly, both positive and negative oil price shocks do not have a significant effect on inflation. In addition, the real exchange rate is affected significantly for the period of 2 months by negative oil price shocks, although there is no a significant effect of positive oil price shocks on the real exchange rate.

3.6. Variance Decomposition Analysis

The results of the forecast error variance decomposition show the proportion of the changes in a variable due to its own shocks versus shocks to the other variables. Table 4 reports the variance decomposition for industrial production, inflation and real exchange rate over the 12-period horizon based on the SVAR model.

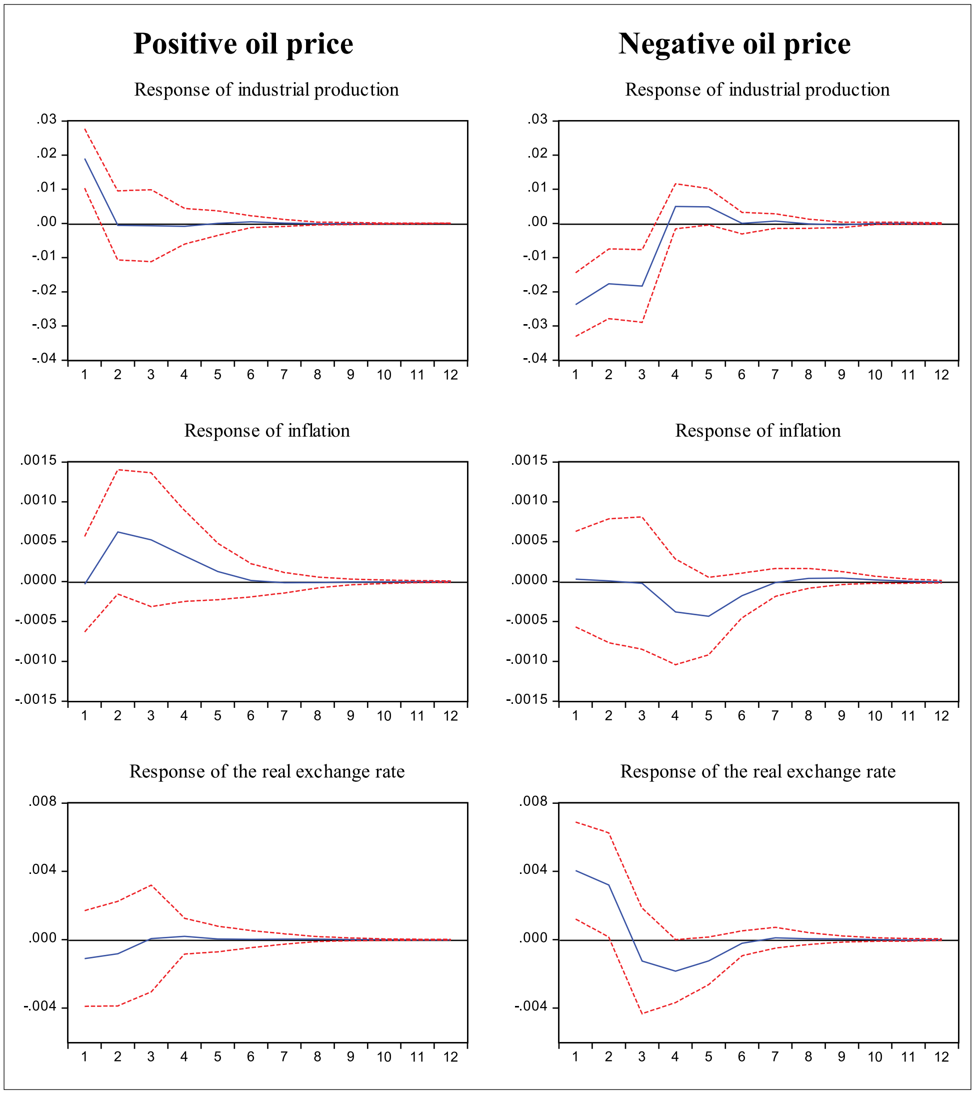
1 Granger causality test results are not reported here but are available from the authors upon request.

Table 4: Results of forecast error variance decomposition

Period	*ip*	*cpi*	*rer*	*sopi*	*sopd*
Variance decomposition of industrial production					
1	73.22	0.00	3.02	9.29	14.46
2	68.17	0.32	2.95	8.36	20.20
3	62.72	0.29	4.20	7.56	25.23
4	62.26	0.29	4.41	7.51	25.53
5	61.99	0.31	4.39	7.46	25.85
6	61.99	0.31	4.39	7.46	25.85
7	61.98	0.31	4.39	7.46	25.85
8	61.98	0.31	4.40	7.46	25.85
9	61.98	0.31	4.39	7.46	25.86
10	61.98	0.31	4.39	7.46	25.86
11	61.98	0.31	4.39	7.46	25.86
12	61.98	0.31	4.39	7.46	25.86
Variance decomposition of inflation					
1	1.11	98.12	0.75	0.01	0.01
2	0.96	96.97	0.49	1.58	0.00
3	2.42	94.68	0.53	2.36	0.01
4	2.68	93.44	0.72	2.65	0.51
5	2.68	92.58	0.91	2.68	1.15
6	2.68	92.39	1.01	2.68	1.25
7	2.69	92.35	1.03	2.68	1.25
8	2.69	92.34	1.03	2.68	1.26
9	2.69	92.34	1.03	2.68	1.26
10	2.69	92.34	1.03	2.68	1.26
11	2.69	92.33	1.03	2.68	1.26
12	2.69	92.33	1.03	2.68	1.26
Variance decomposition of real exchange rate					
1	0.00	0.00	94.89	0.35	4.76
2	0.32	0.23	91.96	0.50	7.00
3	1.66	0.65	89.98	0.48	7.23
4	1.69	0.90	88.93	0.49	8.00
5	1.68	0.97	88.51	0.49	8.34
6	1.68	1.00	88.49	0.49	8.35
7	1.68	1.00	88.48	0.49	8.35
8	1.68	1.00	88.48	0.49	8.35
9	1.68	1.00	88.48	0.49	8.35
10	1.68	1.00	88.48	0.49	8.35
11	1.68	1.00	88.48	0.49	8.35
12	1.68	1.00	88.48	0.49	8.35

According to Table 4, about 15%, 9% and 3% of the one-step forecast error variance of industrial production is accounted for by negative oil price shock, positive oil price shock and real exchange rate innovations, respectively. For the 12-step forecasts, the contribution of negative oil price shock rises to about 26% level but the contribution of positive oil price shock falls to about 7.5% level. The results show that the negative oil price shock is the largest source of changes in industrial production growth. Moreover, the other variables of the system contribute <2.7% to do forecast error variance of inflation for any forecast horizon. The results indicate that there is no significant contribution of the other variables on forecast error variances of inflation for all periods. Although only small fractions of the forecast error variances of real exchange rate are accounted for by innovations in inflation and positive oil price shocks, the contribution of negative oil price shock in the forecast error variance of real exchange rate is 4.76%, 7.00%, 7.23% for the first, second and third periods, respectively, and remains almost 8% level over following periods. The results show that the negative oil price shock is the largest source of changes in real exchange rate.

Figure 2: Response to structural one standard deviation innovations (±2 standard error)



4. CONCLUSION

In this study, the asymmetric effects of real Brent oil price shocks on the industrial production, real exchange rate and inflation in Kazakhstan are investigated empirically by using the monthly data between 2000 and 2013 in the frame of a SVAR model. SVAR analysis is carried out using the scaled model by proposed Lee et al. (1995).

Negative oil price shocks have significant negative impacts on industrial production in Kazakhstan although positive oil shocks have significant positive impacts on industrial production. Moreover, the results of variance decomposition for industrial production show that the negative oil price shocks have a larger impact on industrial production in Kazakhstan. In addition, both positive and negative oil price shocks do not have any significant effect on inflation. There is no a significant effect of positive oil price shocks on the real exchange rate, it is affected significantly by negative oil price shocks. The empirical findings show that the negative oil price shocks have a larger impact on Kazakhstan macro-economic performance.

Increasing in oil price is the main cause of increasing in industrial production for Kazakhstan. Large income that is generated from oil revenue is earmarked “Samruk-Kazina Fund” in Kazakhstan. The main use of oil revenues in the fund is public expenditures, and in particular public investment. Increasing in public expenditures and investment also increases the industrial production. However, decreasing in oil price causes decreasing in industrial production because of decreasing in public expenditures and investment. The negative oil price changes have a larger impact than the positive oil price changes on industrial production of Kazakhstan. This is a risk factor for Kazakhstan macro-economic performance. In order to promote economic growth and sustainable development in Kazakhstan, large income that is generated from oil revenue should be invested in both the tradable-goods sector such as agriculture and manufacturing and social infrastructure such as education and health care.

Positive and negative oil shocks do not have a direct impact on inflation. This result suggest that domestic policies in Kazakhstan should be blamed for inflation. On the other hand, this result also suggests an indirect relationship between oil revenue and inflation. Namely, oil revenue jumps usually are followed by expansions in both public expenditures and public investment, and the expansions will lead to higher prices. After an oil price increase, the government rapidly takes up large social programs and investment projects. Thus, large spending of oil revenues may cause higher inflation.

The effect of positive oil price shocks on the real exchange rate can be seen as evidence for Dutch disease theory since an oil boom leads to currency appreciation and weakening manufacturing and agriculture sectors deteriorating economic growth. Although the effect of positive shocks on the real exchange rate is not significant, negative shocks have a significant impact on the real exchange rate for Kazakhstan. This results point out that the direct influence of oil shocks is limited for the real exchange rate in Kazakhstan. Also there is no strong evidence for Dutch disease since positive shocks do not have significant impact on the real exchange rate for Kazakhstan.

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