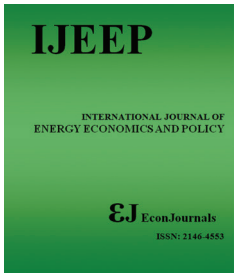

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The Dynamics of Financial and Macroeconomic Determinants in Natural Gas and Crude Oil Markets: Evidence from Organization for Economic Cooperation and Development/Gulf Cooperation Council/Organization of the Petroleum Exporting Countries Countries

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ABSTRACT

This study analyzes the countries in the Organization for Economic Cooperation and Development, Gulf Cooperation Council and Organization of the Petroleum Exporting Countries to test the casual relationship between world energy prices (Brent Oil, West Texas Intermediate, Dubai, Henry Hub (HH), Japan and Russia) and the liquidity level, stock market and industrial production. Augmented Dickey Fuller, Phillips-Perron and Kwiatkowski-Phillips-Schmidt-Shin unit root tests, Johansen cointegration and Granger causality analyses are implemented during the study. The empirical findings indicate that there are multidirectional relationships between the above-mentioned variables. These relationships can be explained by the factors that each country group owns within the framework of their energy sources, financial markets, economic conditions and geographical positions. The data accrued and analyzed in this study is presented as a contribution to guide policymakers, global investors and researchers in constituting an extensive country specific energy, macroeconomic and financial policies.

Keywords: Oil and Natural Gas Prices, Financial and Economic Developments, Cointegration, Causality
JEL Classifications: C32, Q43

1. INTRODUCTION

The volatility of oil prices has drawn attention to the importance of the effects of energy prices on macroeconomic activities. These effects have been considered using two different approaches. Many researchers have researched the effects of the oil prices shocks of the 1970s and 1980s on macroeconomic variables such as gross domestic product (GDP), inflation, interest rates, industrial production, productivity or liquidity. Numerous other researchers have investigated channels through which energy prices can affect macroeconomic variables (Burbidge and Harrison, 1984; De Pratto et al., 2009; Ferderer, 1997; Hamilton, 2008; Kilian, 2008).

Theoretically, the increase in oil prices can have various effects four of which are given below. First, there is the supply-side effect in which in the case of increased energy prices, the input cost of the company increases while productivity and accordingly profitability decrease this in turn might force organizations to reduce new capital investments or use energy-efficient capital. Second is the demand-side effect. This refers to the income transfer from the oil importing countries to the oil exporting countries, which damages the aggregate demand in oil importing countries since the decrease in purchasing power of oil importing countries is higher than the increase in purchasing power of oil exporting countries. Third, the real-balance effect which is namely that increased energy prices have both direct and indirect effects on inflation. Initially, the increased energy prices will slowdown economic activities and cause inflation. Then, due to the higher prices of oil products (such as gasoline and heating-oil) the price of alternative energy sources will also increase. Thus, an indirect

effect occurs due to the behavioral responses of companies and their workers, this is also called a second round effect. In this case firms can reflect the increased input costs in the prices of non-energy products. Furthermore, with the increased cost of living, workers can demand higher wages. A corruption in price-wage loop can damage the wealth of households, by reducing consumption and output. The fourth way that higher energy prices affect the economy is through the monetary policy channel. Increased energy prices decrease consumption, investment and stock prices, increase unemployment and construct new production methods which are less dependent on oil inputs (Cologni and Manera, 2008; Kumar, 2005).

It has been observed that the increases in oil prices cause recession especially in industrialized countries, slowdown the productivity and growth, besides cause inflation (Barsky and Kilian, 2004; Hamilton, 1983; Mork and Hall, 1979). On the other hand, the effects of oil price changes differ depending on countries level of development, stage of economy and its organizational structure. For example; in oil-importing countries the increase in oil prices raises inflation and input costs, which effect manufacturing and transportation industries, besides leads to a decrease in demand of non-oil products; reflecting the lower purchasing power. Furthermore, a slowdown in economic growth leads to a reduction in labor demand; in other words employment level. On the fiscal side, government expenditures rise on the one hand and tax revenues drop on the other, leading to an increase in the budget deficit and interest rates (Yıldız and Ulusoy, 2015).

These macroeconomic issues and their important impact on the financial system have also been discussed in the literature over many years (Lucas, 1998; Patrick, 1966; Robinson, 1952; Schumpeter, 1911). In particular, after 1980; the outcomes of financial liberalization regarding the financial system began to achieve prominence. The financial system plays a crucial role in encouraging the development of economic activities since the system includes financial markets, insurance companies, security markets, banks, other financial intermediaries and the supervision of these intermediaries. Knowledge acquisition, the costs of the execution of contracts and transactions have led need for financial contracts, markets and intermediaries. The differential costs due to administrative, legal and tax differences have led to the creation of district financial contracts, markets and intermediaries between countries (Levine, 2004). There are several views about the direction of the causal relationship between financial development and economic growth. A common view is that financial liberalization increases the shared risk; which in turn lowers the cost of equity while raising the borrowed money, capital accumulation, investments besides the demand for energy, and ultimately improves economic growth (Greenwood and Jovanovic, 1989; Sadorsky, 2010). On the other hand, others believe that financial liberalization may have negative effects on the countries that do not have strong legal institutions. According to those supporting this view, the high level of liberalized financial markets causes the total real credits of domestic firms to decrease, which in turn results in a slowdown of investments and economic growth (Samargandi et al., 2014).

The importance of the energy sources and their effects on the financial and macroeconomic factors are the motivation for this research. This study is the one of the first that focuses on energy prices (oil and natural gas), economic performance (economic growth, industrial production and liquidity) and financial development (stock market). For that purpose, it investigates the relationship between energy prices, the stock market index and the economic performance in the Organization for Economic Cooperation and Development (OECD), Gulf Cooperation Council (GCC) and Organization of the Petroleum Exporting Countries (OPEC).

The remaining sections of this study are organized as follows: Section 2 discusses the empirical literature concerning energy prices and liquidity, energy markets and financial/economic variables, and financial development and economic growth; Section 3 introduces the data set, and econometric models; while Section 4 provides the empirical results and finally Section 5 discusses conclusions.

2. A BRIEF LITERATURE REVIEW

There is extensive literature concerning the relation between energy prices and the financial/economic variables, liquidity, and between financial development and economic growth. Different studies have been undertaken in various countries, over a range of time periods, and using selected proxy variables using a variety of econometric methodologies. The summary of these selected studies are presented in Tables 1-3.

3. DATA AND METHODOLOGY

This section introduces the countries and the variables used in the analysis of the relationship among energy prices, the stock market index and the economic performance of 34 OECD (Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom (UK) and the United States (US), 6 GCC (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United ab Emirates (UAE)) and 12 OPEC (Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, UAE and Venezuela) countries.

The monthly data for oil prices (Brent Oil, West Texas Intermediate [WTI] and Dubai) (US$ per barrel) and natural gas prices (Henry Hub, Japan and Russia) (US$ per million metric British thermal unit) were obtained from the International Monetary Fund (IMF) (http://imf.org). The monthly M2 data; used as a measure of liquidity, and daily stock market prices were obtained from Trading Economics database (http://tradingeconomics.com) for 34 OECD countries, 6 GCC countries and 13 OPEC countries. Daily stock market prices were converted into monthly data by taking the average price. For all countries, the common period used for M2 was 2000-2014, except for: Slovakia (2006-2014), Slovenia (2005-2014), Turkey (2006-2014), Qatar, (2007-2014),

Table 1: Summary of empirical studies on the relationship between energy markets and financial/economic variables

Authors	Period	Country	Methodology	Result
Acaravci et al. (2012)	1990-2008	15 European countries	Granger causality	There are long-term relationships between natural gas prices, industrial production and stock prices for Austria, Denmark, Finland, Germany and Luxembourg; while there is no relationship in the other ten of the EU-15 countries
Ahmed et al. (2012)	1980-2010	USA	CGARCH, VAR	A one standard deviation shock to oil prices causes an increase in consumer prices index and commodity prices, while there is no evidence of any significant effect on industrial production
Arshad and Bashir (2015)	2009-2013	Pakistan	Multi-factor model	Oil and natural gas prices, exchange rates and interest rates have negative impact on stock returns
Basher and Sadorsky (2006)	1992-2005	21 emerging countries	Multi-factor model	Oil price shocks significantly affect stock market returns
Burbidge and Harrison (1984)	1961-1982	Canada, Germany, Japan, UK and USA	VAR	There is a uni-directional causality from oil price shocks to macroeconomic variables (CPI, industrial production, interest rates, current account and hourly earnings in manufacturing sector)
Cuñado and Gracia (2003)	1960-1999	European countries	Cointegration, Granger	There is a uni-directional causality running from oil price changes to industrial production growth rates. Moreover, the increases in oil prices affect industrial production growth rates negatively; while the opposite result is not valid for the decreased oil prices
Ewing and Thompson (2007)	1982-2005	USA	Band pass filter	While oil prices have a strong contemporaneously correlation with consumer price index, they have a negative correlation with unemployment cycles
Guesmi and Fattoum (2014)	1990-2012	10 OECD	DCC	The author indicates that aggregate demand side oil price shocks such as global financial crisis or Chinese economic growth have greater impact on stock markets compared to supply-side shocks such as OPEC's oil embargo
Ferderer (1997)	1970-1990	USA	VAR	The deterioration in oil markets leads to sectorial shocks and uncertainty in the USA economy
Iscan (2010)	2001-2009	Turkey	VAR	There is no causality between oil prices and stock market returns
Kumar (2005)	1975-2004	India	VAR	Oil prices shocks affect industrial production negatively
Masih et al. (2011)	1985-2005	South Korea	VECM	Oil price movements significantly affect stock markets
Miller and Ratti (2009)	1971-2008	6 OECD countries	VECM	There is a negative correlation between oil prices and stock market returns in the long-term
Ng (2012)	1983-2009	Singapore	VECM	While a 1% increase in oil prices causes GDP to decrease by 0.45% in the long-term, in the short term it affects investments, aggregate output and inflation negatively
Papapetrou (2001)	1989-1999	Greece	VAR	Shocks in oil prices have an important impact on economic activity and employment furthermore; oil prices are the significant factors in the explanation of stock price movements
Park and Ratti (2008)	1986-2005	USA, 13 European countries	VAR	Oil price movements significantly affect stock markets
Sadorsky (1999)	1947-1996	USA	Multi-factor model	Volatility of oil prices significantly affects stock market returns
Tang et al. (2010)	1998-2008	China	SVAR	While the rise in oil prices affects output and investments negatively, it has a positive effect on inflation and interest rate

(Contd...)

Table 1: (*Continued*)

Authors	Period	Country	Methodology	Result
Wang et al. (2013)	1999-2011	Oil-improting and oil-exporting countries	SVAR	The uncertainty in oil supply negatively affects the stock market returns of both oil-importing and oil-exporting countries however, the effect of demand uncertainty is much greater on oil-exporting countries when compared to the oil-importing countries
Yıldız and Ulusoy (2015)	2003-2013	Turkey	VAR	There is a significant relationship between oil prices and both the gross fixed capital formation and the interest rate
Yilmaz et al. (2013)	1995-2009	Turkey	ARDL, causality	There is a uni-directional causality running from stock prices to real GDP, from stock prices to natural gas prices and from GDP to real exchange rates

ARDL: Autoregressive distributed lag, CGARCH: Component generalized autoregressive conditional heteroscedasticity, DCC: Dynamic conditional correlations, SVAR: Structural vector autoregressive model, VAR: Vector autoregressive model, VECM: Vector error correction model

Table 2: Summary of empirical studies on the relationship between energy markets and liquidity

Authors	Period	Country	Methodology	Result
Belke et al. (2010)	1984-2006	USA, the euro area, Japan, UK, Canada, South Korea, Australia, Switzerland, Sweden, Norway and Denmark	VAR	Global excess liquidity is an important determinant of asset and goods prices
Kang et al. (2016)	1996-2014	China, USA	SVAR	The increase of China's liquidity increases the global oil and commodity prices and the USA inflation
Ratti and Vespignani (2013a)	1997-2011	BRIC, G3	SVAR	The increase in oil prices raises the liquidity of Brazil and Russia while reducing the liquidity of China and India due to the different positions between countries such as commodity importers or exporters
Ratti and Vespignani (2013b)	1996-2011	China, G3	SVAR	The cumulative impact of China's M2 variable on crude oil prices is statistically significant and higher when compared to G3 countries
Ratti and Vespignani (2015)	1999-2012	BRIC, G3	SFAVEC	Positive shocks to BRIC M2 lead to increases in global industrial production
Wu and Ni (2011)	1995-2005	USA	VAR	There is a bi-directional causality between oil price changes and consumer price changes, between M2 changes and interest rate changes and a uni-directional causality running from inflation to interest rate changes

SFAVEC: Structural factor-augmented error correction, SVAR: Structural vector autoregressive model

UAE (2002-2013), Angola (2010-2014), Ecuador (2007-2014) and Iraq (2004-2014). Australia, Algeria, Iran, and Libya were not selected due to the lack of available data. For all countries the common period used for stock index was also 2000-2014, except for: New Zealand (2001-2014), Slovenia (2004-2014), Bahrain (2003-2014), Kuwait (2011-2014), Qatar (2011-2014), UAE (2002-2013), Ecuador (2005-2014) and Nigeria (2010-2014). Sweden, Algeria, Angola, Iran, Iraq and Libya were not selected due to the lack of available data.

The monthly Industrial Production (IP) data (measured at constant 2005 USA$, seasonally adjusted) are sourced from WDI (2015) for 34 OECD countries, 6 GCC countries and 13 OPEC countries. For all countries, the period used was 1998-2014, except for: Iceland (1998-2012), Turkey (2005-2014) and Venezuela (1998-2012). Bahrain, Angola and Nigeria were not selected due to the lack of available data. EViews version 7.0 econometric software was employed for the data analysis.

In the first step, all the data set were transformed into natural logarithms. Next, Augmented Dickey Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests were carried out to examine stationary. Although there are different unit root tests that investigate the stability of the series, the one which is most frequently used is the ADF test. The ADF test indicates that the first difference of the variable is regressed onto its own delayed value and onto the delayed values of its first differences in order to test whether the coefficient of ADF is zero (Dickey and Fuller, 1979). Another unit root test made for the determination of stability is PP test. The PP model introduces

Table 3: Summary of empirical studies on the relationship between financial development and economic growth

Authors	Period	Country	Methodology	Result	Supported hypothesis
Abu-Bader and Abu-Qarn (2006)	1960-2004	5 MENA countries	Granger	FD≠GDP	Neutrality
Al-Malkawi et al. (2012)	1974-2008	UAE	ARDL method	FD↔GDP	Feedback
Al-Yousif (2002)	1970-1999	30 developing countries	Granger	FD↔GDP	Feedback
Ang and McKibbin (2007)	1960-2001	Malesia	Granger	GDP→FD	Demand-following
Bangake and Eggoh (2011)	1960-2004	71 developed and developing countries	Granger	FD↔GDP in long-term FD≠GDP for low and middle income countries in short-term GDP→FD for high income countries in short-term	Feedback in long-term Neutrality and Feedback in short-term
Calderón and Liu (2003)	1960-1994	109 developing and industrialized countries	Granger	FD↔GDP	Feedback
Caporale et al. (2005)	1979-1998	Chile, Malaysia, Korea and the Philippines	VAR, TY	FD→GDP	Supply-leading
Choe and Moosa (1999)	1970-1992	Korea	Granger	FD→GDP	Supply-leading
Christopoulos and Tsionas (2004)	1970-2000	10 developing countries	Panel Granger	FD→GDP	Supply-leading
Demetriades and Hussein (1996)	1960-1990	16 countries	Granger	GDP→FD	Demand-following
Hayo (1999)	1960-1990	14 European countries, Canada, USA and Japan	Granger	FD≠GDP	Neutrality
Hsueh et al. (2013)	1980-2007	10 Asian countries	Panel Granger	FD→GDP	Supply-leading
Jung (1986)	1950-1981	37 developing and 19 developed countries	Granger	GDP→FD in developed countries FD→GDP in developing countries	Demand-following Supply-leading
King and Levine (1993)	1960-1989	80 countries	Least squares technique	FD↔GDP, PCA, ECD	Feedback
Luintel and Khan (1999)	36-41 years	10 developing countries	Granger	FD↔GDP	Feedback
Menyah et al. (2014)	1965-2008	21 African countries	Granger	FD≠GDP	Neutrality
Pradhan et al. (2015)	1988-2012	34 ECD countries	Granger	FD→GDP in long-term FD↔GDP in short-term	Supply-leading in long-term Feedback in short-term
Sinha and Macri (2001)	1950-1997	8 Asian countries	Granger	GDP→FD in Pakistan and the Philippines FD→GDP in Japan, Thailand and Korea FD↔GDP in India, Malesia	Demand-following Supply-leading Feedback
Thangavelu and Jiunn (2004)	1960-1999	Australia	VAR, Granger	FD→GDP	Supply-leading
Uddin et al. (2003)	1971-2011	Kenya	ARDL	FD→GDP	Supply-leading
Xu (2000)	1960-1993	41 countries	VAR	FD→GDP	Supply-leading
Zhang et al. (2012)	2001-2006	China	GMM	FD↔GDP	Feedback

FD→GDP refers to the uni-directional causality running from financial development to economic growth. GDP→FD refers to the uni-directional causality running from economic growth to financial development. FD↔GDP refers to the bidirectional causality between financial development and economic growth. FD≠GDP refers no causality between financial development and economic growth. FD: Financial development, GDP: Economic growth, ARDL: Autoregressive distributed lag, GMM: Generalized method of moments, TY: Toda-Yamamoto, VAR: Vector autoregressive model

many weakly dependent and heterogeneously distributed time series and ignores any serial correlation. One of the important advantages of using the PP unit root test is that it is more robust to heteroscedasticity in the error term and non-parametric compared to ADF. The excess sensitivity of the results obtained from the ADF and PP tests to determined lag length has been criticized from time to time. In this context, it is observed that KPSS (1992) stationarity test, which is not sensitive to lag length, has been preferred in recent studies. The KPSS test differs from the other unit root tests since it assumes that series is stationary under the null hypothesis

Table 4: OECD Granger causality test results

Country	BR→M2	M2→BR	WTI→M2	M2→WTI	DUB→M2	M2→DUB	HH→M2	M2→HH	LNG→M2
Australia									
χ^2	-	-	-	-	-	-	-	-	-
P-value	-	-	-	-	-	-	-	-	-
Austria									
χ^2	16.440	4.911	17.100	5.938	17.128	4.956	0.744	0.265	7.588
P-value	0.002***	0.296	0.001***	0.203	0.001***	0.291	0.388	0.606	0.107
Belgium									
χ^2	0.332	7.274	1.843	3.009	0.053	8.474	0.520	1.100	1.306
P-value	0.846	0.026**	0.605	0.390	0.973	0.014**	0.470	0.294	0.727
Canada									
χ^2	11.705	2.153	11.746	1.892	12.444	2.138	4.078	1.114	2.008
P-value	0.008***	0.541	0.008***	0.594	0.006***	0.544	0.130	0.572	0.570
Chile									
χ^2	2.782	0.593	1.834	0.661	1.719	1.434	3.822	0.651	1.201
P-value	0.248	0.473	0.399	0.718	0.423	0.488	0.147	0.721	0.548
Czech									
χ^2	12.181	3.557	14.166	5.219	11.501	3.142	16.043	3.106	8.859
P-value	0.016**	0.469	0.006***	0.265	0.021**	0.534	0.003***	0.540	0.064*
Denmark									
χ^2	24.826	14.633	19.310	13.661	26.091	11.252	48.766	40.188	22.631
P-value	0.036**	0.403	0.153	0.475	0.025**	0.666	0.061*	0.251	0.066*
Estonia									
χ^2	2.055	16.967	2.392	18.780	0.175	1.916	0.237	0.204	0.955
P-value	0.725	0.002***	0.663	0.000***	0.915	0.383	0.626	0.651	0.812
Finland									
χ^2	6.305	4.371	6.753	4.945	6.325	3.677	5.781	5.761	2.939
P-value	0.042**	0.112	0.080*	0.073*	0.042**	0.159	0.216	0.217	0.401
France									
χ^2	6.941	10.488	3.298	10.772	4.903	8.533	2.628	3.003	5.839
P-value	0.139	0.033**	0.509	0.029**	0.179	0.036**	0.452	0.391	0.119
Germany									
χ^2	2.785	2.507	3.857	3.084	2.423	2.305	0.100	0.000	1.174
P-value	0.248	0.285	0.425	0.543	0.297	0.315	0.751	0.981	0.882
Greece									
χ^2	4.921	8.648	6.250	9.723	3.678	10.935	13.345	15.776	3.326
P-value	0.669	0.278	0.510	0.204	0.815	0.141	0.064*	0.027**	0.853
Hungary									
χ^2	4.973	1.349	5.122	0.399	3.662	1.675	4.883	1.054	0.358
P-value	0.083*	0.509	0.163	0.940	0.1601	0.432	0.087*	0.590	0.835
Iceland									
χ^2	8.601	3.347	6.917	1.963	7.737	2.556	6.133	4.914	1.219
P-value	0.013**	0.187	0.074*	0.580	0.020**	0.278	0.105	0.178	0.748
Ireland									
χ^2	3.756	1.323	5.251	1.776	4.257	4.720	1.415	7.232	4.608
P-value	0.152	0.515	0.262	0.7476	0.372	0.317	0.492	0.026**	0.329
Israel									
χ^2	8.464	1.954	9.392	2.452	8.623*	1.909	3.730	3.221	4.549
P-value	0.076*	0.744	0.052*	0.653	0.071*	0.752	0.443	0.521	0.336

(Contd...)

Table 4: (*Continued*)

Country	BR→M2	M2→BR	WTI→M2	M2→WTI	DUB→M2	M2→DUB	HH→M2	M2→HH	LNG→M2
Italy									
χ^2	7.319	9.053	5.516	10.072	5.150	9.514	11.685	3.768	4.951
P-value	0.396	0.248	0.640	0.184	0.161	0.023**	0.111	0.806	0.175
Japan									
χ^2	3.607	4.640	4.153	4.563	3.121	4.736	3.062	8.862	9.573
P-value	0.307	0.200	0.245	0.206	0.373	0.192	0.690	0.114	0.088*
Korea									
χ^2	4.874	2.425	5.900	5.119	5.278	2.855	1.962	1.954	2.761
P-value	0.087*	0.297	0.116	0.163	0.071*	0.239	0.161	0.162	0.429
Luxembourg									
χ^2	11.188	0.465	0.838	0.675	10.918	0.339	0.699	5.495	6.518
P-value	0.003***	0.792	0.657	0.713	0.004***	0.843	0.704	0.064*	0.038**
Mexico									
χ^2	44.283	4.198	35.821	7.091	43.987	3.081	0.097	1.897	21.383
P-value	0.000***	0.240	0.000***	0.131	0.000***	0.379	0.755	0.168	0.000***
Netherlands									
χ^2	2.177	1.397	2.250	5.609	2.153	1.145	3.195	0.755	2.043
P-value	0.336	0.497	0.522	0.132	0.340	0.564	0.073*	0.384	0.360
NewZealand									
χ^2	16.889	8.591	13.026	8.232	13.971	8.221	10.282	15.256	12.669
P-value	0.002***	0.072*	0.011**	0.083*	0.007***	0.083*	0.113	0.018**	0.005***
Norway									
χ^2	6.711	13.519	5.001	9.665	7.865	14.889	8.594	9.089	6.189
P-value	0.568	0.095*	0.757	0.289	0.446	0.061*	0.377	0.334	0.626
Poland									
χ^2	15.166	4.341	19.052	5.568	16.607	3.231	8.920	0.011**	2.658
P-value	0.004***	0.361	0.000***	0.233	0.002***	0.519	2.306	0.315	0.447
Portugal									
χ^2	3.238	2.626	3.497	3.433	6.493	1.906	0.147	0.117	1.206
P-value	0.198	0.268	0.174	0.179	0.0358**	0385	0.700	0.732	0.751
Slovakia									
χ^2	26.811	5.238	21.008	3.155	28.918	5.974	0.004	1.652	30.750
P-value	0.000***	0.263	0.000***	0.368	0.000***	0.201	0.945	0.198	0.000***
Slovenia									
χ^2	2.235	2.195	1.348	3.661	3.490	2.628	1.547	0.840	2.868
P-value	0.327	0.333	0.717	0.300	0.174	0.268	0.416	0.656	0.238
Spain									
χ^2	9.773	4.057	14.075	4.793	10.325	2.802	9.377	17.533	2.754
P-value	0.201	0.773	0.049**	0.685	0.170	0.902	0.226	0.014**	0.906
Sweden									
χ^2	20.100	15.278	19.131	11.266	22.489	16.955	0.204	0.093	12.906
P-value	0.002***	0.018**	0.003***	0.080*	0.001***	0.009***	0.902	0.954	0.011**
Switzerland									
χ^2	33.714	10.002	15.751	13.599	45.934	8.634	1.331	1.725	1.311
P-value	0.000***	0.188	0.003***	0.008***	0.000***	0.280	0.513	0.422	0.519
Turkey									
χ^2	1.048	0.690	3.802	1.004	4.186	7.073	0.729	1.890	1.214
P-value	0.592	0.708	0.283	0.800	0.242	0.069	0.393	0.169	0.749

(Contd...)

Table 4: (*Continued*)

Country	BR→M2	M2→BR	WTI→M2	M2→WTI	DUB→M2	M2→DUB	HH→M2	M2→HH	LNG→M2
UK									
χ^2	2.565	21.599	0.627	22.682	1.873	21.299	0.945	15.094	3.990
P-value	0.633	0.000***	0.730	0.000	0.759	0.000***	0.917	0.004***	0.407
US									
χ^2	23.620	2.582	20.009	7.707	26.091	2.887	1.883	12.666	15.908
P-value	0.000***	0.764	0.002***	0.260	0.000***	0.717	0.930	0.048**	0.000***

Country	M2→LNG	RUS→M2	M2→RUS	BR→SI	SI→BR	WTI→SI	SI→WTI	DUB→SI	SI→DUB
Australia									
χ^2	-	-	-	0.144	5.897	0.673	5.349	0.098	6.069
P-value	-	-	-	0.930	0.052*	0.714	0.068*	0.981	0.048**
Austria									
χ^2	8.986	4.784	9.960	1.521	24.803	1.694	17.964	1.518	19.977
P-value	0.061*	0.686	0.190	0.822	0.000***	0.428	0.000***	0.468	0.000
Belgium									
χ^2	9.016	2.200	1.032	0.293	16.458	7.950	18.578	0.357	13.650
P-value	0.029**	0.698	0.904	0.863	0.000***	0.337	0.009***	0.836	0.001***
Canada									
χ^2	6.462	1.669	3.293	10.815	47.340	9.716	38.323	12.971	59.603
P-value	0.091*	0.796	0.510	0.146	0.000***	0.205	0.000***	0.112	0.000***
Chile									
χ^2	1.707	15.511	17.187	1.125	0.261	0.764	0.144	1.358	0.212
P-value	0.425	0.030**	0.016**	0.569	0.877	0.682	0.930	0.506	0.899
Czech									
χ^2	5.8301	0.788	4.707	0.880	11.556	11.659	12.437	5.247	15.492
P-value	0.212	0.940	0.318	0.643	0.003***	0.112	0.087*	0.262	0.003***
Denmark									
χ^2	5.404	3.134	6.662	0.326	10.687	11.517	17.843	12.059	17.600
P-value	0.979	0.679	0.247	0.849	0.004***	0.117	0.012**	0.098*	0.013**
Estonia									
χ^2	2.087	4.1801	4.653	0.825	9.524	3.694	13.604	0.771	8.547
P-value	0.554	0.382	0.324	0.661	0.008***	0.449	0.008	0.680	0.013**
Finland									
χ^2	10.869	2.924	1.981	14.098	16.807	14.848	16.764	18.816	20.303
P-value	0.012**	0.570	0.739	0.049**	0.018**	0.0385**	0.019**	0.008***	0.004***
France									
χ^2	4.461	5.506	10.527	8.771	18.340	12.583	15.137	9.043	16.825
P-value	0.215	0.239	0.032**	0.186	0.005***	0.050*	0.019**	0.249	0.018**
Germany									
χ^2	1.075	12.922	1.056	4.444	9.533	14.942	14.763	4.573	9.258
P-value	0.898	0.011**	0.901	0.108	0.008***	0.036**	0.039**	0.101	0.009***
Greece									
χ^2	8.765	2.335	11.021	2.551	9.797	2.058	5.031	2.586	10.473
P-value	0.269	0.938	0.137	0.279	0.007***	0.357	0.080	0.274	0.005***
Hungary									
χ^2	3.842	5.873	5.465	3.886	5.750	14.125	6.503	4.862	16.865
P-value	0.146	0.208	0.242	0.273	0.124	0.014**	0.260	0.301	0.002***

(Contd...)

Table 4: (*Continued*)

Country	M2→LNG	RUS→M2	M2→RUS	BR→SI	SI→BR	WTI→SI	SI→WTI	DUB→SI	SI→DUB
Iceland									
χ^2	13.260	1.087	3.305	9.793	14.192	12.413	16.383	12.004	11.275
P-value	0.004***	0.896	0.508	0.044**	0.006***	0.087*	0.021**	0.017**	0.023**
Ireland									
χ^2	5.157	3.356	3.417	11.301	19.510	14.435	16.273	12.649	15.804
P-value	0.271	0.500	0.490	0.126	0.006***	0.044**	0.022**	0.081*	0.027**
Israel									
χ^2	6.899	10.033	1.320	0.145	13.089	17.218	19.204	19.774	20.005
P-value	0.141	0.039**	0.857	0.929	0.001***	0.016**	0.007***	0.006***	0.005***
Italy									
χ^2	6.175	8.907	9.662	2.093	7.978	8.762	13.445	5.593	10.507
P-value	0.103	0.259	0.208	0.351	0.018**	0.270	0.062**	0.231	0.032**
Japan									
χ^2	14.185	6.033	18.358	0.645	5.954	0.571	2.706	19.774	20.005
P-value	0.014**	0.535	0.010*	0.724	0.050	0.751	0.258	0.006***	0.005***
Korea									
χ^2	9.185	9.012	20.815	3.315	4.285	3.154	0.888	5.593	10.507
P-value	0.026**	0.251	0.004***	0.345	0.232	0.368	0.828	0.231	0.032**
Luxembourg									
χ^2	2.296	5.644	5.079	9.998	34.389	8.859	29.970	11.081	37.284
P-value	0.317	0.342	0.406	0.124	0.000***	0.181	0.000***	0.085*	0.000***
Mexico									
χ^2	1.756	7.038	23.343	0.252	1.059	0.247	0.628	0.134	1.508
p-value	0.624	0.217	0.000***	0.881	0.588	0.883	0.730	0.935	0.470
Netherlands									
χ^2	0.673	3.660	1.330	8.931	27.867	8.061	22.100	7.086	23.821
P-value	0.714	0.453	0.856	0.177	0.000***	0.327	0.002***	0.419	0.001***
NewZealand									
χ^2	8.103	6.239	6.571	0.927	4.575	2.185	3.410	0.737	3.967
P-value	0.043**	0.182	0.160	0.628	0.101	0.534	0.332	0.691	0.137
Norway									
χ^2	12.065	3.601	21.387	10.476	33.112	11.038	31.146	11.195	28,533
P-value	0.148	0.891	0.006***	0.106	0.000***	0.087*	0.000***	0.082*	0.000***
Poland									
χ^2	2.766	6.846	2.175	0.108	9.480	1.127	0.222	0.013	9.401
P-value	0.429	0.144	0.703	0.947	0.008***	0.569	0.894	0.993	0.009***
Portugal									
χ^2	5.700	4.585	8.772	0.936	8.351	9.084	20.752	1.091	9.596
P-value	0.127	0.468	0.118	0.626	0.015**	0.246	0.004***	0.579	0.008***
Slovakia									
χ^2	2.172	19.961	29.725	3.719	1.680	6.688	2.128	4.036	1.958
P-value	0.537	0.005***	0.000***	0.155	0.431	0.035**	0.345	0.132	0.375
Slovenia									
χ^2	2.102	5.710	4.154	31.264	4.052	4.243	3.312	12.455	1.138
P-value	0.349	0.221	0.385	0.000***	0.852	0.374	0.507	0.014**	0.888
Spain									
χ^2	0.906	6.772	4.009	0.435	9.348	0.901	5.270	0.514	11.779
P-value	0.044**	0.453	0.778	0.804	0.009***	0.637	0.071*	0.773	0.002***

(Contd...)

Table 4: (*Continued*)

Country	BR→M2	M2→BR	WTI→M2	M2→WTI	DUB→M2	M2→DUB	HH→M2	M2→HH	LNG→M2
Sweden									
χ^2	12.162	2.448	1.776	-	-	-	-	-	-
P-value	0.016**	0.653	0.776	-	-	-	-	-	-
Switzerland									
χ^2	18.622	3.877	32.686	1.017	7.164	0.895	4.818	0.923	7.369
P-value	0.000	0.567	0.000***	0.601	0.027**	0.639	0.089	0.630	0.025**
Turkey									
χ^2	11.013	2.580	6.022	3.479	3.917	4.562	0.676	3.418	4.294
P-value	0.011**	0.630	0.197	0.323	0.270	0.206	0.878	0.331	0.231
UK									
χ^2	15.528	5.438	26.658	2.351	12.218	7.842	13.464	2.355	12.925
P-value	0.003***	0.606	0.000***	0.502	0.006***	0.165	0.019**	0.501	0.004***
US									
χ^2	2.943	5.842	17.351	0.870	13.222	3.881	16.018	9.107	22.897
P-value	0.229	0.321	0.003***	0.647	0.001***	0.422	0.003***	0.104	0.000***

"→" denotes unidirectional causality, BR: Brent oil price, WTI: West Texas Intermediate price, DUB: Dubai oil price, HH: Henry Hub price, LNG: Liquefied natural gas price, RUS: Russia natural gas price, M2: Liquidity, SI: Stock index, IP: Industrial production, ***, **, and * denote statistical significance at 1%, 5% and 10% level of significance respectively

(Başar and Temurlenk, 2007). Thus, hypothesis to be built for KPSS test means that null hypothesis time series is stationary and on the other hand alternative hypothesis means that time series is not stationary (Sevüktekin and Nargeleçekenler, 2005).

After determining whether the variables were suitable for the analysis, Johansen cointegration tests were performed to examine the long-term relationship between world oil and natural gas prices and stock markets, liquidity and industrial production respectively and between financial development and economic growth. In the presence of a long-term relationship (cointegration vector) between the relevant variables the vector error correction model was conducted; while in the case of absence of a long-term relationship, in order to investigate the short-term Granger causality the vector autoregressive model (VAR) was applied.

4. EMPIRICAL FINDINGS

The Granger causality tests results of OECD, GCC and OPEC countries are illustrated in at Tables 4-9. The relationship between energy prices (Brent, WTI, Dubai, HH, LNG and Russia) and liquidity was the subject of the first investigation. For most OECD, GCC and OPEC countries; there were long-term relationships between the energy prices and liquidity. The general findings of the Granger causality test results showed that in most of the OECD countries there was a uni-directional causality running from oil prices (Brent, WTI and Dubai) to liquidity, which is in line with the results of Ratti and Vespignani (2013a). It is not possible to generalize the results from the analysis of the GCC countries since the results are country specific however, there were no causal relationships between oil prices and liquidity in most of the OPEC countries. Furthermore, when the relationship between natural gas prices (HH, LNG and Russia) and liquidity was investigated an absence of causality between natural gas prices and liquidity was detected in most of the OECD, GCC and OPEC countries. This finding was not in line with those of Belke et al. (2010), Ratti and Vespignani (2013b) and Kang et al. (2016). Concerning the liquidity theory, the increase in liquidity would increase aggregate demand, while lowering interest rates; which may in turn raise commodity and oil prices. On the other hand, the increase in oil prices may cause recessions by lowering consumption, investments, stock prices, economic growth and aggregate demand. The findings of the current study indicate that a rise in oil prices may damage liquidity level, and consequently, have a negative effect on economic growth in the long-term for OECD countries; while this will not have an effect in OPEC countries. Furthermore, while the increase in natural gas prices will not have any negative effect on the liquidity level of the OECD, GCC and OPEC countries, a monetary expansion policy would promote economic growth without affecting oil prices in the OECD and OPEC countries, or natural gas prices in OECD, GCC and OPEC countries.

The second relationship to be examined was between energy prices and stock index. For most OECD, GCC and OPEC countries; there were no long-term relationships between energy prices and the stock index. The general findings of the Granger causality test results showed that; in most of the OECD countries there

Table 5: OECD Granger causality test results cont

Country	HH→SI	SI→HH	LNG→SI	SI→LNG	RUS→SI	SI→RUS	BR→IP	IP→BR	WTI→IP	IP→WTI
Australia										
χ^2	0.717	2.066	0.742	16.306	10.822	1.767	4.358	0.866	3.363	1.426
P-value	0.698	0.355	0.690	0.000***	0.028**	0.778	0.225	0.833	0.338	0.699
Austria										
χ^2	0.076	2.951	4.252	41.963	5.056	27.132	15.865	8.374	17.385	8.056
P-value	0.962	0.228	0.373	0.000***	0.653	0.000***	0.003***	0.078*	0.001***	0.089*
Belgium										
χ^2	0.355	5.487	11.599	20.220	5.531	16.785	3.299	3.264	5.769	1.905
P-value	0.837	0.064*	0.071*	0.002***	0.595	0.018**	0.192	0.195	0.123	0.592
Canada										
χ^2	0.603	0.204	2.219	52.268	2.979	9.832	11.701	1.702	10.065	1.678
P-value	0.739	0.902	0.528	0.000***	0.561	0.043**	0.019**	0.790	0.039**	0.794
Chile										
χ^2	2.069	1.753	3.542	3.535	10.780	16.715	3.215	7.458	4.564	7.386
P-value	0.355	0.416	0.170	0.170	0.029**	0.002***	0.359	0.058*	0.206	0.0609*
Czech										
χ^2	0.452	1.900	5.865	23.480	12.979	27.046***	3.609	3.087	2.148	1.168
P-value	0.797	0.386	0.118	0.000***	0.072*	0.000	0.164	0.213	0.341	0.557
Denmark										
χ^2	0.397	0.161	2.395	26.272	6.325	23.805	24.725	7.930	24.932	7.618
P-value	0.819	0.922	0.494	0.000***	0.502	0.001***	0.000***	0.338	0.000***	0.367
Estonia										
χ^2	1.799	0.369	0.752	15.819	14.927	20.295	19.280	4.129	18.192	3.882
P-value	0.406	0.831	0.686	0.000***	0.036**	0.005***	0.000***	0.388	0.001***	0.422
Finland										
χ^2	2.080	1.044	1.315	5.150	2.224	13.834	24.725	7.930	24.932	7.618
P-value	0.353	0.593	0.725	0.161	0.694	0.007***	0.000***	0.338	0.000***	0.367
France										
χ^2	0.160	0.457	1.904	17.382	7.004	9.443	28.945	2.323	31.058	2.323
P-value	0.922	0.795	0.592	0.000***	0.428	0.222	0.000***	0.676	0.000***	0.676
Germany										
χ^2	0.340	0.528	5.988	13.229	10.930	11.450	34.524	4.956	36.411	4.956
P-value	0.843	0.767	0.112	0.004***	0.141	0.120	0.000***	0.421	0.000***	0.421
Greece										
χ^2	0.702	0.588	4.017	16.016	16.279	8.311	6.339	0.898	6.519	0.909
P-value	0.704	0.745	0.259	0.001***	0.022***	0.306	0.096*	0.825	0.088*	0.823
Hungary										
χ^2	0.149	1.056	8.342	22.934	16.561	4.850	11.200	0.412	14.880	7.606
P-value	0.928	0.589	0.079*	0.001***	0.002***	0.303	0.010*	0.937	0.001***	0.054*
Iceland										
χ^2	6.901	1.207	12.874	50.150	11.426	73.974	14.122	3.242	15.912	4.053
P-value	0.075*	0.751	0.045**	0.000***	0.178	0.000***	0.002	0.355	0.001***	0.255
Ireland										
χ^2	0.855	0.001	15.088	18.045	8.390	13.227	2.542	2.287	2.165	1.186
P-value	0.652	0.999	0.019**	0.006***	0.299	0.066*	0.467	0.514	0.538	0.756
Israel										
χ^2	0.232	0.088	8.633	22.904	11.620	14.516	0.050	0.465	0.056	0.012
P-value	0.890	0.956	0.124	0.000***	0.113	0.042**	0.975	0.792	0.972	0.993
Italy										
χ^2	0.021	0.306	5.972	0.113	9.453	0.221	21.468	4.073	22.419	2.910
P-value	0.884	0.579	11.938	0.007***	13.925	0.052*	0.000***	0.538	0.004***	0.713
Japan										
χ^2	0.019	1.358	1.924	19.579	3.306	5.792	24.887	1.661	31.068	1.936
P-value	0.990	0.507	0.588	0.000***	0.507	0.215	0.000***	0.797	0.000***	0.747
Korea										
χ^2	0.091	0.349	13.013	30.526	8.150	9.447	16.450	0.501	14.659	1.226
P-value	0.955	0.839	0.023**	0.000***	0.086*	0.050*	0.000***	0.778	0.000***	0.541
Luxembourg										
χ^2	2.231	0.386	4.840	25.959	5.030	19.801	26.618	0.428	16.637	3.754
P-value	0.327	0.824	0.304	0.000***	0.656	0.006***	0.000***	0.807	0.000***	0.289
Mexico										
χ^2	0.150	0.680	3.885	23.275	9.994	8.170	9.240	1.265	10.345	2.531
P-value	0.927	0.711	0.274	0.000***	0.040**	0.085*	0.009***	0.531	0.005***	0.282

(Contd...)

Table 5: (*Continued*)

Country	HH→SI	SI→HH	LNG→SI	SI→LNG	RUS→SI	SI→RUS	BR→IP	IP→BR	WTI→IP	IP→WTI
Netherlands										
χ^2	1.481	0.815	2.273	27.623	4.538	21.906	2.181	1.732	4.873	2.466
P-value	0.476	0.665	0.685	0.000***	0.716	0.002***	0.335	0.420	0.181	0.481
NewZealand										
χ^2	0.068	0.013	1.043	19.649	6.243	9.334	5.946	4.340	9.657	10.563
P-value	0.966	0.993	0.790	0.000***	0.181	0.053*	0.114	0.226	0.046**	0.031**
Norway										
χ^2	0.092	1.340	2.923	55.381	4.165	9.937	3.284	8.151	2.905	6.931
P-value	0.954	0.511	0.403	0.000***	0.384	0.041**	0.656	0.148	0.714	0.225
Poland										
χ^2	0.488	0.331	0.283	19.441	9.267	2.249	4.760	17.708	7.000	5.160
P-value	0.783	0.847	0.867	0.000***	0.054*	0.689	0.312	0.001***	0.135	0.271
Portugal										
χ^2	0.542	1.658	2.291	11.432	3.294	6.270	10.376	2.563	8.890	4.134
P-value	0.762	0.436	0.514	0.009***	0.509	0.179	0.034**	0.633	0.063*	0.388
Slovakia										
χ^2	1.673	4.786	2.447	3.864	13.500	18.331	32.111	8.000	25.632	9.039
P-value	0.433	0.01*	0.294	0.144	0.095*	0.018**	0.000***	0.091*	0.000***	0.060*
Slovenia										
χ^2	1.955	4.752	11.612	12.198	23.300	20.729	15.836	0.280	13.935	0.383
P-value	0.376	0.092*	0.020**	0.015**	0.000***	0.002***	0.000***	0.869	0.000***	0.825
Spain										
χ^2	0.330	0.973	0.199	11.143	8.700	9.568	20.325	0.131	21.408	1.719
P-value	0.847	0.614	0.977	0.011**	0.069*	0.048**	0.000***	0.997	0.000***	0.787
Sweden										
χ^2	-	-	-	-	-	-	22.556	2.225	19.360	1.557
P-value	-	-	-	-	-	-	0.000***	0.694	0.000***	0.816
Switzerland										
χ^2	0.156	2.041	6.244	11.061	3.623	8.099	8.605	0.601	7.234	0.854
P-value	0.924	0.360	0.100	0.011**	0.459	0.088*	0.013**	0.740	0.026**	0.652
Turkey										
χ^2	0.166	0.110	2.275	3.916	8.807	5.133	34.896	2.757	40.311	0.697
P-value	0.83	0.739	0.517	0.270	0.066*	0.273	0.000***	0.251	0.000***	0.873
UK										
χ^2	0.334	0.109	4.866	22.4763	7.838	19.360	8.696	2.116	12.754	2.555
P-value	0.563	0.740	0.181	0.000***	0.347	0.007***	0.012**	0.347	0.001***	0.278
US										
χ^2	2.097	1.408	5.660	21.563	6.047	19.536	5.409	10.775	9.635	10.887
P-value	0.350	0.494	0.129	0.000***	0.534	0.006***	0.492	0.095*	0.210	0.143
Country	**DUB→IP**	**IP→DUB**	**HH→IP**	**IP→HH**	**LNG→IP**	**IP→LNG**	**RUS→IP**	**IP→RUS**	**SI→IP**	**IP→SI**
Australia										
χ^2	3.976	0.991	7.489	3.062	7.202	2.807	4.184	6.388	3.950	1.592
P-value	0.264	0.803	0.057*	0.382	0.065*	0.422	0.381	0.172	0.266	0.661
Austria										
χ^2	16.121	7.713	6.486	0.162	7.122	10.371	3.541	1.491	16.566	3.314
P-value	0.002***	0.102	0.010**	0.686	0.129	0.034**	0.471	0.828	0.035**	0.913
Belgium										
χ^2	2.448	4.190	8.318	1.285	15.010	4.787	1.249	2.984	31.039	7.437
P-value	0.294	0.123	0.039**	0.732	0.001***	0.188	0.869	0.560	0.000***	0.282
Canada										
χ^2	15.844	0.678	19.675	3.752	6.884	7.382	3.646	17.540	31.278	5.796
P-value	0.007***	0.984	0.001***	0.585	0.229	0.193	0.601	0.003***	0.000***	0.214
Chile										
χ^2	8.513	3.529	0.415	4.587	7.044	12.548	0.620	2.616	7.519	4.363
P-value	0.317	0.036**	0.937	0.204	0.070*	0.005***	0.960	0.623	0.057*	0.224
Czech										
χ^2	3.569	4.148	1.181	0.088	0.747	5.869	1.004	7.828	10.431	4.640
P-value	0.167	0.125	0.554	0.956	0.688	0.053*	0.909	0.098*	0.015**	0.200
Denmark										
χ^2	20.429	6.610	3.621	8.382	5.039	3.531	10.981	4.410	10.223	6.384
P-value	0.004***	0.470	0.605	0.136	0.411	0.618	0.051*	0.491	0.036**	0.172
Estonia										
χ^2	9.695	2.278	4.613	0.120	12.327	14.790	3.719	28.477	22.316	4.827
P-value	0.007***	0.320	0.099*	0.941	0.015**	0.005***	0.445	0.000***	0.002***	0.681

(Contd...)

Table 5: (*Continued*)

Country	DUB→IP	IP→DUB	HH→IP	IP→HH	LNG→IP	IP→LNG	RUS→IP	IP→RUS	SI→IP	IP→SI
Finland										
χ^2	20.429	6.610	3.621	8.382	3.954	1.782	14.769	4.760	19.059	5.312
P-value	0.004***	0.470	0.605	0.136	0.266	0.618	0.0369**	0.689	0.000***	0.256
France			8.373	7.737						
χ^2	27.064	2.799	0.078*	0.101	30.356	5.368	10.501	27.950	18.456	4.281
P-value	0.000***	0.591			0.000***	0.146	0.062*	0.000***	0.001***	0.369
Germany			2.061	8.867						
χ^2	34.532	5.994	0.724	0.064**	24.210	25.345	7.534	39.039	35.616	7.596
P-value	0.000***	0.306			0.000***	0.000***	0.110	0.000***	0.000***	0.269
Greece			6.935	3.715						
χ^2	6.844	1.097	0.225	0.591	5.583	2.863	4.090	1.760	6.854	10.111
P-value	0.077*	0.777			0.133	0.413	0.393	0.779	0.143	0.038**
Hungary			3.627	0.550			3.871	20.434	5.538	4.277
χ^2	17.689	2.593	0.163	0.759	14.0701	2.444	0.568	0.001***	0.136	0.233
P-value	0.000***	0.458			0.002***	0.485				
Iceland			2.336	0.667			7.7412	7.444	15.463	10.133
χ^2	3.027	2.420	0.310	0.716	14.612	4.847	0.191	0.189	0.050*	0.255
P-value	0.387	0.489			0.002***	0.183				
Ireland			7.390	2.316			4.350	4.520	2.584	4.747
χ^2	1.703	1.717	0.060*	0.509	2.801	1.750	0.360	0.340	0.629	0.314
P-value	0.636	0.633			0.423	0.625				
Israel			3.799	0.0748			2.713	2.437	0.782	0.248
χ^2	0.179	0.144	0.149	0.961	9.809	1.453	0.606	0.655	0.676	0.833
P-value	0.914	0.930			0.020**	0.693				
Italy			4.019	15.563	15.544	15.052	19.063	21.528	20.415	7.213
χ^2	31.401	18.956	0.674	0.016**	0.016**	0.019**	0.008***	0.003***	0.000***	0.125
P-value	0.000***	0.015**								
Japan			1.005	1.614	19.451	2.758	2.090	35.237	1.100	2.205
χ^2	26.458	2.664	0.604	0.446	0.000	0.430	0.719	0.000***	0.576	0.332
P-value	0.000***	0.615								
Korea			1.331	0.095	7.371	5.082	7.422	23.032	13.908	0.802
χ^2	19.345	0.222	0.248	0.756	0.025**	0.078*	0.115	0.000***	0.001***	0.669
P-value	0.000***	0.894								
Luxembourg			2.242	0.544	1.925	3.297	11.155	32.086	8.256	0.932
χ^2	21.071	0.311	0.326	0.761	0.381	0.192	0.132	0.000***	0.016**	0.627
P-value	0.000***	0.855								
Mexico			6.521	7.418	20.443	9.733	6.530	0.786	22.070	5.511
χ^2	8.631	1.736	0.258	0.191	0.000***	0.021**				
P-value	0.013**	0.419					0.088*	0.852	0.000***	0.356
Netherlands			0.5601	0.961	6.001	6.205				
χ^2	2.328	2.706	0.755	0.618	0.111	0.102	5.437	8.509	-	-
P-value	0.312	0.258					0.364	0.130	-	-
NewZealand			0.557	6.980	3.287	6.838				
χ^2	7.887	2.198	0.906	0.072*	0.348	0.077*	4.598	21.350	2.373	1.658
P-value	0.048**	0.532					0.331	0.000***	0.498	0.646
Norway			2.287	1.378	8.199	20.288				
χ^2	4.259	1.542	0.808	0.926	0.223	0.002***	4.732	5.867	1.160	3.963
P-value	0.234	0.672					0.315	0.209	0.884	0.411
Poland			3.576	8.502	3.874	6.371				
χ^2	4.645	1.534	0.611	0.130	0.567	0.271	1.801	32.010	12.304	17.552
P-value	0.098*	0.464					0.772	0.000***	0.030**	0.003***
Portugal			13.762	11.413	10.175	3.428				
χ^2	10.410	2.007	0.032**	0.076*	0.037**	0.488	11.416	9.582	9.825	2.363
P-value	0.034**	0.734					0.043**	0.088*	0.043**	0.669
Slovakia			0.5772	2.597	32.294	12.489				
χ^2	31.512	9.212	0.966	0.627	0.000***	0.051*	5.051	17.983	1.443	3.449
P-value	0.000***	0.056*					0.409	0.003***	0.836	0.485
Slovenia			7.118	10.946	12.501	5.570				
χ^2	17.938	1.680	0.212	0.052*	0.014**	0.233	5.491	59.002	14.696	7.884
P-value	0.000***	0.431					0.704	0.000***	0.005***	0.095*
Spain			8.286	8.255	31.113	16.916				
χ^2	24.403	0.211	0.081*	0.082*	0.000***	0.031**	20.426	30.484	12.055	6.302
P-value	0.000***	0.994					0.004***	0.000***	0.016**	0.177

(Contd...)

Table 5: (*Continued*)

Country	DUB→IP	IP→DUB	HH→IP	IP→HH	LNG→IP	IP→LNG	RUS→IP	IP→RUS	SI→IP	IP→SI
Sweden										
χ^2	24.505	1.241	1.039	2.482	18.568	4.134	5.150	25.793	-	-
P-value	0.000***	0.871	0.594	0.2859	0.001***	0.388	0.397	0.000***	-	-
Switzerland										
χ^2	13.473	2.313	5.519	6.020	6.826	12.751	14.191	6.562	18.737	7.712
P-value	0.009***	0.678	0.355	0.304	0.145	0.012**	0.014**	0.255	0.000***	0.102
Turkey										
χ^2	33.961	1.168	6.030	4.085	6.944	15.657	15.911	3.089	5.244	5.372
P-value	0.000***	0.557	0.110	0.252	0.073*	0.001***	0.025**	0.876	0.072*	0.068*
UK										
χ^2	8.738	2.056	1.471	1.606	15.453	10.292	3.524	13.513	2.068	9.526
P-value	0.012**	0.357	0.479	0.447	0.001***	0.016**	0.474	0.009**	0.355	0.008***
US										
χ^2	8.636	13.356	7.653	3.398	10.395	10.652	15.982	26.652	31.927	26.785
P-value	0.279	0.063*	0.176	0.638	0.108	0.099*	0.067*	0.001***	0.000***	0.000***

"→" denotes unidirectional causality, BR: Brent oil price, WTI: West Texas Intermediate price, DUB: Dubai oil price, HH: Henry Hub price, LNG: Liquefied natural gas price, RUS: Russia natural gas price, M2: Liquidity; SI: Stock index, IP: İndustrial production, ***, ** and * denote statistical significance at 1%, 5% and 10% level of significance respectively

was a uni-directional causality running from stock index to oil prices; on the other hand, in most of the GCC countries there was a uni-directional causality running from oil prices to stock index, which is in line with the findings of Basher and Sadorsky (2006), Masih et al. (2011), Park and Ratti (2008) and Sadorsky (1999), Furthermore, in most of the OPEC countries there were no causal relationships between oil prices and the stock index, in line with the results of Iscan's study (2010). An oil demand shortage or oil supply surplus can cause oil prices to decrease leading to smaller revenues and reduced stock market returns in GCC countries. As a result, investors in GCC countries can buy futures contracts or use financial derivatives in order to hedge the demand uncertainty. Furthermore, to achieve an effective diversified portfolio, investors can invest in OECD and OPEC countries when there was a high volatility in energy prices as oil and natural gas price changes do not have a significant effect on stock market returns of OECD and OPEC countries. For most of the OECD countries, there was a uni-directional causality running from stock index to natural gas prices which is in line with the results from research undertaken by Yilmaz et al. (2013); however, there were no causal relationships between natural gas prices and the stock index of both GCC and OPEC countries, which is in agreement with the results obtained by Acaravci et al. (2012). Finally, policies to avoid natural gas price uncertainty may not have any impact on stock index of OECD, GCC and OPEC countries.

The relationship between energy prices and industrial production accounts for the third relationship. For most of the OECD, GCC and OPEC countries; there were no long-term relationships between the energy prices and industrial production. The general findings of the Granger causality tests showed that in most of the OECD, GCC and OPEC countries there was a uni-directional causality running from oil prices to industrial production and the results are in line with the studies of Burbidge and Harrison (1984) and Cuñado and Gracia (2003). These results indicate that three of the country groups could choose energy policies that stabilize the uncertainties in oil prices, since oil price volatility is the reason for the volatility in industrial production as well as in economic growth. In an environment of volatile oil prices, OECD countries may delay their oil sensitive investments in the short-term. However, a long-delay may cause aggregate industrial output level to decrease and dampen economic activities. For GCC and OPEC countries, an increase in oil prices would increase the export earnings, and consequently, the industrial output level. The danger will occur when the oil prices are too high and remain at that level for a long-time. In that case, energy demand would start to decrease, which may cause oil surplus and lead to a reduction in oil prices which would damage the budget of oil-exporting countries. As a result, the governments of OECD, GCC and OPEC countries may implement policies that reduce the oil price volatility in order to have steady industrial production in the short-term. The economies of GCC and OPEC countries are heavily dependent on oil exports. An uncertainty in oil prices can easily affect their income levels. These countries may diversify their income sources or reduce the impact of oil price shocks on economic growth (Ftiti et al., 2014). On the other hand; there were no causal relationships between natural gas prices and industrial production in most of the OECD, GCC and OPEC countries. This means that energy policies to stabilize the uncertainty in natural gas prices would not have a significant effect on industrial production as well as economic growth in OECD, GCC and OPEC countries.

The last relationship is between the stock index and industrial production. In this study, stock index is considered as a proxy for financial development and industrial production is considered as a proxy for economic growth. The findings show that there were no long-term relationships between financial development and economic growth for most of the OECD, GCC and OPEC countries. On the other hand, the findings of the Granger causality test showed that while there was uni-directional causality running from the stock index to industrial production in most of the OECD countries, the absence of causality between the stock index and industrial production was supported in most of the GCC and OPEC countries. The findings from OECD countries support the view of Schumpeter (1934), which advocates the supply-leading hypothesis, and the findings of GCC and OPEC countries support the view of Lucas (1998) and Stern (1989), endorsing the neutrality hypothesis. This means that for OECD countries, the services provided by financial intermediaries promote innovation and economic growth; while financial stress affects savings and

Table 6: GCC Granger causality test results

Country	BR→M2	M2→BR	WTI→M2	M2→WTI	DUB→M2	M2→DUB	HH→M2	M2→HH	LNG→M2
Bahrain									
χ^2	9.414	7.015	13.414	12.330	12.255	8.668	17.654	9.318	11.739
P-value	0.009***	0.030**	0.003***	0.006***	0.006***	0.034**	0.013**	0.230	0.109
Kuwait									
χ^2	21.092	17.280	21.573	16.344	20.562	17.014	0.052	1.927	8.058
P-value	0.003***	0.015**	0.003***	0.022**	0.004***	0.017**	0.818	0.165	0.044**
Oman									
χ^2	8.885	1.977	7.483	3.215	6.706	3.599	0.762	5.661	0.548
P-value	0.011**	0.372	0.023**	0.200	0.035**	0.165	0.683	0.059*	0.908
Qatar									
χ^2	10.227	7.403	16.152	9.864	7.780	7.139	19.956	8.836	6.972
P-value	0.069*	0.192	0.023**	0.196	0.099*	0.128	0.002***	0.183	0.072*
Saudi Arabia									
χ^2	1.151	10.715	1.245	9.986	4.760	13.194	3.358	0.355	0.510
P-value	0.764	0.013**	0.742	0.018**	0.190	0.004***	0.066*	0.551	0.916
UAE									
χ^2	5.282	12.817	7.964	18.829	4.925	12.198	1.554	0.001	2.599
P-value	0.259	0.012**	0.158	0.002***	0.295	0.015**	0.212	0.972	0.626

Country	M2→LNG	RUS→M2	M2→RUS	BR→SI	SI→BR	WTI→SI	SI→WTI	DUB→SI	SI→DUB
Bahrain									
χ^2	4.498	9.233	15.094	10.391	1.259	13.064	2.160	9.822	1.221
P-value	0.720	0.236	0.034**	0.005***	0.532	0.001**	0.339	0.007***	0.543
Kuwait									
χ^2	9.596	7.571	7.190	2.616	1.755	3.326	0.259	-	-
P-value	0.022**	0.371	0.409	0.270	0.415	0.189	0.878	-	-
Oman									
χ^2	6.611	1.782	4.212	12.644	28.110	11.618	26.047	16.288	32.652
P-value	0.085*	0.775	0.378	0.008***	0.000***	0.008***	0.000***	0.026**	0.000***
Qatar									
χ^2	5.770	5.520	11.578	0.823	6.477	2.754	8.926	1.402	6.012
P-value	0.123	0.479	0.072*	0.843	0.090*	0.431	0.030**	0.705	0.111
Saudi Arabia									
χ^2	5.619	10.125	1.170	3.462	5.221	6.788	4.406	3.189	5.458
P-value	0.131	0.038**	0.882	0.177	0.073*	0.033**	0.110	0.202	0.065*
UAE									
χ^2	8.040	2.302	6.357	18.660	9.049	1.633	5.030	21.371	11.191
P-value	0.090*	0.680	0.174	0.009***	0.249	0.442	0.080*	0.003***	0.130

"→" denotes unidirectional causality, BR: Brent oil price, WTI: West Texas Intermediate price, DUB: Dubai oil price, HH: Henry Hub price, LNG: Liquefied natural gas price, RUS: Russia natural gas price, M2: Liquidity, SI: Stock index, IP: İndustrial production, ***, ** and * denote statistical significance at 1%, 5% and 10% level of significance respectively

Table 7: GCC Granger causality test results cont

Country	HH→SI	SI→HH	LNG→SI	SI→LNG	RUS→SI	SI→RUS	BR→IP	IP→BR	WTI→IP	IP→WTI
Bahrain										
χ^2	13.935	11.742	0.654	3.630	3.022	7.173	-	-	-	-
P-value	0.003***	0.008***	0.721	0.162	0.554	0.127	-	-	-	-
Kuwait										
χ^2	1.075	2.450	-	-	0.925	3.625	4.900	0.488	5.707	0.560
P-value	0.584	0.293	-	-	0.629	0.163	0.086*	0.783	0.057*	0.755
Oman										
χ^2	2.390	4.836	1.313	11.325	21.216	43.955	1.427	6.842	1.573	7.565
P-value	0.302	0.089*	0.518	0.003***	0.006***	0.000***	0.489	0.032**	0.455	0.022**
Qatar										
χ^2	1.214	0.002	2.936	0.466	2.293	2.801	11.588	9.115	11.321	9.683
P-value	0.270	0.961	0.086*	0.494	0.317	0.246	0.008***	0.027**	0.010**	0.021**
Saudi Arabia										
χ^2	0.288	0.762	2.873	11.894	10.186	18.919	15.222	2.962	16.447	3.181
P-value	0.865	0.683	0.237	0.002***	0.178	0.008***	0.001***	0.397	0.000***	0.364
UAE										
χ^2	2.179	1.493	4.213	3.933	11.542	14.264	4.265	1.083	6.393	1.775
P-value	0.336	0.474	0.121	0.139	0.116	0.046**	0.118	0.581	0.040**	0.411

Country	DUB→IP	IP→DUB	HH→IP	IP→HH	LNG→IP	IP→LNG	RUS→IP	IP→RUS	SI→IP	IP→SI
Bahrain										
χ^2	--	-	-	-	-	-	-	-	-	-
P-value	--	-	-	-	-	-	-	-	-	-
Kuwait										
χ^2	3.648	0.545	2.699	0.087	7.216	4.096	5.624	17.900	0.785	0.390
P-value	0.161	0.761	0.259	0.957	0.27**	0.129	0.344	0.003***	0.675	0.302
Oman										
χ^2	2.707	5.447	0.327	6.096	1.074	0.273	2.846	4.535	3.463	2.334
P-value	0.258	0.065*	0.848	0.047*	0.584	0.872	0.583	0.338	0.177	0.311
Qatar										
χ^2	9.873	10.058	0.252	4.064	8.868	11.288	3.179	9.205	9.510	2.035
P-value	0.019**	0.018**	0.881	0.131	0.031**	0.010**	0.528	0.056*	0.002***	0.153
Saudi Arabia										
χ^2	8.995	2.166	1.681	0.000	10.503	6.766	7.510	10.512	12.286	1.743
P-value	0.011**	0.338	0.194	0.980	0.014**	0.079*	0.111	0.032**	0.002***	0.418
UAE										
χ^2	3.567	1.728	1.918	4.120	11.944	0.401	4.817	11.458	1.134	2.233
P-value	0.168	0.421	0.383	0.127	0.002***	0.818	0.306	0.021**	0.567	0.327

"→" denotes unidirectional causality, BR: Brent oil price, WTI: West Texas Intermediate price, DUB: Dubai oil price, HH: Henry Hub price, LNG: Liquefied natural gas price, RUS: Russia natural gas price, M2: Liquidity, SI: Stock index, IP: Industrial production, ***, ** and * denote statistical significance at 1%, 5% and 10% level of significance respectively

Table 8: OPEC Granger causality test results

Country	BR→M2	M2→BR	WTI→M2	M2→WTI	DUB→M2	M2→DUB	HH→M2	M2→HH	LNG→M2
Algeria									
χ^2	-	-	-	-	-	-	-	-	-
P-value	-	-	-	-	-	-	-	-	-
Angola									
χ^2	5.255	4.459	1.304	1.721	4.540	3.237	1.552	7.176	1.191
P-value	0.072*	0.107	0.520	0.422	0.103	0.198	0.670	0.066*	0.275
Ecuador									
χ^2	0.686	0.978	0.721	3.630	12.971	1.353	13.293	12.409	6.012
P-value	0.876	0.806	0.868	0.304	0.011**	0.852	0.065*	0.087*	0.111
Iran									
χ^2	-	-	-	-	-	-	-	-	-
P-value	-	-	-	-	-	-	-	-	-
Iraq									
χ^2	1.051	0.964	1.957	0.571	0.142	1.284	0.018	5.787	0.256
P-value	0.591	0.617	0.5281	0.902	0.986	0.732	0.891	0.016	0.879
Kuwait									
χ^2	21.092	17.280	21.573	16.344	20.562	17.014	0.052	1.927	8.058
P-value	0.003***	0.015**	0.003***	0.022**	0.004***	0.017**	0.818	0.165	0.044**
Nigeria									
χ^2	2.632	4.834	2.211	4.110	3.443	3.434	0.222	0.120	2.549
P-value	0.451	0.184	0.529	0.249	0.328	0.329	0.637	0.728	0.279
Qatar									
χ^2	10.227	7.403	16.152	9.864	7.780	7.139	19.956	8.836	6.972
P-value	0.069*	0.192	0.023**	0.196	0.099*	0.128	0.002***	0.183	0.072*
Saudi Arabia									
χ^2	1.151	10.715	1.245	9.986	4.760	13.194	3.358	0.355	0.510
P-value	0.764	0.013**	0.742	0.018**	0.190	0.004***	0.066*	0.551	0.916
UAE									
χ^2	5.282	12.817	7.964	18.829	4.925	12.198	1.554	0.001	2.599
P-value	0.259	0.012**	0.158	0.002***	0.295	0.015**	0.212	0.972	0.626
Venezuela									
χ^2	4.993	1.911	10.734	3.953	3.390	2.982	4.062	18.797	13.844
P-value	0.082*	0.384	0.056*	0.552	0.183	0.225	0.540	0.002***	0.016**

Country	M2→LNG	RUS→M2	M2→RUS	BR→SI	SI→BR	WTI→SI	SI→WTI	DUB→SI	SI→DUB
Algeria									
χ^2	-	-	-	-	-	-	-	-	-
P-value	-	-	-	-	-	-	-	-	-
Angola									
χ^2	0.311	10.938	7.873	-	-	-	-	-	-
P-value	0.576	0.012**	0.048**	-	-	-	-	-	-
Ecuador									
χ^2	0.355	21.651	12.004	6.036	4.609	2.174	2.644	4.997	3.847
P-value	0.949	0.006***	0.034**	0.109	0.202	0.537	0.449	0.172	0.278
Iran									
χ^2	-	-	-	-	-	-	-	-	-
P-value	-	-	-	-	-	-	-	-	-

(Contd...)

Table 8: *(Continued)*

Country	M2→LNG	RUS→M2	M2→RUS	BR→SI	SI→BR	WTI→SI	SI→WTI	DUB→SI	SI→DUB
Iraq					-				
χ^2	0.757	5.324	6.520	-	-	-	-	-	-
P-value	0.684	0.255	0.163	-	1.755	-	-	-	-
Kuwait					0.415				
χ^2	9.596	7.571	7.190	2.616		3.326	0.259	-	-
P-value	0.022**	0.371	0.409	0.270	2.640	0.189	0.878	-	-
Nigeria					0.267				
χ^2	2.298	16.751	17.511	2.048		6.291	0.565	2.018	2.966
P-value	0.317	0.019**	0.014**	0.359	6.477	0.043**	0.753	0.364	0.226
Qatar					0.090*				
χ^2	5.770	5.520	11.578	0.823		2.754	8.926	1.402	6.012
P-value	0.123	0.479	0.072*	0.843	5.221	0.431	0.030**	0.705	0.111
Saudi Arabia					0.073*				
χ^2	5.619	10.125	1.170	3.462		6.788	4.406	3.189	5.458
P-value	0.131	0.038**	0.882	0.177	9.049	0.033**	0.110	0.202	0.065*
UAE					0.249				
χ^2	8.040	2.302	6.357	18.660		1.633	5.030	21.371	11.191
P-value	0.090*	0.680	0.174	0.009***	0.332	0.442	0.080*	0.003***	0.130
Venezuela					0.953				
χ^2	14.343	4.148	0.663	0.345		0.497	0.639	0.502	0.220
P-value	0.013**	0.528	0.984	0.951		0.919	0.887	0.918	0.974

"→" denotes unidirectional causality, BR: Brent oil price, WTI: West Texas Intermediate price, DUB: Dubai oil price, HH: Henry Hub price, LNG: Liquefied natural gas price, RUS: Russia natural gas price, M2: Liquidity, SI: Stock index, IP: İndustrial production, ***, ** and * denote statistical significance at 1%, 5% and 10% level of significance respectively

Table 9: OPEC Granger causality test results cont

Country	HH→SI	SI→HH	LNG→SI	SI→LNG	RUS→SI	SI→RUS	BR→IP	IP→BR	WTI→IP	IP→WTI
Algeria										
χ^2	-	-	-	-	-	-	-	-	-	-
P-value	-	-	-	-	-	-	-	-	-	-
Angola										
χ^2	-	-	-	-	-	-	-	-	-	-
P-value	-	-	-	-	-	-	-	-	-	-
Ecuador										
χ^2	0.260	0.205	3.917	1.884	19.190	1.559	3.158	5.941	3.560	5.212
P-value	0.609	0.650	0.270	0.596	0.007***	0.816	0.206	0.051*	0.168	0.073*
Iran										
χ^2	-	-	-	-	-	-	2.140	0.898	2.260	0.815
P-value	-	-	-	-	-	-	0.342	0.638	0.323	0.665
Iraq										
χ^2	-	-	-	-	-	-	-	-	-	-
P-value	-	-	-	-	-	-	-	-	-	-
Kuwait										
χ^2	1.075	2.450	-	-	0.925	3.625	4.900	0.488	5.707	0.560
P-value	0.584	0.293	-	-	0.629	0.163	0.086*	0.783	0.057*	0.755
Nigeria										
χ^2	1.304	4.676	0.171	0.599	8.067	3.617	-	-	-	-
P-value	0.253	0.030**	0.678	0.438	0.089*	0.460	-	-	-	-

(Contd...)

Table 9: ***(Continued...)***

Country	HH→SI	SI→HH	LNG→SI	SI→LNG	RUS→SI	SI→RUS	BR→IP	IP→BR	WTI→IP	IP→WTI
Qatar										
χ^2	1.214	0.002	2.936	0.466	2.293	2.801	11.588	9.115	11.321	9.683
P-value	0.270	0.961	0.086*	0.494	0.317	0.246	0.008***	0.027**	0.010**	0.021**
Saudi Arabia										
χ^2	0.288	0.762	2.873	11.894	10.186	18.919	15.222	2.962	16.447	3.181
P-value	0.865	0.683	0.237	0.002***	0.178	0.008***	0.001***	0.397	0.000***	0.364
UAE										
χ^2	2.179	1.493	4.213	3.933	11.542	14.264	4.265	1.083	6.393	1.775
P-value	0.336	0.474	0.121	0.139	0.116	0.046**	0.118	0.581	0.040**	0.411
Venezuela										
χ^2	1.394	0.797	4.106	5.208	0.809	3.673	11.070	2.577	0.922	3.804
P-value	0.706	0.850	0.250	0.157	0.937	0.452	0.025**	0.630	0.820	0.283
Country	**DUB→IP**	**IP→DUB**	**HH→IP**	**IP→HH**	**LNG→IP**	**IP→LNG**	**RUS→IP**	**IP→RUS**	**SI→IP**	**IP→SI**
Algeria										
χ^2	-	-	-	-	-	-	-	-	-	-
P-value	-	-	-	-	-	-	-	-	-	-
Angola										
χ^2	-	-	-	-	-	-	-	-	-	-
P-value	-	-	-	-	-	-	-	-	-	-
Ecuador										
χ^2	2.368	5.273	2.821	0.979	1.493	2.271	1.965	4.454	2.854	0.438
P-value	0.305	0.071*	0.244	0.612	0.473	0.321	0.742	0.348	0.414	0.932
Iran										
χ^2	3.018	0.533	2.654	0.239	8.847	1.197	5.453	1.877	-	-
P-value	0.221	0.765	0.265	0.887	0.031**	0.753	0.243	0.758	-	-
Iraq										
χ^2	-	-	-	-	-	-	-	-	-	-
P-value	-	-	-	-	-	-	-	-	-	-
Kuwait										
χ^2	3.648	0.545	2.699	0.087	7.216	4.096	5.624	17.900	0.785	0.390
P-value	0.161	0.761	0.259	0.957	0.27**	0.129	0.344	0.003***	0.675	0.302
Nigeria										
χ^2	-	-	-	-	-	-	-	-	-	-
P-value	-	-	-	-	-	-	-	-	-	-
Qatar										
χ^2	9.873	10.058	0.252	4.064	8.868	11.288	3.179	9.205	9.510	2.035
P-value	0.019**	0.018**	0.881	0.131	0.031**	0.010**	0.528	0.056*	0.002***	0.153
Saudi Arabia										
χ^2	8.995	2.166	1.681	0.000	10.503	6.766	7.510	10.512	12.286	1.743
P-value	0.011**	0.338	0.194	0.980	0.014**	0.079*	0.111	0.032**	0.002***	0.418
UAE										
χ^2	3.567	1.728	1.918	4.120	11.944	0.401	4.817	11.458	1.134	2.233
P-value	0.168	0.421	0.383	0.127	0.002***	0.818	0.306	0.021**	0.567	0.327
Venezuela										
χ^2	11.238	3.214	1.012	11.734	39.704	8.576	10.508	2.072	3.755	0.237
P-value	0.024**	0.522	0.798	0.008***	0.000***	0.284	0.032**	0.722	0.289	0.971

"→" denotes unidirectional causality, BR: Brent oil price, WTI: West Texas Intermediate price, DUB: Dubai oil price, HH: Henry Hub price, LNG: Liquefied natural gas price, RUS: Russia natural gas price, M2: Liquidity; SI: Stock index, IP: ndustrial production, ***, ** and * denote statistical significance at 1%, 5% and 10% level of significance respectively

investments negatively. As a result, in order to obtain sustainable economic growth in OECD countries, it is necessary to undertake financial reforms, such as the liberalization of the finance sector. These results are in line with the work of Caporale et al. (2005), Choe and Moosa (1999), Christopoulos and Tsionas (2004), Hsueh et al. (2013), Thangavelu and Jiunn (2004), Uddin et al. (2003) and Xu (2000). On the other hand, policies to promote economic growth or finance sector liberalization would not have any significant effect in GCC and OPEC countries; this is in line with the findings of Abu-Bader and Abu-Qarn (2006), Hayo (1999), and Menyah et al. (2014).

5. CONCLUDING REMARKS

The purpose of this study was to analyze the countries in the group of OECD, GCC and OPEC under the selected data periods to test whether there are long-term or short-term relationships between the world energy prices (Brent Oil, WTI, Dubai, HH, Japan and Russia) and the liquidity level, stock market and industrial production of the target countries and to test whether there are long-term or short-term relationship between financial development and the economic growth of the these countries.

The determination of the relationships between the relevant variables varies across countries in regard to their economic policies, proximity to raw material sources, energy production capacities, energy reserves or stock markets. This causes commodity prices, stock prices and even output level to be affected by energy price changes (Arouri et al., 2011). As a result it is difficult to reach a common associative consequence between countries; however, it is possible to propose some generalizations and interpretations.

The empirical findings of the current study indicate that there were multidirectional relationships between the above-mentioned variables. These relationships can be explained by the factors that each country group owns within the framework of their energy sources, financial markets, economic conditions and geographical positions. The data accrued and analyzed in this study is presented as a contribution to guide policymakers, global investors and researchers in constituting an extensive country specific energy, macroeconomic and financial policies.

This study does not cover the period after 2014. There have been very important issues in energy markets since that year and it is essential that there is further research to capture the latest events in the energy markets, understand those developments and consider their likely effects on the countries of the. This future work could be undertaken by applying the models and approaches in the current study to an enlarged data set covering an extended period of time.

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