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The impact of oil prices on macroeconomic fundamentals, monetary policy and stock market for eight Middle East and North African countries

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The impact of oil prices on macroeconomic fundamentals, monetary policy and stock market for eight Middle East and North African countries

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Abstract

The objective of this study is to investigate the impact of oil prices on macroeconomic fundamentals as well as monetary policy and stock market for eight oil-exporting and non-oil exports countries in the Middle East and North African region, namely Algeria, Egypt, Iran, Kuwait, Morocco, Saudi Arabia, Tunisia and Turkey. Using quarterly data for the period 1994Q4-2015Q2, with a Panel-ARDL, we may conclude that there are short run dynamic cross-section relationships between, first, oil prices and macroeconomic variables such as growth rate and consumer price index, second, oil prices and money market rate and, third, market capitalization and oil prices.

In the long run, dependent variables such as consumer price index and market stock exhibit a cointegration relationship with oil prices. However, no cointegration relationships could be established between oil price variations, monetary policy and growth rate. In this context, we apply a multivariate VAR model to examine responses of all variables to oil price shocks. Results show a relatively high elastic response of economic growth in oil-exporting countries except for Kuwait and, conversely, in oil-importing economics, GDP response to oil prices appear reasonably stable, close to zero.

Similarly, the same results can be captured for each oil-importing and exporting country as far as the negative sign exhibited by market response to oil price during the first period caused by financial crisis contagion.

The next macroeconomic variable, CPI, shows a positive response to oil .In addition, oil prices appear to have a negligible response on money market rates in the Middle East and North Africa except for Turkey and Egypt.

Keywords: Oil shocks; Economic growth; Economy; Monetary policy; Stock market; Panel-ARDL

JEL Classification: E60, G28, O11

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I. Introduction

Oil price is the most attractive index in financial markets. As the world economy has become highly vulnerable to oil price fluctuations, since 2002, the price of a barrel of oil has increased fourfold, moving from $26 in 2002 to $107 in 2012. The prices dropped from about $90 in June 2014 to less than $50 a barrel in august 2015. It is now (beginning of 2016) below $40. In this context, concern about crude oil future, especially as many new signs of disturbances resurfaced with China's economy slowdown, increased supply due mainly to US shale oil and gas substitution, market share preservation strategy of the Organization of the Petroleum Exporting Countries, world economic deceleration, harshless weather and some geopolitical factors.

In contrast, and in a stable situation, oil prices appear to have a positive impact on the economies of oil-countries and a negative effect on oil-importing economies. Therefore, with the increase of the US dollar, current account balance, government revenue and GDP increase in first group. Conversely, for the latter group, high energy costs pushes up production and CPI costs and indirectly money market rates and impact current account imbalance and decelerate oil-importing economy's growth. In our analysis, we shall investigate the impact of oil prices on macroeconomic fundamentals, monetary policy and stock market for eight Middle East and North African countries.

The rest of the paper is organized as follows. In section 2, we shall present a literature review on the impact. Section 3 deals with the model and the methodology, followed by the results and discussion in Section 4, and finally, section 5 sets out the main findings.

II. Literature review

The price of oil plays a strategic role in the global economy. Many studies have highlighted its different impacts on macroeconomic variables such as GDP growth, unemployment rates, inflation, the stock market, etc. (See: Rasche and Tatom (1977), Darby (1982), Hamilton (1983, 1996, 2003), Lee et al. (1995), Rotemberg and Woodford (1996), Eltony and Al-Awadi (2001), Brown and Yücel (2002, 2010), Blanchard and Gali (2007), Bjørland (2008), Wang, Wu, and Yang (2013), Basher, Haug, and Sadorsky (2012), Benhabib et al (2014, 2015)).

Pradhan et al (2015) pointed out, using a panel vector autoregressive model for the G-20 countries over the period 1961– 2012, a robust long-run economic relationship between economic growth, oil price, the depth in the stock market, and three other key macroeconomic indicators such as real effective exchange rate, inflation rate, and real interest rate.

Katircioglu et al (2015) use panel cointegration in order to test the relationship between oil price movements and macroeconomic aggregates, such as gross domestic product (GDP), consumer prices (CPI), and unemployment, for twenty-six OECD countries between 1980 and 2011. They results confirmed that there is a long-term relationship between oil prices and those macroeconomic aggregates

George Filis (2010) examined the relationship between consumer price index, industrial production, and stock market, and oil prices in Greece during the period 1996 M1 to 2008 M6. He found a positive effect of oil prices and the stock market on the Greek CPI in the short term. In the long run, oil prices exercise significant negative influence on the stock market and respond negatively to CPI.

Korhonen et al. (2007) estimated the real exchange rate in OPEC countries from 1975 to 2005 and three oil-producing Commonwealth Independent States (CIS) from1993 to 2005 using panel co-integration methods. Their results show that real oil price has a direct effect on the equilibrium exchange rate in oil-producing countries. Nikbakht (2009) studied the long run relationship between real oil prices and real exchange rates from 2000 to 2007 by using monthly panel of seven OPEC countries (Algeria, Indonesia, Iran, Kuwait, Nigeria, Saudi Arabia, and Venezuela). His results show that there is a long run and positive linkage between real oil prices and real exchange rates in OPEC countries.

In Morocco, Lahrech et al (2014) examined the association between oil price shocks and the MASI index (Moroccan All Shares Index). Using a Dynamic Conditional Correlation Multivariate GARCH, they concluded on the existence of significant correlation between oil, MASI index and the Moroccan economic sectors.

Necibi (2013) analyzed the impact of oil prices on Tunisian economic activity using quarterly and monthly data for the period 2000 to 2011. He established a relationship between slightly rising oil price variations and macroeconomics variables and confirmed the impact on the rising production cost as well as the consumer price index that pushed down Tunisian output.

In a similarly study for Turkish data between January 1988 and March 2011, Çatık and Önder (2013) detected the nonlinear relationship between oil prices and macroeconomic activity based on a multivariate two-regime threshold VAR (TVAR) model.

Akoum et al (2012) found that oil and stock returns co-move in the long term for the six Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) utilising a wavelet analysis.

Farzanegan and Markwardt (2009) investigated the effects of oil price shocks on the Iranian economy by applying a VAR approach. They observed a strong positive relationship between positive oil price changes and industrial output growth. On the contrary, the impact of oil prices has negligible effect on real government expenditures but appreciate real effective exchange rate.

Eltony (2001) used VAR approach upon quarterly data for the period 1984 Q1 – 1998 Q4 and found out a causality between major macroeconomic variables in Kuwait (oil prices and oil revenues, and government development and current expenditure).

III. Model and Methodology

A) Data source

The sample comprises 83 quarterly observations for the period 1994Q4 – 2015Q2.The sources of our variables are collected from different issues of International financial Statistics and world development indicators**.**

B) Definition of the model

The ARDL model is used to analyze cointegration series for short and long run dynamics, even when the time-series are stationary I(0) or integrated of order I(1). The variables may include a mixture of stationary and non-stationary time-series for ARDL Bounds testing approach proposed by Pesaran (1997), Pesaran, Smith and Shin (2001) and Pesaran et al. (2001). In addition, the bounds testing procedure (Pesaran et al., 2001), proposed in this study, are robust for small sample (Abd Pattichis, 1999; Mah, 2000; and Tang and Nair, 2002, Halim et al 2008, Kamel et Benhabib (2015)). In this context, we use panel ARDL cointegration tests for cross-section data for eight oil-exporting and non-oil exports countries in the Middle East and North African region, namely Algeria, Egypt, Iran, Kuwait, Morocco, Saudi Arabia, Tunisia and Turkey.

Our variables are oil prices (**Oil**) and macroeconomic variables such as growth rate (**GDP**) and consumer price index change (**CPI**), market capitalization (**Mrk**) for monetary policy and money market rate (**I**).

IV. Results and discussions

A) Stationary test results

Before presenting the results from the empirical panel ARDL, we apply the stationary test of the time series data. We have chosen the cross-sectionally augmented panel unit root test of Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003**)** and ADF Fisher-type tests. All results show that all variables are integrated of order one (I (1)), though CPI change and growth rate variables are stationary at levels (I (0)).

Table 1 The result of Unit Root Test at Level or I (0) (Null: Unit Root Test): with Intercept and Trend

Variable	Levin, Lin & Chu t*	Probability	Im, Pesaran and Shin W-stat	Probability	ADF - Fisher Chi-square	Probability	
GDP	-1.77853	0.0377	-2.78145	0.0027	37.7037	0.0017	I(0)
Oil	-0.68411	0.2470	0.53659	0.7042	7.95123	0.9503	I(1)
I	-3.32729	0.0004	-1.84120	0.0328	23.5717	0.0404	I(0)
Mrk	-1.47662	0.0699	-0.61151	0.2704	19.3304	0.2519	I(1)
CPI	-3.46934	0.0003	-3.34414	0.0004	43.5671	0.0002	I(0)

Table 1 presents the results of unit root test at level. We reject the null hypothesis and accept the alternative hypothesis for two variables (oil, Market capitalization) when the p-value is more than 0.05 (5%) and even 0.1 (10%), Oil variable P-values are 0.247, 0.7 and 0.95 respectively for three tests of Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003) and ADF Fisher-type tests; Additionally, Market capitalization p-value is more than the 5% critical value (0.06, 0.27 and 0.25).

CPI, GDP and interest rate variables are stationary at levels (I (0)) with statistical tests less than the 5% critical value, allow us not to reject the null hypothesis. Indeed, we observe GDP p-value of 3%, 0.2% and 0.1%, where the critical value of interest rate is less than 0.04%,

3% and 4%. Finally, CPI p-value is significant at 5% with the probabilities of 0.03%, 0.04% and 0.02%.

Table 2 The result of Unit Root Test at 1st different or I (1) (Null: Unit Root Test): with Intercept and Trend

Variable	Levin, Lin & Chu t*	Probability	Im, Pesaran and Shin W-stat	Probability	ADF - Fisher Chi-square	Probability	
GDP	-2.61131	0.0045	-5.47554	0.0000			I(0)
Oil	-22.7033	0.0000	-20.1954	0.0000	268.732	0.0000	I(1)
I	-20.1422	0.0000	-19.1702	0.0000	231.507	0.0000	I(0)
Mrk	-10.0700	0.0000	-11.4630	0.0000	154.633	0.0000	I(1)
CPI	-7.54668	0.0000	-17.6019	0.0000	207.286	0.0000	I(0)

Table 2 shows the result of unit root test at 1st different. All results confirm integrated oil and markets variables of order one (I (1))on the contrary, the series of CPI, interest rate and GDP have no unit roots, then we conclude that these variables are stationary at levels (I (0)).

B) Cointegration tests

In order to explain the relationship between oil prices and the MENA economies (Table 03), the Panel-ARDL model is used to analyze cointegration series for short and long run dynamics. In the long run, dependent variables such as consumer price index and market stock exhibit a cointegration relationship with oil prices. However, no cointegration relationships can be established among oil price variations, monetary policy and growth rate.

Table 3: Pooled cointegration test

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
OILP	-0.000462	0.000819	-0.563168	0.0035
MRK	0.014846	0.002788	5.325305	0.0000
I	0.010527	0.007621	1.381287	0.1677
CPI	-0.020791	0.005160	-4.029242	0.0001
Short Run Equation				
COINTEQ01	-0.121092	0.063348	-1.911519	0.0464
D(GDP(-1))	1.753913	0.494250	3.548633	0.0004
D(GDP(-2))	-1.578388	0.514201	-3.069597	0.0022
D(GDP(-3))	0.530667	0.162131	3.273082	0.0011
D(OILP)	-0.000965	0.000930	-1.038513	0.2995
D(MRK)	0.002216	0.008338	0.265824	0.7905
D(I)	-0.017112	0.015435	-1.108638	0.2681

D(CPI)	-0.008527	0.004616	-1.847420	0.0652
C	0.116539	0.063998	1.820974	0.0691
Mean dependent var	0.003375	S.D. dependent var		0.459245
S.E. of regression	0.417403	Akaike info criterion		-7.225068
Sum squared resid	99.48249	Schwarz criterion		-6.699723
Log likelihood	2413.309	Hannan-Quinn criter.		-7.021257

*Note: p-values and any subsequent tests do not account for model selection.

C) Relationships between oil prices and variables from MENA economics

Table 4 reports the relationships between oil prices and variables from MENA economics in the short run. We use the speed of adjustment that explains the move from the short to the long-run equilibrium among the studied variables. The deviation from long-run equilibrium is corrected with very slow adjustment speed for about 12% for every quarter. The speed of adjustment is higher in the MENA oil-importing countries when the adjustment speeds are 30% for turkey and Egypt, 58 and 41% respectively for morocco and Tunisia. On the contrary, for oil-exporting countries, the adjustment speed during the same estimated period moves to a target of about 25% and less than the first speed adjustment group. This result may be explained particularly for oil-exporting countries by time constraints that do not allow them to correct deviations of their macroeconomic variables from long-run equilibrium. In addition, we note the speed of adjustment is lower in Saudi Arabia and Kuwait compared to Algeria. This result clarifies the comparative disadvantage of oil dependency of these countries and help distinguish between oil rich countries and relatively non-rich oil countries. In 2014, Saudi Arabia and Kuwait produced 11 bbl. /day and 3 bbl. /day respectively, compared to 1.7 for Algeria. Furthermore, this relationship emphasizes how policymakers choose their budget strategy to serve an ever expanding public spending to stimulate economic growth. In addition, Oil price trends have positive effect on Algeria, Iran, Kuwait and Saudi Arabia. However, the analysis for Tunisian GDP has not detected short run relationship with oil price, which may imply that change in oil price impacts negatively the Tunisian real GDP. Turkey Financial Market capitalization is related positively, but is not statically significant for the period 1994Q4-2015Q2. Moreover, oil prices appear as having a statistical association with CPI for oil-importing countries as well as oil-exporting countries in MENA region upon the reason that when oil price increases, inflation also comes up.

Table 4: Cross section short run coefficients

_ALG

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.419136	0.009804	-42.74995	0.0000
D(Y(-1))	0.041936	0.012319	3.404122	0.0423
D(OILP)	-0.000453	1.49E-05	-30.45181	0.0001
D(MRK)	-0.008595	0.000192	-44.77069	0.0000
D(CPI)	-0.003259	0.000358	-9.098534	0.0028
C	0.401554	0.011910	33.71489	0.0001

_EGP

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.308161	0.011231	-27.43759	0.0001
D(Y(-1))	-0.176413	0.014102	-12.50988	0.0011
D(OILP)	-0.005163	1.75E-05	-295.7704	0.0000
D(MRK)	0.015117	0.000148	101.9408	0.0000
D(CPI)	-0.134245	0.009872	-13.59912	0.0009
C	0.348764	0.022542	15.47149	0.0006

_IRN

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.229867	0.005430	-42.33060	0.0000
D(Y(-1))	0.038339	0.011764	3.259078	0.0472
D(OILP)	0.005969	2.74E-05	218.2222	0.0000
D(MRK)	0.077726	0.001958	39.70287	0.0000
D(CPI)	-0.016309	0.000203	-80.30038	0.0000
C	0.254878	0.012826	19.87215	0.0003

_KWT

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.192203	0.004364	-44.04171	0.0000
D(Y(-1))	0.097726	0.011659	8.382048	0.0036
D(OILP)	-0.006557	7.30E-05	-89.81905	0.0000
D(MRK)	-0.020169	0.001001	-20.15669	0.0003
D(CPI)	-0.017377	0.005992	-2.899974	0.0625
C	0.201818	0.012647	15.95737	0.0005

_MAR

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.580376	0.008832	-65.71439	0.0000
D(Y(-1))	0.337381	0.010594	31.84675	0.0001
D(OILP)	-0.008138	9.84E-05	-82.72028	0.0000
D(MRK)	-0.028025	0.000793	-35.32036	0.0000
D(CPI)	0.084737	0.008216	10.31334	0.0019
C	0.588979	0.032172	18.30743	0.0004

_SA

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.198285	0.004826	-41.08816	0.0000
D(Y(-1))	0.007680	0.012132	0.633056	0.5717
D(OILP)	-0.012459	3.31E-05	-375.8754	0.0000
D(MRK)	0.009244	0.001153	8.018226	0.0040
D(CPI)	-0.022157	0.004273	-5.184943	0.0139
C	0.229185	0.008623	26.57735	0.0001

_TUN

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.414709	0.010504	-39.48222	0.0000
D(Y(-1))	0.028268	0.012511	2.259492	0.1090
D(OILP)	7.86E-05	1.82E-05	4.305612	0.0231
D(MRK)	-0.024002	0.000664	-36.13390	0.0000
D(CPI)	-0.028152	0.003657	-7.698253	0.0046
C	0.461418	0.016306	28.29816	0.0001

_TUR

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.340369	0.007370	-46.18589	0.0000
D(Y(-1))	0.192448	0.011739	16.39354	0.0005
D(OILP)	0.001443	8.72E-05	16.54319	0.0005
D(MRK)	0.064265	0.296330	0.216869	0.8422
D(CPI)	-0.000722	0.000215	-3.360302	0.0437
C	0.507719	0.030644	16.56811	0.0005

D) The impact of oil Prices on the variables of each individual country

In this section, we analyze the impact of oil prices on macroeconomic fundamentals, monetary policy and stock market for each of the eight Middle East and North African country. We use SVAR model[4] applied by Blanchard and Quah (1989), Cushman and Zha (1997), Zha (1999), Maćkowiak (2007), Sato et al (2009), Kilian (2009) who investigated the effect of oil shocks on different variables.

Figure 1 checks the impulse responses. The impulse responses present the dynamic responses of the exogenous variables in relation to the time of variation of the endogenous

[4] In our analysis, we use quarterly data over the period of Q4 2006 to Q2 2015. This period can give us the stationary series after introducing logarithms. Our results, drawn from the stationary Augmented Dickey-Fuller (1979, 1981) and Phillips and Peron, (1988) tests, allow a rejection of the null hypothesis in the first difference that signifies no stationary in all our series, but enables an acceptance at a level that signifies integration of the variables at order 1.

variable (See Doan (1992), Sims and Zha (1999)). It shows that responses of GDP in oil-exporting countries present a positive sign during all period, and conversely, in oil-importing economies, responses appear reasonably stable, close to zero.

Similarly, the same results can be captured for market responses that exhibit a negative sign that is likely to be caused by financial crisis contagion.

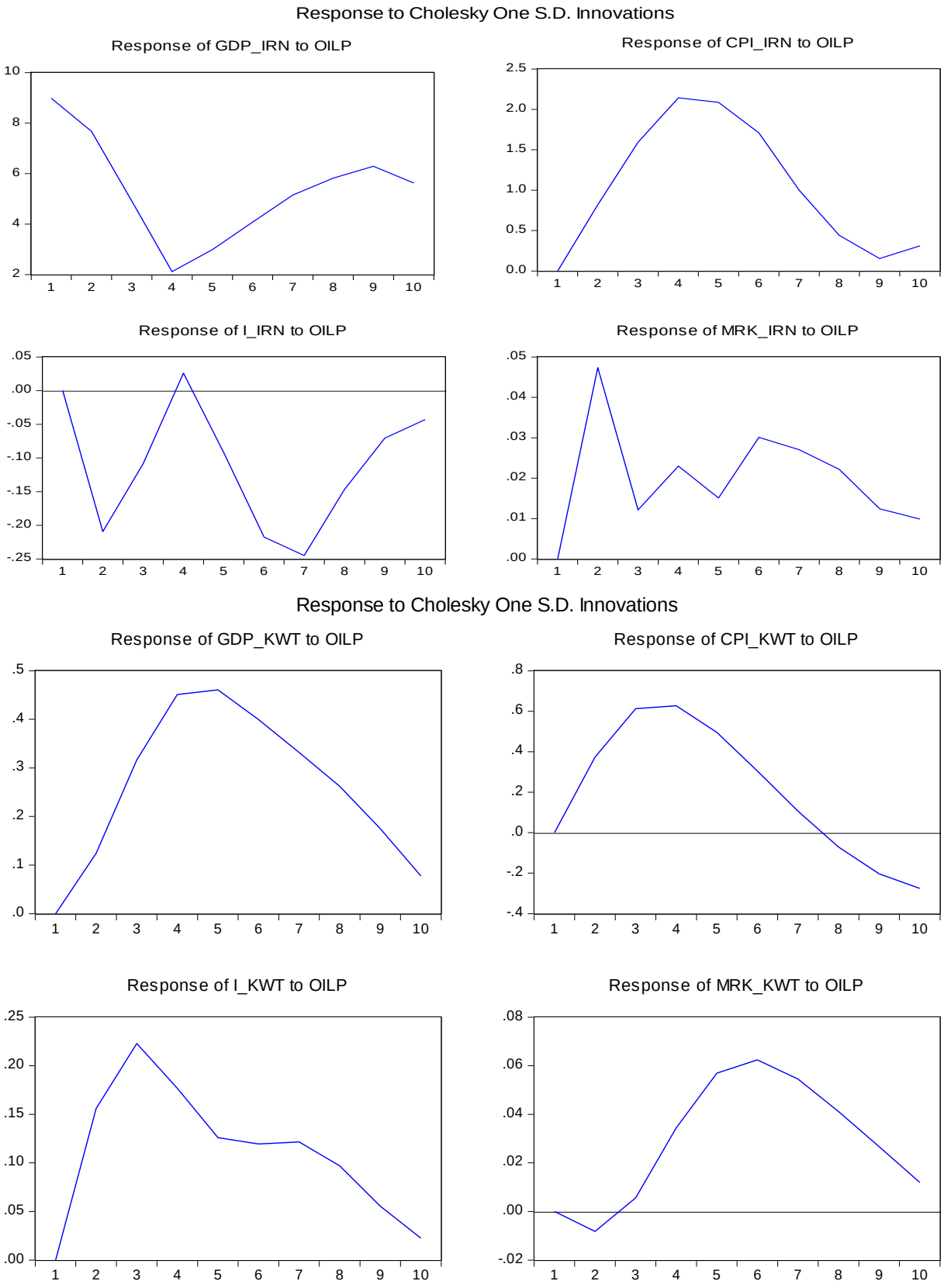
The next macroeconomic variable, CPI presents a positive response to oil change and provides the theoretical framework on why oil increase leads to a rise in inflation except for the Saudi Arabian case. This puzzling result for Saudi Arabia may be explained by its adoption of a beg exchange rate regime.

Indeed, Oil prices have a mixed effect on monetary policy. In the long run, it shows a negative sign for Iran, Algeria, Morocco, Tunisia and turkey, whilst it presents the same positive direction for Kuwait, Saudi Arabia and Egypt.

In fact, the rising oil prices lead to increased inflation and automatically to monetary policy response because of raising interest rate. On other hand, the negative sign is shown for both developed and less developed countries especially during financial crisis (transfer of monetary shocks) except in the case of Algeria where the impact of oil price had a negligible effect on money market rate.

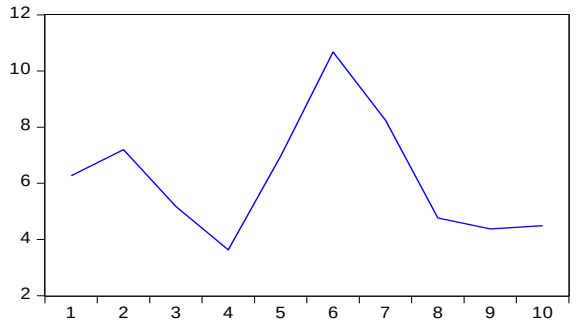
Finally, concern about crude oil future, especially as many new signs of disturbances resurfaced with China's economy slowdown, increased supply due mainly to US shale oil and gas substitution, market share preservation strategy of the Organization of the Petroleum Exporting Countries, world economic deceleration, harshless weather, some geopolitical factors and the persistence of lower oil price (prices dropped from about $100 in September 2014 to less than $35 a barrel in January 2016) has been associated with negative responses. Moreover, a one-standard deviation of oil price causes all explanatory variables to decrease about 0.02 to 2 a standard deviation over last period as interval of week or negative except GDP and CPI in non-oil countries.

Figure 1: Response functions to oil price changes

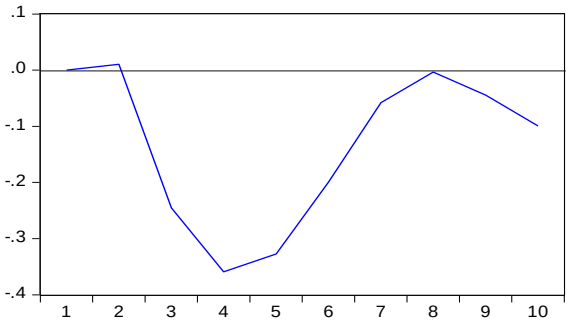


Response to Cholesky One S.D. Innovations

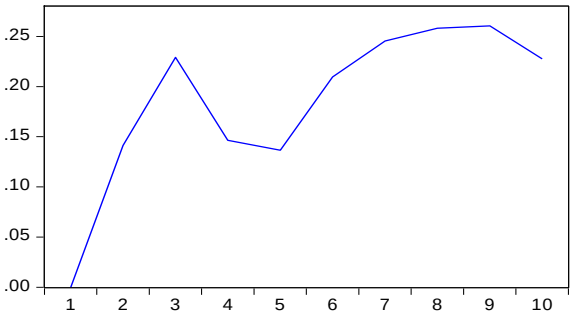
Response of GDP_SA to OILP



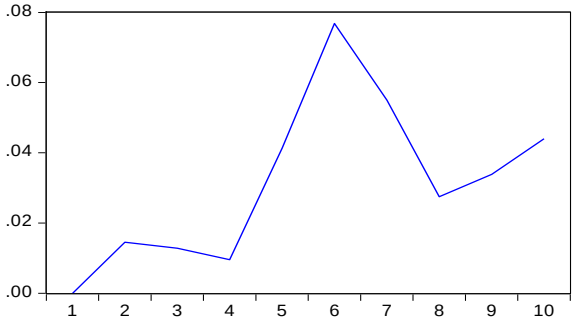
Response of CPI_SA to OILP



Response of I_SA to OILP

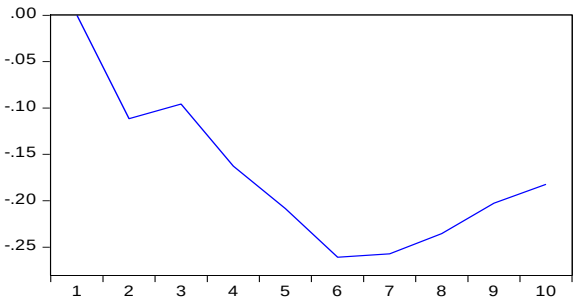


Response of MRK_SA to OILP

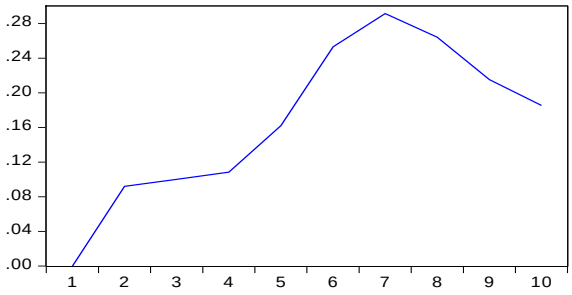


Response to Cholesky One S.D. Innovations

Response of GDP_TUN to OILP



Response of CPI_TUN to OILP



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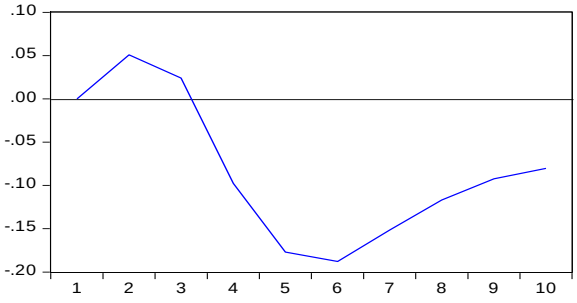
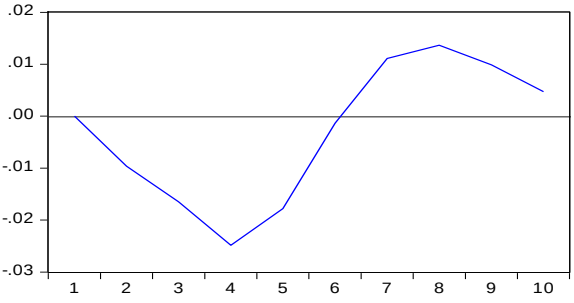
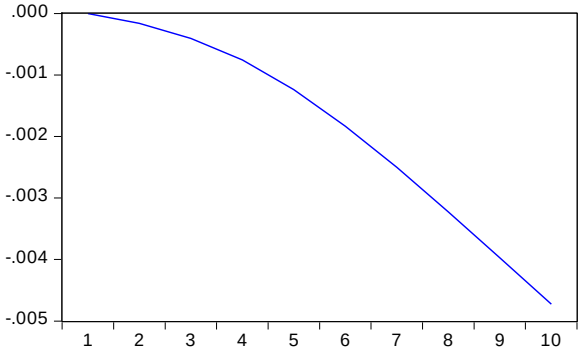


Response of MRK_TUN to OILP

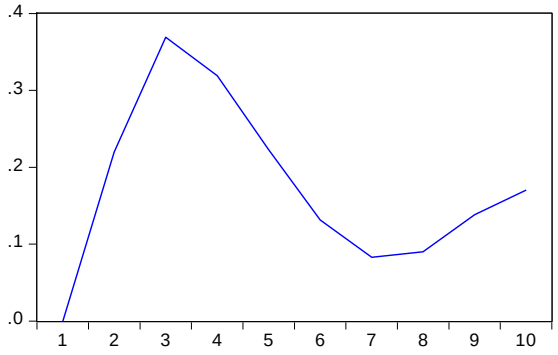


Response to Cholesky One S.D. Innovations

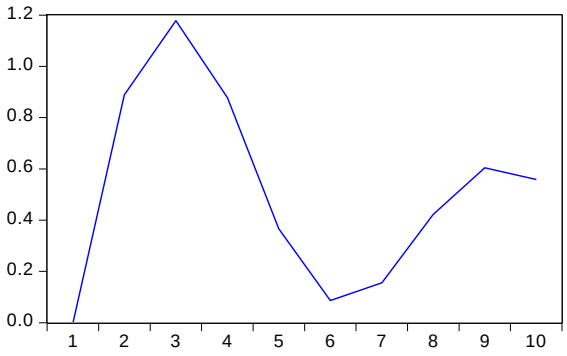
Response of GDP_EGP to OILP



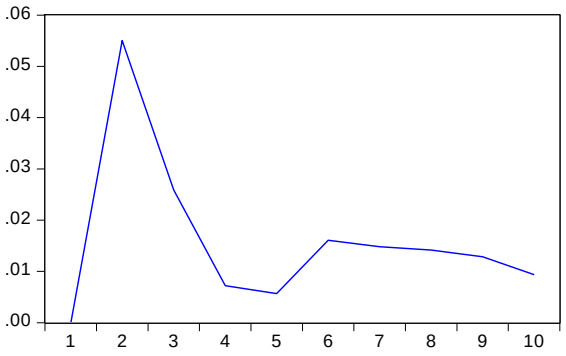
Response of CPI_EGP to OILP



Response of I_EGP to OILP

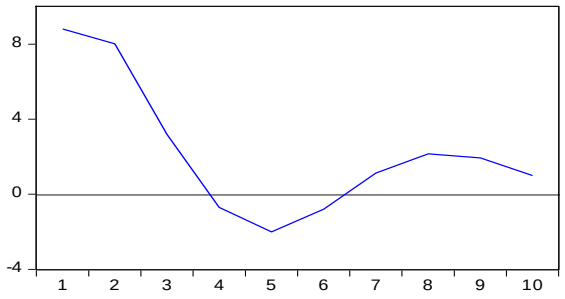


Response of MRK_EGP to OILP

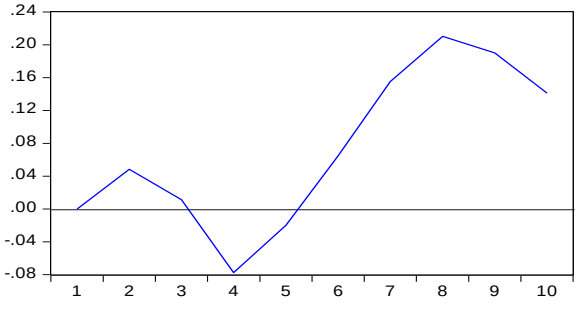


Response to Cholesky One S.D. Innovations

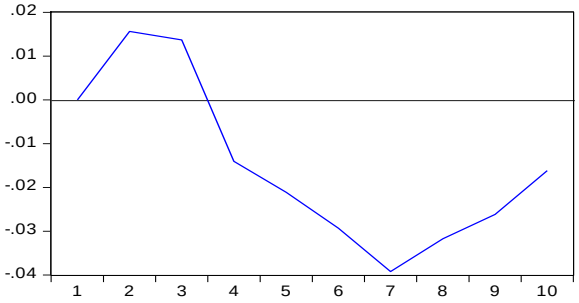
Response of GDP_ALG to OILP



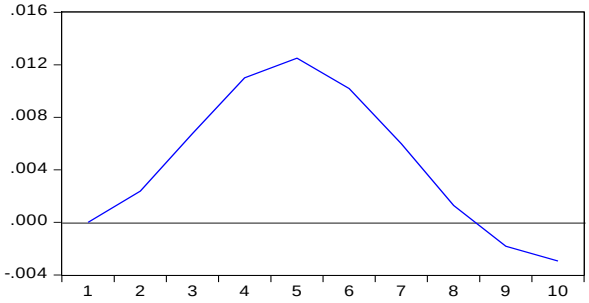
Response of CPI_ALG to OILP



Response of I_ALG to OILP

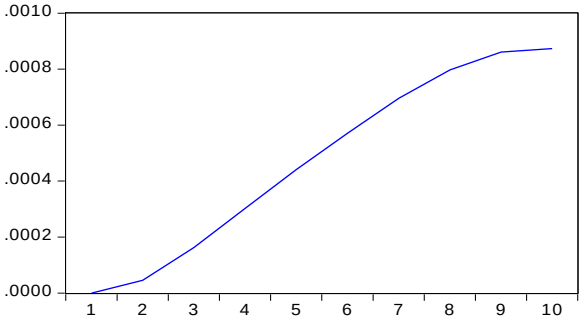


Response of MRK_ALG to OILP

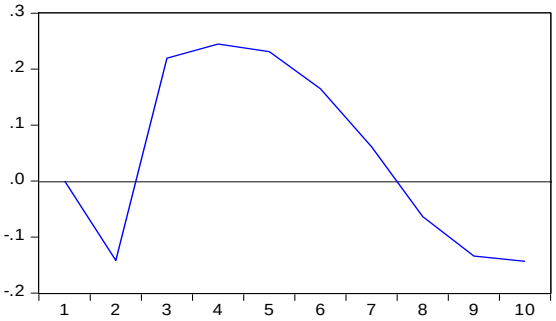


Response to Cholesky One S.D. Innovations

Response of GDP_MAR to OILP



Response of CPI_MAR to OILP



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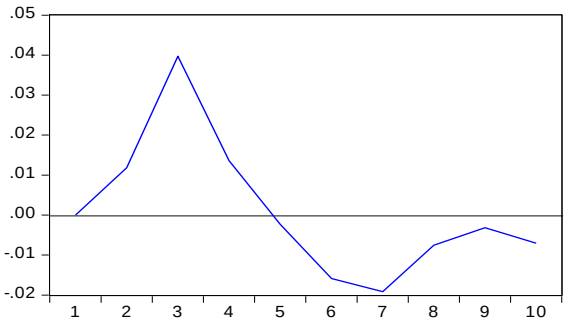
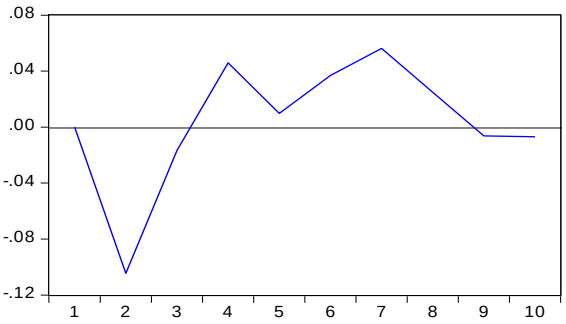
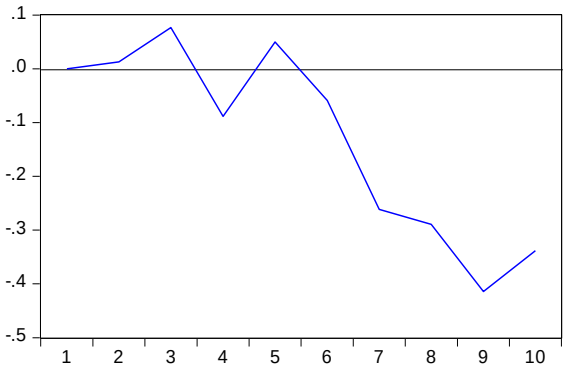


Response of MRK_MAR to OILP

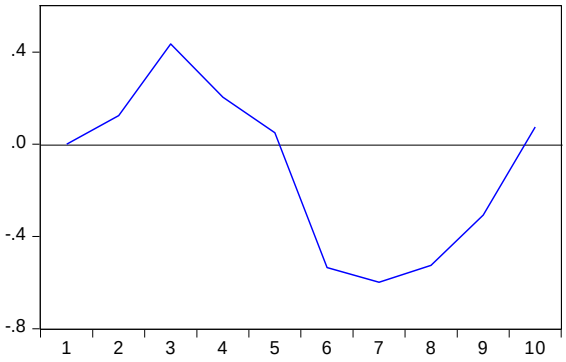


Response to Cholesky One S.D. Innovations

Response of GDP_TUR to OILP



Response of CPI_TUR to OILP



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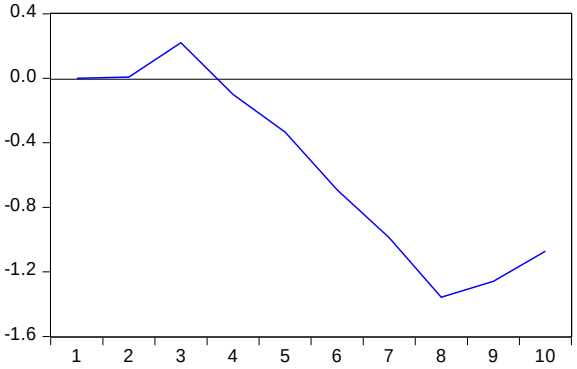
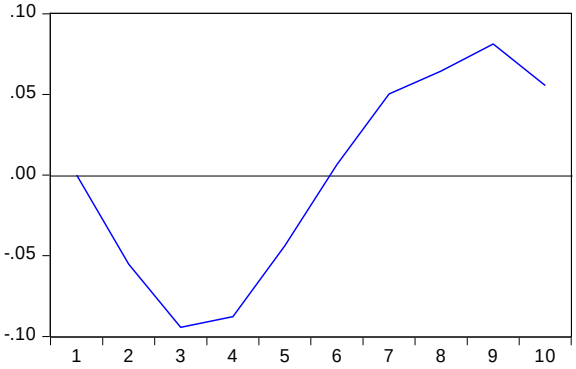


Response of MRK_TUR to OILP



E) Responses correlation

Table 5 presents response correlation between oil prices and macroeconomic fundamentals, for eight Middle East and North African countries. The correlation coefficients between oil and GDP appear positive and represent more than 45 % for Algeria, Iran, Kuwait and Saudi Arabic. On the other hand, Morocco and Tunisia presents negative correlation with oil, but less than turkey. GDP and oil correlation in Egypt explain more than 0.5. Furthermore, CPI and oil variables suggest positive correlation in all countries except Morocco and Tunisia. In addition, the interest rate is well correlated with oil prices in both importing and exporting oil countries except Turkey, Morocco, Algeria and Kuwait. Finally, market capitalization is not well correlated with oil sector in Kuwait as an oil exporting country.

Table 5: response correlation among MENA variables.

	GDP_IRN	CPI_IRN	I_IRN	MRK_IRN	OILP
OILP	0,47	0,28	-0,52	0,63	1
	GDP_KWT	CPI_KWT	I_KWT	MRK_KWT	OILP
OILP	0,51	0,08	-0,27	-0,03	1
	GDP_SA	CPI_SA	I_SA	MRK_SA	OILP
OILP	0,20	0,05	0,40	0,46	1
	GDP_TUN	CPI_TUN	I_TUN	MRK_TUN	OILP
OILP	-0,15	-0,08	-0,40	-0,11	1
	GDP_EGP	CPI_EGP	I_EGP	MRK_EGP	OILP
OILP	-0,56	0,47	0,42	0,40	1
	GDP_ALG	CPI_ALG	I_ALG	MRK_ALG	OILP
OILP	0,70	0,20	-0,15	0,32	1
	GDP_MAR	CPI_MAR	I_MAR	MRK_MAR	OILP
OILP	-0,09	-0,15	0,06	-0,39	1
	GDP_TUR	CPI_TUR	I_TUR	MRK_TUR	OILP
OILP	-0,17	0,31	-0,20	0,15	1

V. Conclusion

In the case of MENA region, the main conclusion is that risks faced by their economies can be explained by fundamentals that can be complemented by oil price decline during 2015 onwards. Our results show that there are long-run relationships between oil and consumer price

index and market stock. However, our estimation of a Panel- ARDL model calls for an economic diversification as prerequisites for oil exporters as far as an economic stability is concerned.

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