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IMPACT OF OIL PRICES ON STOCK RETURN: EVIDENCE FROM G7 COUNTRIES*

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Abstract. The aim of the study is to investigate the impact of oil prices on the stock market of G7 countries. Oil prices not only affect the economy of a country but also the country's stock market. The stock market affects the stock valuation or, to put in another way, the company's stock value. The stock value is associated with the discounted sum of predictable future cash flows and these flows may be distressed by macroeconomic variables including oil prices fluctuations. This study has researched the impact of oil prices' fluctuation on countries included G7, i.e. Canada, Germany, France, Italy, United Kingdom, United States of America and Japan. The time periods were from September 2009 to August 2016. For the analysis, the most recent data is collected. In this study, the real stock return has considered as a depended variable or predict variable, while oil prices, industrial production, and short-term interest rate are as independent, or predictor variables. The study is quantitative in nature. All data was collected from OECD website with the exception of oil prices, which were taken from oil intelligence report. The model, which has been used in the study is based on Arbitrage pricing theory-APT model, where financial assets are associated with macroeconomic variables. The results showed that Industrial production is positively associated with a real stock return in the case of Germany, Italy, Japan, the United Kingdom, and France, while the short-term interest rate is negatively connected with a real stock return in the case of Canada, the United Kingdom, and United States of America. Oil prices have an insignificant effect on real stock markets of all considered countries. The authors provide an economic interpretation of the obtained results.

Keywords: oil prices; industrial production; short-term interest rate; real stock return; G7 countries; Arbitrage Pricing Theory

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JEL Classifications: E31, G12

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1. Introduction

Discussion concerning oil prices and their effect on various phenomena has become rather a common one in recent time (e.g. Humberova et al. 2019). In one strand of literature price of energetic resources is frequently associated with energy consumption (Tvaronavičienė et al. 2017) and energy security (Melas et al. 2017).

In another strand of literature interrelation of between oil prices and stock markets performance is being examined. The stock market performance directly affects the stock valuation. The stock value is associated with the discounted sum of predictable future cash flows, and these flows may be affected by main macroeconomic variables, including oil prices fluctuations. Effect of fluctuation can be positive, negative, significant or insignificant. That we will discuss further. This research examines the impact of oil prices on the real stock return in Group of Seven (G7) countries. The main research question is: how the markets of the indicated countries respond when transactional real oil price changes.

Generally, if discussing the volatility of oil prices fluctuation, the anticipated answer would be, that it must be a negative relationship between stock market and oil prices. Alas, if talking about reality, this relationship appears to be not that simple. Different series of examination allowed to reveal the influence of oil prices and oil tremor on economies of developing and emerging economies. But the very limited number of research papers analyze the impact of oil prices on the stock market or stock return. Jones and Kaul (1996) and Huang et al. (1996) made studies to find the effect of oil prices on the stock market. They did not find significant relationships or influence of oil prices on the stock market.

The motivation behind those investigations were studies conducted even earlier, specifically in the year 1973. Since then there were investigated reasons for the oil prices oscillation, US Economy, importing and exporting oil countries, alas there were few papers, which tackled G7 countries in this context. This paper will focus on G7 countries and will examine how the real market return reacts to oil prices change. To put the research question in another way, the aim of the study is to describe the behavior of the stock markets of G7 countries as a reaction to oil prices fluctuation; the previous research will be considered.

In the first section the researchers provide an introduction and the purpose of the study. The second part presents the literature review. In the third section methodology of the research is described; i.e. hypotheses, tools, and a model, which will be used for analysis of the collected data. Section four is devoted to the elaboration of obtained results. Section five is the last one, in it conclusions and research limitations are presented.

2. Literature review. Oil price fluctuation: concept and historical overview

Shortage and oversupply of oil are conditioned by policies of OPEC. The price of the oil is basically a spot price per barrel, which is used as a reference price for buyers and sellers of oil. The spot price of oil is basically used for the grading purpose. It consists of four benchmarks, which include:

- West Texas Intermediate (WTI)
- Brent Blend
- Dubai Crude
- OPEC Reference Basket (ORB)

The above oils have their own demand and supply, which means that their prices are also changing in own way. The major effect of oil prices fluctuations appears due to the supply distraction and also due to the radical disturbance in the Middle East (Tverberg 2010).

Oil prices shocks are a phenomenon, which differs from oil price fluctuation. Hamilton (2005) focused on the different events which were directly or indirectly impacted the oil prices. According to the researcher, the most worldwide oil prices tremors were caused by clashes which took place in the Middle East. The researcher examined the different events, which included World War II, Oil embargo in 1973-1974, 1978-1979, Iranian Revolution, Iran – Iraq war in 1980, Persian War in 1990-91 as oil prices oscillations factors. It can be easily observed, that the value of oil was not quite important then if to compare to nowadays. Hamilton (2011) argued in his paper that demand in oil never corresponded level of prices, as it could be expected. According to him, crude oil prices played an especially significant role in the global economy in the years 1971, 1979 and 2008.

The First Oil Shock (October 1973 – March 1974): in the year 1973, the Arab - Israel war commenced, what triggered the oil crisis. Then Syria and Egypt fight with Israel, and the USA played the role of a financial donor of Israel. That provoked boycott Persian countries and Iran on the supply of oil to the USA.

The Second Oil Shock (April 1979 – July 1990): in the year 1979 Ayatollah Khomeini seized power in Iran. The impact of this revolution on oil prices was huge and oil prices skyrocketed up from \$13 to \$32 bbl.

The First Oil Countershock (November 1985 – July 1986): the first oil countershock was recorded when Saudi Arabia cut down its production by almost 75% to reduce the prices of oil globally. On this action, 25% of prices were declined from 1985 to 1986.

Gulf War (July 1990 – November 1990): when Iraq was assaulted on Kuwait in the year of 1990, at that time Iraq was supplying 8% of world oil. United Nation banned on Iraq's global supply and Kuwait production was also completely shut down which create a shortage in the world market.

Asian Financial Crisis (January 1997 – December 1998): Asian financial crises were unpredictable; it also affects oil prices and production of oil in many countries including both OPEC and non-OPEC. The Third Oil Shock (December 2003 – June 2008): in that period price of oil fluctuated from \$16 to \$126. Prices of oil fluctuated due to the high demand from emerging economies. The third oil shock was not that difficult to handle by oil importing countries as compared to the previous two oil shocks because it is was smaller (Norman 1988).

Financial Crises (July 2008 - February 2009): the third oil shock was called a boom period, in which oil prices the first time reached the highest level. On the other hand, the time period within July 2008 to February 2009 is also considered as a global financial crisis, which caused a deep recession similarly as the great depression in the year of (1930).

The Fifth oil Countershock (September 2014 – February 2016): the countershock was caused by oversupply (oil shale and tar sands) and global recession, during which prices of oil fall from US\$105.79 to US\$44. i.e. decreased by 58.4%.

Oil Prices and Economic Activity. According to previous studies, oil prices' oscillation has an impact on economic activities through the channel of demand and supply, mainly. Bernanke (1983) argued that oil has a very important part of the production process or manufacturing. If the value of oil prices increases than, definitely, cost of production value also becomes high, and which ultimately fall the production process. Tatom (1988) discussed in his study that oil prices have also an adversative influence on the stock because due to growth in prices organization's cost rise. During the past history, prices of oil increased or decreased sharply, which are totally unpredictable to observe. If to review the past oil prices, it could be noticed a 76% rise in oil prices from

March 2007 to July 2008. On the other hand, 48% diminished in oil prices from July 2008 to October 2008. The high percentage change in oil prices surely affect the economic activities of any country. According to Arouri and Fouquau (2009), oil prices play a significant role in the economic activities of developed countries.

Oil prices and Exchange Rate. The exchange rate is the most important element of macroeconomic variables. Sadorsky (2001) investigated the relationship between oil prices and the emerging stock market. He considered the exchange rate index of major currencies, interest rate, oil supply, and world economic activity as variables. He found that exchange rate movement and change in oil prices are interlinked.

Oil Prices and Oil Exporting Countries. Dutch Disease Theory (Corden and Neary, 1982) explain the effect of oil prices increase on economic growth. According to the theory, an industrial structure can be changed due to an increase in the price level of oil prices. Oil exporting countries condition the higher concentration in the oil sector as compared to other non-traded sectors. It is claimed that higher oil prices may result in increase of the local currency value, what automatically increases the level of import of consumer goods. As the result, the competition among local producers would be reduced. According to this theory, increase of a level of oil prices is not fruitful for oil exporting countries (Van Wijnbergen 1986).

Oil Prices and Stock Market. According to the study, conducted by Jones and Kaul (1996), the impact of oil prices on stock market in United States of America and Canada appear to be significant. Huang et al. (1996) discussed the different channels through which oil prices can affect stock market. According to the researchers, when oil prices change, they affect costs of production, what, in its turn, influence prices in the stock market.

3. Methodology

Based on literature review, the following hypotheses were formulated:

H1: There is a relationship between Real stock market return and oil prices.

H2: There is a relationship between Real stock market return and Industrial Production.

H3: There is a relationship between Real stock market return and the Short Term Interest Rate.

A variable of real stock market return is a dependent variable, and other variables, such as oil prices, industrial production and short-term interest rate, are independent variables. Similar variables were used in the research of Park and Ratii (2008) and Papapetrou (2001).

All data all are secondary. They embrace period from September 2009 to August 2016 on a monthly basis. Data of oil prices was collected from oil intelligence website. The benchmark, which is considered for this study, was Burnett oil (this variable is considered as an independent variable). Data for other variables, i.e. industrial production index and short-term interest rate, were collected from OECD website database for G7 countries. They both are also considered as independent variables. One more variable, which is very important and is a base of this study, is stock market return. Data of G7 countries stock indices are collected from the OECD database. For the purpose of real stock market return and real industrial production, the study also considered Consumer prices index for inflation-adjusted proxy. G7 consumer prices index is collected from OECD wed database.

Statistical tools are: descriptive statistics and regression analysis. In the first step description of each selected variables is done. In the next step the impact of select variables on the dependent variable is indentified. In the third step, the F- test is performed. Further analysis will be conducted on the basis of the coefficient in which T-test is used to check the significance level of the select variables. Finally, the last step will be a correlation analysis.

The Arbitrage Pricing Theory was presented in the year of 1976 by Stephen Ross (Ross 1976). According to this theory, financial assets are linked with the different type of macroeconomics variables. Besides, the securities are linked linearly with other variables. We use model, in which return is priced with consideration of the different macroeconomic variables. Stock return is used as a dependent variable. Macroeconomic variables include oil prices, interest rate, and industrial production. Those variables are used as explanatory variables. Stock return reacts linearly after the change in descriptive variables.

Statistical description of G7 countries is provided in Table 1. Regression statistics is provided in Table 2 (Appendix B). R^2 is called the coefficient of determination, which allows to judge how the regression equation fits the statistics. It is simply how alteration of independent variable will be affect i the change of the dependent variables. In the case of Canada's stock return, the value of R^2 is 0.540001518. It means that about just 0.54 of the variation in the real stock return is explained by oil prices, industrial production, and short-term interest rate. When observed value is close to 1 it means that the sample regression line fits the data very well.

= F.INV.RT (Probability, Degree of Freedom)

= F.INV.RT (Probability, Regression, Residual)

= F.INV.RT (0.05, 3, 80)

= 2.718784982

In the above table, the value of F is 31.30453912 and the critical value is 2.71. It means that the real stock market has a correlation with other variables. In the case of Germany's stock return, the value of R^2 is 0.017502266 which almost close to 0 value. It means that about just 0.01 of the variation in the real stock return is explained by oil prices, industrial production, and short-term interest rate. When the observed value is close to 0, it means that the sample regression line almost does not fit the data.

= F.INV.RT (0.05, 3, 80)

= 2.718784982

In the above table, the value of F is 0.47504138, the critical value is 2.71. It means that the real stock market is not correlated with other variables. F test is not successful in the case of Germany.

In the case of Italy's stock return, the value of R^2 is 0.0267175, what almost close to 0 value. It means that about just 0.02 of the variation in the real stock return is explained by oil prices, industrial production, and short-term interest rate. = F.INV.RT (0.05, 3, 80)

= 2.718784982

In the above table, the value of F is 0.73202462, the critical value is 2.71. It means that the real stock market is not correlated with other variables. F test is not successful in the case of Italy.

In the case of Japan stock return, the value of R^2 is 0.01991456, what almost close to zero value. It means that about just 0.01 of the variation in the real stock return is explained by oil prices, industrial production, and short-term interest rate.

= F.INV.RT (0.05, 3, 80)

= 2.718784982

In the above table, the value of F is 0.5418455, the critical value is 2.71. It means that the real stock market has no correlation with other variables. F test is not successful in the case of Japan. In the case of the United Kingdom stock return, the value of R^2 is 0.014398061, what almost close to 0 value. It means that about just 0.014 of the variation in the real stock return is explained by oil prices, industrial production, and short-term interest rate.

= F.INV.RT (0.05, 3, 80)

= 2.718784982

In the above table, the value of F is 0.389557151 and the critical value is 2.71. It means that the real stock market does not correlate with other variables. F test is not successful in the case of the United Kingdom.

In the case of US stock return, the value of R^2 is 0.00317609, what is almost close to zero value. It means that about just 0.31 of the variation in the real stock return is explained by oil prices, industrial production, and short-term interest rate.

= F.INV.RT (0.05, 3, 80)

= 2.718784982

In the above table, the value of F is 0.08496561, the critical value is 2.71. It means that the real stock market is not correlated with other variables. F test is not successful in the case of the United State of America.

In the case of France stock return, the value of R^2 is 0.029654053, what almost close to 0 value. It means that about just 0.02 of the variation in the real stock return is explained by oil prices, industrial production, and short-term interest rate.

= F.INV.RT (0.05, 3, 80)

= 2.718784982

In the above table, the value of F is 0.814941046 and the critical value is 2.71. It means that the real stock market has no correlation with other variables. F test is not successful in the case of the United State of France. According to Table 3 (Appendix C), Canada, Germany, Italy, Japan, UK, USA and France demonstrates that the change of oil prices, industrial production, and interest rate, all are insignificant for real stock return.

Conclusions

Role of oil prices appear to be in focus of scientists and practitioners during the recent decades. The reason is that to change in oil prices affect economies of oil importing countries. This research examined how stock market return of G7 countries react to change of oil prices. This study has shown that not all considered countries are sensitive to change of oil prices.

Let us recall that in this study, the real stock return has considered as a depended variable or predict variable, while oil prices, industrial production, and short-term interest rate as independent or predictor variables. All data has collected from OECD website, and prices of oil were taken from oil intelligence report. Stock market performance reacts negatively to the increase of oil prices in Germany, Italy, France and Japan. Industrial production is positively associated with a real stock return in the case of Germany, Italy, Japan, the United Kingdom and France. While the short-term interest rate is negatively connected with a real stock return in the case of Canada, United Kingdom and United States of America. Research limitations: performance of any stock exchange is affected by wide array of factors, therefore the research results may change if other factors were considered.

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Tables and Graphs

Appendix A

Table 1. Description of G7 countries (September 31, 2015 –August 31, 2016)

	CANADA			GERMANY			ITALY			JAPAN		
	RSR	LNIP	IR	RSR	LNIP	IR	RSR	LNIP	IR	RSR	LNIP	IR
Mean	-0.99	4.664	0.986	-0.000	4.673	0.4682	0.000	4.555	0.467	-0.000	4.579	0.271
Standard Error	3.760	0.004	0.028	0.000	0.005	0.056	0.000	0.004	0.056	0.000	0.003	0.012
Median	-0.99	4.667	1.16	-0.000	4.693	0.3	0.000	4.541	0.3	-0.000	4.582	0.27
SD	0.000	0.044	0.263	0.005	0.055	0.521	0.006	0.039	0.521	0.005	0.032	0.111
SVariance	1.188	0.001	0.069	3.386	0.003	0.271	4.654	0.001	0.272	3.478	0.001	0.012
Kurtosis	1.108	-0.85	0.155	3.593	2.435	-0.574	-0.44	-0.76	-0.58	-0.38	2.781	-0.113
Skewness	0.764	-0.49	-1.20	0.903	-1.78	0.625	0.051	0.739	0.626	0.247	-1.304	0.240
Minimum	-0.99	4.564	0.376	-0.014	4.495	-0.3	0.031	0.140	1.9	-0.013	4.457	0.06
Maximum	-0.99	4.723	1.189	0.025	4.737	1.6	-0.01	4.504	-0.3	0.013	4.629	0.54
Count	84	84	84	84	84	84	0.018	4.644	1.6	84	84	84

	UK			USA			FRANCE		
	RSR	LNIP	IR	RSR	LNIP	IR	RSR	LNIP	IR
Mean	0.000	4.585	0.653	-0.000	0.263	0.263	-7.474	4.607	0.480
Standard Error	0.000	0.001	0.019	0.000	0.014	0.014	0.000	0.001	0.056
Median	4.858	4.587	0.57	-0.000	0.24	0.24	-9.045	4.606	0.28
Standard Deviation	0.004	0.017	0.179	0.004	0.131	0.131	0.005	0.017	0.518
Sample Variance	1.658	0.000	0.032	1.905	0.017	0.017	3.245	0.000	0.268
Kurtosis	0.066	-0.378	0.394	0.750	0.477	0.477	-0.344	-0.213	-0.617
Skewness	0.167	-0.211	1.225	0.267	1.080	1.080	0.279	0.308	0.613
Minimum	-0.008	4.541	0.47	-0.012	0.11	0.11	-0.011	4.571	-0.29
Maximum	0.009	4.624	1.11	0.011	0.62	0.62	0.016	4.656	1.6
Sum	0.001	389.7	55.58	84	84	84	84	84	84

Appendix B**Table 2.** Regression statistics of G7 countries

	CANADA	GERMANY	ITALY	JAPAN	UK	USA	FRANCE
Multiple R	0.73484795	0.13229612	0.163454	0.141118	0.1199919	0.056356	0.1722035
R Square	0.54000151	0.01750226	0.026717	0.019914	0.0143980	0.003176	0.0296540
Adjusted R Square	0.52275157	-0.01934139	-0.00978	-0.01683	-0.0225620	-0.034204	-0.006733
Standard Error	0.00023812	0.00587543	0.006855	0.005947	0.0040999	0.004439	0.0057159
F Statistics	31.3045391	0.47504138	0.732024	0.541845	0.3895571	0.084965	0.8149410
Observations	84	84	84	84	84	84	84

Appendix C**Table 3.** Countries stock return value analysis

	CANADA			GERMANY		
	OP	LNIP	IR	OP	LNIP	IR
P Value	0.074271977	2.48083E-06	0.164243448	0.72559686	0.33298899	0.33276159
	ITALY			JAPAN		
	OP	LNIP	IR	OP	LNIP	IR
P Value	0.98491183	0.33792517	0.33792517	0.33792517	0.3697064	0.50047671
	UK			USA		
	OP	LNIP	IR	OP	LNIP	IR
P Value	0.35905009	0.48788738	0.891075269	0.76015991	0.73638268	0.81934329
	FRANCE					
	OP	LNIP	IR			
P Value	0.842119538	0.34397682	0.535256008			

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