The Impact of Oil Prices on the Exchange Rate and Economic Growth in Norway

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3 August 2010

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Abstract

This study examines the impact of oil shocks on the real exchange rate and the gross domestic product of Norway using time series data from 1975 to 2008. The cointegration and Granger causality tests are based on the vector autoregressive model. The results of the study show that the increase in oil price is the reason behind Norway's GDP increase and the increase of its competitiveness to trade. The increase in Norway's trade competitiveness is due to its real exchange rate depreciation brought about by the increase in the price of oil. So it seems that oil price shocks in the case of Norway are a blessing, due to a number of reasons. First, Norway uses the floating exchange rate regime which is a good shock absorber; it increases the freedom of the monetary authority and makes the adjustment smoother and less expensive. A second reason is that Norway has more flexible labor markets. Other reasons include improvements in the conduct of monetary policy and a smaller share of the world's oil production.

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1. Introduction

During the last few years the oil exporting countries especially the OPEC members suffered from high levels of inflation that reached phenomenal levels due to the increase in oil prices during the period 2003-2008, while Norway as an oil exporting country its inflation rate remains low and stable. Hence this paper investigates one of the largest oil exporting countries in Europe and the world which is Norway. Norway is the sixth largest oil exporter in the world in 2008 whose petroleum plays a role in its economic growth. Since the discovery of oil in 1969, Norway did not join OPEC and decides to evaluate its energy prices in line with the global market. Contrary to other producing countries, Norway uses its energy revenue wisely because it increases its gross savings during the increase of oil revenues. The main reason behind choosing Norway is because although it's an oil exporting country it has a stabile economic growth and low inflation compared with the other oil exporting countries that suffered from high levels of inflation and rapid unstable growth.

To find out the reason behind Norway's economic success to maintain its low inflation and its stable economic growth, the main goal of this study is to examine the impact of oil prices on Norway's real exchange rate and gross domestic product to show clearly if the oil shock is a blessing or a curse. To achieve this goal, the vector autoregressive VAR model will be used using time series data from 1975-2008 covering the three famous oil shocks.

2. Studies on Oil Price and the Macroeconomy

Many writers found that oil prices has a significant negative impact on the macroeconomy in both developed and the developing countries. Jayaraman & choong (2009) found that oil prices have a long run and short run relationship with the economic growth in the Asian pacific countries. The same results are found in Japan, (Hanabusa, 2009), in Thailand (Rafiq et. Al, 2008) , in Malaysia, Japan, south Korea, Thailand, Philippines and Singapore (Cunado & Gracia, 2005), in China (Du et. Al, 2010) and in Greece, (Papapetrou, 2001). It also seems that oil prices has a long run relationship with the economic activates in the US and the European countries, (Lardic & Mignon, 2006). The same results are found by Cun˜ado & Gracia (2003) and Blanchard et. al (2007) in the OECD countries. Garratt, et. al (2003) also found that oil prices increase economic activities and inflation in the UK. Doroodian & Boyd (2003) found that the impact of oil prices on the US economy was negatively significant during the 1970's and this impact began to fall after the 1980's because the US economy has been transformed from manufacturing based economy to a service based economy. However, Hamilton (1983), Barsky (2004), Leduc (2002), Gisser et. al (1986), Brown et. al (1995) and Anzuini (2007) found that oil prices have a negative impact on the US economic growth even after the 1980s. However, in Norway, oil prices have an insignificant impact on the economic activates, (Robalo, 2007) while in the Republic of Trinidad and Tobago oil prices are one of the major determinants on growth, (Lorde et. Al, 2009).

3. Studies on Oil Prices and the Exchange Rate

Amano (1998) states that an oil price shock is a major source on the real exchange rate movement of the US dollar. The same results are found in Turkey, (Ozturk, 2008), and in Russia, (Rautava, 2004). However, China's exchange rate has an insignificant response to the changes in oil prices because China is less dependent on imported oil. It also pegs its exchange rate to a basket of currencies. This helped the Chinese exchange rate to remain stable despite the oil shocks, (Huang, 2006). In the 1970's the changes in oil prices have caused a real exchange rate appreciation in the US dollar exchange rate in 1973-74 oil shocks, while the US dollar depreciated in the 1979-80 oil shock due to the decrease in the US dependents on the OPEC oil, (Golub, 1983). However, in Nigeria, oil prices will cause its real exchange rate to appreciate, (Aliyu, 2008). The same results are found in Fiji, (Narayan et. al, 2008).

4. Methodology

In this study the vector autoregressive (VAR) model which is commonly used for forecasting a system of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables is used. It is useful because it is less restrictive compared to other models. In this study two models the GDP growth and the real exchange rate are built.

For the real exchange rate model five variables are used. They are real exchange rate model as a dependent variable, consumer price index, trade balance, oil price, and net foreign direct investment as independent variables. The real exchange rate model is specified as follows:

$$\boldsymbol{Log\ REXCH_t = \alpha + \beta_1 \log CPI_t + \beta_2 \log OIL_t + \beta_3\, TB_t + \beta_4\, FDINET_t + \varepsilon_t} \qquad (1)$$

Where REXCH is the real effective exchange rate national currency per US dollar, CPI is the consumer price index; TB is the trade balance of goods and services measured in millions of US dollars, OIL is the oil price US dollar per barrel, GOVEX is the government consumption expenditure measured in millions of US dollars, β1, β2, β3, β4 are the coefficients of the model, α is the intercept, and εt is the error term.

For the GDP growth model five variables are used. They are the gross domestic product as a dependent variable, inflation rate, total trade, employment, and the oil price as independent variables. The GDP growth model is specified as follows:

$$\boldsymbol{Log\ GDP_t = \alpha + \beta_1 INF_t + \beta_2 \log OIL_t + \beta_3 Log\ TDV_t + \beta_4 Log\ EMPLOY_t + \varepsilon_t} \quad (2)$$

Where GDP is the gross domestic product measured in millions of US dollars, INF is the inflation rate, OIL is the price of oil US dollar per barrel, TDV is the total trade of goods and services measured in millions of US dollars, EMPLOY is the employment measured in thousands of workers, β1, β2, β3, β4 are the coefficients of the model, α is the intercept, and εt is the error term.

5. Data Source

All the variables namely, gross domestic product, real effective exchange rate, net foreign direct investment, trade balance of goods and services, total trade of goods and services, consumer price index, inflation rate, and employment are taken from the World Bank data base, while the oil price is taken from the OPEC data statistics.

6. Estimation procedures

6.1 Unit Root Test

Most time series variables are not stationary because they have time trend, i.e. the time series variable mean, variance and the covariance do not change over time to avoid the possibility of incorrect regressions and wrong conclusion. The Augmented Dickey-Fuller test is used in this study to examine whether the variables are stationary or not. If the variables are stationary at levels, the variables will be integrated in order $y_t \sim I(0)$, but if the variables are not at levels, the variables will be integrated in order $y_t \sim I(1)$.

6.2 Cointegration Test

If the variables are stationary at the first difference, they will have a long run relationship; hence, the variables are cointegrated.

Johansen (1988) and Johansen and Juselius (1990) built a test that can help to find out whether the variables have a long relationship. In this study the Johansen-Juselius (JJ) cointegration test is used which is based on the vector autoregressive (VAR) model. The optimal lag length will be determined by the Akaike Information Criteria.

$$y_t = \mu + \sum_{k=1}^{p} \Gamma_k y_{t-k} + \varepsilon_t \quad (3)$$

This model can help us to use the cointegration process where yt is a g-vector of I(1) variables, μ is a g-vector of constants, and εt is a g-vector of white noise residuals at time t with zero mean and constant variance. Equation (5) below is the same as equation (4) but with only one difference which is *p-1*:

$$\Delta y_t = \mu + \sum_{k=1}^{p-1} Л_k \, \Delta y_{t-k} + \Gamma \, y_{t-1} + \varepsilon_t \qquad (4)$$

where $Л_k = -(I - A_1 - \ldots - A_k)$, $(k = 1,\ldots,p-1)$ and $\Gamma = -(I - A_1 - A_2 - \ldots - A_k)$. Γ is called the impact matrix that can give us information about the long run relationship between the variables. The rank (r) of Л is equal to the number of cointegrating vectors. If Γ is of full-rank, that is $r = g$, then there are g cointegrating vectors. If $0 < r < g$, there exists r cointegrating vectors, which means that there are r stationary linear combinations of y_t. If the rank of Γ is 1, there exists only 1 cointegrating vector. But if the rank of Л is zero, there is no cointegrating equation and the variables are not cointegrated.

The Johansen process is based on two kinds of likelihood ratio tests, the trace test and the maximum eigenvalue test. The test statistic for the trace test is given in the following equation:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{g} \ln(1-\lambda_i) \qquad (5)$$

where λ_i is the largest eigenvalue of the Π matrix, r is the number of cointegration vectors, g is the number of variables and T is the number of observations. The null hypothesis under this test is that there are less than or equal to r cointegrating vectors and the alternative hypothesis is a general one. For example, to test if there is at most only 1 cointegrating vector, the null and alternative hypotheses will be as follows:

H_0: $r \leq 1$ (there is at most 1 cointegrating vector) against

H_1: $r \geq 2$ (there are at least 2 cointegrating vectors)

If the test statistic is greater than the critical value, H_0 will be rejected.

The test statistic for the second test, the maximum eigenvalue test is written as follows:

$$\lambda_{max}(r, r+1) = -T \ln(1 - \lambda_{r+1}) \tag{6}$$

The null hypothesis in this test is that there are exactly r cointegration vectors against the alternative hypothesis of (r + 1) cointegrated vectors where r = 1, 2,..., g − 1, g. For example, to test the existence of 1 cointegrating vector, the null and alternative hypotheses are as follows:

H_0: $r = 1$ (there is exactly 1 cointegrating vector) against

H_1: $r = 2$ (there are exactly 2 cointegrating vectors)

If the value of the test statistic is greater than the critical value, then H_0 will be rejected.

6.3 Granger Causality test

The Granger approach (1969) helps us to find out the variable *a* granger causes variable *b*, the granger causality exists if the past value of *a* can predicate the present value of *b*. If there is at least one cointegration vector among the variables of the model in this study, we will proceed with the estimation of the vector error-correction model (VECM) to investigate the temporal short-run causality between the variables. On the other hand, if there is no long run relationship (no cointegration) between the variables in the model, the vector autoregressive (VAR) model will be employed to examine the short-run causality between the variables. The VECM is a special form of the VAR for I(1) variables that are cointegrated. The VEC model allows us to capture both the short-run and long-run relationships**.**

For the purpose of this study, if the variables are I(1) and cointegrated, the Granger causality tests will be based on the following VECM model with uniform lag length (equations (7), (8)):

$$\Delta REXCHt = \alpha 1 + \beta 1ectt\text{-}1 + \sum_{i=1}^{l} \xi i \Delta REXCHt\text{-}1 + \sum_{i=1}^{l} \varphi i \Delta \log(OIL)t\text{-}1 + \sum_{i=1}^{l} \delta i\ (FDINET)t\text{-}1 + \sum_{i=1}^{l} \gamma i \Delta (TB)t\text{-}1 + \sum_{i=1}^{l} \lambda i \Delta \log(CPI)t\text{-}1 + \mu 1 \quad (7)$$

$$\Delta GDPt = \alpha 2 + \beta 2ectt\text{-}1 + \sum_{i=1}^{l} \xi iGDPt\text{-}1 + \sum_{i=1}^{l} \varphi i \Delta \log(OIL)t\text{-}1 + \sum_{i=1}^{l} \delta i \Delta \log(EMPLOY)t\text{-}1 + \sum_{i=1}^{l} \gamma i \Delta (INF)t\text{-}1 + \sum_{i=1}^{l} \lambda i \Delta \log(TDV)t\text{-}1 + \mu 2 \quad (8)$$

In equation (7) through (8) above, Δ is the first difference operator, αi is the constant term, βi, ξi, φi, δi, γi and λi are the parameters, ectt-1 is the lagged error correction term obtained from the cointegrating equation and μi is the white noise error.

On the other hand, if we do not find cointegration, we would not be able to use the VECM to examine the short-run dynamic relationship between the variables of the model. Instead we will estimate a VAR model equation (9), and (10), as follows:

$$\Delta REXCHt = \alpha 1 + \sum_{i=1}^{l} \xi i\ \Delta REXCHt\text{-}1 + \sum_{i=1}^{l} \varphi i \Delta \log(OIL)t\text{-}1 + \sum_{i=1}^{l} \delta i \Delta \log(FDINET)t\text{-}1 + \sum_{i=1}^{l} \gamma i \Delta (TB)t\text{-}1 + \sum_{i=1}^{l} \lambda i \Delta \log(CPI)t\text{-}1 + \mu 1 \quad (9)$$

$$\Delta GDPt = \alpha 3 + \sum_{i=1}^{l} \xi i \Delta GDPt\text{-}1 + \sum_{i=1}^{l} \varphi i \Delta \log(OIL)t\text{-}1 + \sum_{i=1}^{l} \delta i \Delta \log(EMPLOY)t\text{-}1 + \sum_{i=1}^{l} \gamma i \Delta (INF)t\text{-}1 + \sum_{i=1}^{l} \lambda i \Delta \log(TDV)t\text{-}1 + \mu 3 \quad (10)$$

The Granger causality tests are conducted by calculating the respective Wald F-statistic based on the null hypothesis that the set of coefficients (φi, δi, γi and λi) on the lagged values of the right hand side variables are not statistically different from zero. If the null hypothesis is not rejected, it can be concluded that the right hand side variables do not Granger cause the left hand side variable.

7. Empirical Results and Discussion of Results

The ADF results show that all the variables in both models are stationary at the first difference at 5% level of significance, thus we will use the Johansen and Juselius cointegration test to find out the negative or the positive long run relationship between the independent variables and the dependent variables in both models.

Table 2: ADF Unit Root Test Results (exchange rate model)

Variable	Level		First Difference	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend
LREXCH	-2.150352	-2.385633	-5.015927***	-4.927405***
LCPI	-2.112206	-0.761737	-2.742827**	-3.162100
LOIL	-1.030786	-0.390732	-5.152922***	-5.443982***
TB	4.479656	3.151230	-3.376266**	-4.211990**
FDINET	-0.398263	-2.957423	-3.918415**	-3.843644**

Note: *** denotes significance at the 1% level and ** at the 5% level.

Table 2: ADF Unit Root Test Results (GDP model)

Variable	Level		First Difference	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend
LGDP	0.337309	-2.344588	-3.693318**	-3.672596**
LOIL	-1.030786	-0.390732	-5.152922***	-5.443982***
INF	-2.237289	-2.693264	-5.579233***	-5.545132***
LEMPLOY	-0.340870	-2.837357	-3.398748**	-3.261598**
LTDV	0.834194	-1.967240	-3.480282**	-3.563743**

Note: *** denotes significance at the 1% level and ** at the 5% level.

7.1 Cointegration Test results

The cointegration will be tested after we have found that all the variables in both models are stationary at the first difference to examine the long run relationship between the independent variables and the dependent variable in both the GDP model and the exchange rate model. Before we conduct the test we will use the lag length criteria to find the optimal lag length for our models, due to the sensitiveness of the cointegration to the lag length.

Table three shows that the optimal lag length for the exchange rate model is lag three based on the minimum AIC while table four shows that the optimal lag length for the GDP model is the lag two based on the minimum AIC.

While Table five shows the cointegration results for the trace statistics, table six shows the cointegration results for the maximum eigenvalue for the exchange rate model.

Table 3: Lag Length Selection from VAR Estimates (The Exchange Rate Model)

VAR Lag Order Selection Criteria
Endogenous variables: LREXCH LCPI TB LOILINF FDINET
Exogenous variables: C
Date: 10/27/10 Time: 15:40
Sample: 1975 2008
Included observations: 30

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1370.739	NA	4.67e+33	91.71592	91.94945	91.79062
1	-1225.094	233.0310	1.54e+30	83.67296	85.07416	84.12121
2	-1195.712	37.21785	1.34e+30	83.38079	85.94965	84.20259
3	-1137.422	54.40415*	2.25e+29*	81.16145	84.89797*	82.35679*
4	-1107.474	17.96849	4.67e+29	80.83162*	85.73581	82.40051

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 4: Lag Length Selection from VAR Estimates (The GDP Model)

VAR Lag Order Selection Criteria
Endogenous variables: LGDP LOILINF INF LTDV LEMPLOY
Exogenous variables: C
Date: 10/27/10 Time: 15:42
Sample: 1975 2008
Included observations: 31

Lag	LogL	LR	FPE	AIC	SC	HQ
0	18.02667	NA	2.97e-07	-0.840430	-0.609142	-0.765036
1	158.4572	226.5008	1.77e-10	-8.287561	-6.899831	-7.835195
2	212.8072	70.12900*	3.06e-11*	-10.18111	-7.636937*	-9.351771*
3	242.5370	28.77077	3.33e-11	-10.48626*	-6.785644	-9.279949

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 5: Johansen-Juselius Cointegration Test Results Based on the Trace Statistic

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.824542	142.2757	76.97277	0.0000
At most 1 *	0.768647	90.06492	54.07904	0.0000
At most 2 *	0.567264	46.15062	35.19275	0.0023
At most 3 *	0.413619	21.02183	20.26184	0.0392
At most 4	0.153752	5.008279	9.164546	0.2825

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 6: Johansen-Juselius Cointegration Test Results Based on the Maximum Eigenvalue Statistic

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.824542	52.21073	34.80587	0.0002
At most 1 *	0.768647	43.91430	28.58808	0.0003
At most 2 *	0.567264	25.12879	22.29962	0.0196
At most 3 *	0.413619	16.01355	15.89210	0.0479
At most 4	0.153752	5.008279	9.164546	0.2825

Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 5 and table 6 show that the trace and the maximum eigenvalue indicates four cointegration equations at 5% level of significance, indicating a long run relationship between the independent variables namely, consumer price index, trade balance, oil price, and net foreign direct investment and the dependent variable the real exchange rate. Table seven below shows the normalized cointegration vector.

Table 7: Cointegration Equation Normalized With Respect To LREXCH

LREXCH	LCPI	TB	LOIL	FDINET	C
1.000000	-0.514806	4.10E-12	-0.221097	4.90E-11	-2.004132
	(0.08945)	(2.8E-12)	(0.09114)	(1.0E-11)	(0.42122)

From table seven, the long run equation for the real exchange rate model can be written as:

Log REXCH= 2.004132+ 0.514806 log CPI*- 4.10E-12 TB*+ 0.221097 log OIL*- 4.90E-11FDI* (11)

The equation above shows that the consumer price index and oil price have a long run positive relationship with the real exchange rate while the trade balance and the net foreign direct investment have a long run negative relationship with the real exchange rate.

1% increase in the consumer price will depreciate the real exchange rate by 0.5%. This relationship is obvious because when the price level or inflation increases, it will reduce the value of the local currency.

One million increase in trade balance will appreciate the real exchange rate by 4.10E-12, because the increase trade balance will increase the foreign capital inflows which comes into the country causing local currency to appreciate.

1% increase in oil price will cause the real exchange rate to depreciate by 0.22%. It seems that the oil price will make the value of the local currency lower which will increase the comparative advantage for Norway to export more since exports play more than 47% of Norway total GDP. This has a positive effect on its growth.

One million increase in net foreign direct investment will appreciate the exchange rate by 4.90E-11, because foreign investors always bring foreign currency to invest in the country, so the increase in foreign capital inflows will increase the value of Norway's local currency.

Table 8 below shows the cointegration results for the trace statistics whereas table 9 shows the cointegration results for the maximum eigenvalue for the GDP growth model.

Table 8: Johansen-Juselius Cointegration Test Results Based on the Trace Statistic

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.800583	117.7600	76.97277	0.0000
At most 1 *	0.701815	67.77696	54.07904	0.0019
At most 2	0.447111	30.26571	35.19275	0.1544
At most 3	0.230216	11.89519	20.26184	0.4582
At most 4	0.114914	3.784182	9.164546	0.4452

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 9: Johansen-Juselius Cointegration Test Results Based on the Maximum Eigenvalue Statistic

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.800583	49.98306	34.80587	0.0004
At most 1 *	0.701815	37.51125	28.58808	0.0028
At most 2	0.447111	18.37052	22.29962	0.1619
At most 3	0.230216	8.111007	15.89210	0.5345
At most 4	0.114914	3.784182	9.164546	0.4452

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

For both trace and maximum eigenvalue statistics we find at least two cointegration equations at 5% level of significance indicating that the long run relationship exists between the independent variables, namely inflation rate, oil price, employment, and total trade value and the GDP as a dependent variable. Table 10 shows the normalized cointegration vector.

Table 10: Cointegration Equation Normalized With Respect To LGDP

LGDP	LOIL	INF	LTDV	LEMPLOY	C
1.000000	-0.096420	0.033770	-0.921073	-0.044341	-1.957496
	(0.02423)	(0.00550)	(0.03907)	(0.18005)	(0.72142)

Hence, the long run equation for the real exchange rate model can be written as

Log GDP= 1.957496+0.096420 log OIL*-0.033770 INF*+ 0.921073log LTDV*+ 0.044341 log EMPLOY* (12)

The equation above shows that oil price, total trade value, and employment have a long run positive relationship with the gross domestic product, while inflation rate has a long run negative relationship with the gross domestic product.

1% increase in oil price will increase Norway's gross domestic product by 0.0957%, indicating the higher oil price the better economic growth in Norway.

One unit increase in inflation rate will slow Norway's GDP growth by 0.0337%. This relationship is obvious because the increase in price level will decrease the demand for goods and services. This has its negative effect on the GDP. This result is supported by Sarel (1996), Javier (1999), and Barro (1998).

1% increase in total trade value will increase Norway's gross domestic product by 0.921%. This positive relationship is due to the fact that Norway is an open economy and its trade plays more than 73% of total GDP. It is clear that the increase in total trade will lead to a higher growth.

1% increase in employment will increase Norway's gross domestic product by 0.0443%. The increase in employment means that there will be more people who have the ability to buy goods and services and that in general will increase the demand for goods and services. This will have a positive impact on the growth.

7.2 Granger Causality test

After finding the long run relationship between the dependent and the independent variables in both the exchange rate model and the GDP growth model, we find it obligatory to use the Granger causality test (VECM). Table 11 shows the F-statistics results for the exchange rate model that only the oil price granger causes the real exchange rate in the short run. The significance of the ect (-1) indicates that all the variables, namely oil price, trade balance, consumer price index, net foreign investment granger cause the real exchange rate in the long run.

Table 12 shows that only the total trade value granger causes the real gross domestic product in the short run. The significance of the ect (-1) indicates that all the variables, namely oil price, inflation rate, total trade value, and employment granger causes the gross domestic product in the long run.

Table 11: Granger Causality Results with LOG REXCH as the Dependent Variable

	∑DLOG REXCH	∑DLOG OIL	∑D TB	∑D cpi	∑D FDINET	ect(-1)
F-stats.	1.045567 (1)	2.406444 **(4)	0.951094 (2)	1.795367 (1)	0.858794 (2)	-4.895618**

Notes: ect (-1) represents the error correction term lagged one period. The numbers in the brackets show the optimal lag based on the AIC. D represents the first difference. Only F-statistics for the explanatory lagged variables in first differences are reported here. For the ect(-1) the t-statistic is reported instead. ** denotes significance at the 5% level and * indicates significance at the 10% level.

Table 12: Granger Causality Results with LOG GDP as the Dependent Variable

	∑DLOG GDP	∑DLOG OIL	∑D INF	∑DLOG TDV	∑D LOGEMPLOY	ect(-1)
F-stats.	2.125915 (4)	0.976487 (3)	2.016342(1)	3.918640 **(4)	1.986354 (1)	-1.648370*

Notes: ect (-1) represents the error correction term lagged one period. The numbers in the brackets show the optimal lag based on the AIC. D represents the first difference. Only F-statistics for the explanatory lagged variables in first differences are reported here. For the ect(-1) the t-statistic is reported instead. ** denotes significance at the 5% level and * indicates significance at the 10% level.

The results emanated from the cointegration and the Granger causality show that oil windfall is not a curse because the increase in oil prices will depreciate the real exchange rate of the country. This helps Norway to increase its comparative advantage to trade. Oil price will also increase Norway gross domestic product. Therefore, it can be stated that oil price is blessing for Norway due to two reasons. The first reason is that Norway uses the floating exchange rate regime which always acts as a shock absorber. The floating exchange rate regime can achieve policy autonomy as well. The monetary authority will be independent which can help to choose the inflation rate independently. The floating exchange rate regime can help to achieve the adjustments smoother and less expensive during the external shocks.

The other reason is that despite Norway is oil producing country; it has a flexible labor market, smaller share of oil in production, and Indirect Tax Analogy. All these policies help Norway's economy to be less vulnerable to the oil shocks.

8. Conclusion

This study aims at finding out the impact of oil shocks on the real exchange rate and the gross domestic product in Norway using time series data from 1975 to 2008. The cointegration and the Granger causality test are implemented in this study. The Johansen-Juselius cointegration result shows that the increase in oil price will cause Norway's GDP to increase. It also increases its competitiveness to trade by its real exchange rate depreciation. It seems that the increase in oil price in Norway is a blessing due to two reasons. First, Norway uses the floating exchange rate regime, which is a good shock absorber. It increases the freedom of the monetary authority, and makes the adjustment smoother and less expensive. The second reason is that Norway has more flexible labor markets and smaller share of oil in production. Although oil is considered as a positive criterion in the Norway economy, however, the role of petroleum in Norway economy is drastically increasing which can make their economy more vulnerable to the changes in oil prices, so we recommend Norway to decrease its dependency on oil.

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