Review of Socio-Economic Perspectives **Horobet, A. et. al., pp. 1-15**
Vol. 4. Issue: 2/ December 2019

DOI: 10.19275/RSEP067
Received: *11.05.2019*
Accepted: *23.10.2019*

OIL PRICE EXPOSURE OF CEE FINANCIAL COMPANIES

Alexandra Horobet
Professor, Ph.D., The Bucharest University of Economic Studies, Romania
alexandra.horobet@rei.ase.ro

Georgiana Maria Vrinceanu
Ph.D. candidate, The Bucharest University of Economic Studies, Romania
georgiana.maria.vrinceanu@gmail.com

Lucian Belascu
Professor, Ph.D., "Lucian Blaga" University of Sibiu, Romania
lucian.belascu@ulbsibiu.ro

Abstract

In recent years an alarming situation concerning the global financial markets is represented by the fact that Brent crude oil price and stock prices created the impression that they are strongly correlated. Besides, crude oil represents an indispensable and critical resource for the world economy and European Union member countries are net oil importers. In this general framework, the main purpose of this paper is to investigate the exposure to oil price risk of financial companies listed on stock exchanges from Central and Eastern European countries using monthly datasets covering the period between January 2011 and December 2018. The empirical analysis includes financial companies from seven economies from Central and Eastern Europe, all EU members and oil importers: Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia. We use Brent crude oil prices, companies' stock returns, local stock market indices, the Dow Jones Europe Financials Index and foreign exchange rates of the domestic currencies against the US dollar, as well as an index that capture the financial sector – related stress (CLIFS) in order to shed light on the idiosyncrasies of the oil price – returns relationship. The relevance of financial companies' exposures to oil price changes is identified using the panel data methodology in a traditional OLS structure, as well as in a dynamic ARDL panel estimation that capture the long-run versus the short-run exposure of CEE financial companies to oil price risk. Our results suggest that oil price fluctuations impact the stock prices of financial companies from CEE countries, but the link between stock return and oil price risk has some specificities and is mostly observable on the long run. The oil price changes have a negative impact on companies' stock returns, thus proving that they should be understood as a risk factor for the financial sector. At the same time, our results indirectly highlight the ubiquitous exposure of CEE economies to market risk factors and the worrying role of economy-wide risk transmitter of the financial sector.

Keywords: Oil price, Exposure, Central and Eastern Europe, Financial sector.

JEL Classification : F23, G15, G32

Citation : Horobet, A. et. al. (2019). Oil Price Exposure of CEE Financial Companies, Review of Socio-Economic Perspectives, Vol 4(2), pp. 1-15, DOI : 10.19275/RSEP067.

1. Introduction

Crude oil represents today the most treasured resource for the world economy. Fluctuating oil prices have the potential to impact the monetary, fiscal and structural policies based on a country status of oil importer or exporter. Between 2011 and 2014, the price of Brent crude oil seemed approximately stable at around $105 per barrel but since June 2014 it has plunged to reach the lowest level in twelve years in February 2016, when it fell to $30 per barrel. Still, until the end of 2016 the price of Brent crude oil bounced back (Khandelwal et al, 2016). After 2016, the price of Brent crude oil fluctuated less, with the minimum value reached in December 2018 ($52.16) and the maximum in January 2018 ($86.29).

These changes in crude oil prices seem to have a crucial impact on the entire world economy, on the global inflation rate, on the exchange rates and on the revenue of domestic and global corporations. Recently, an alarming issue is represented by the fact that oil prices and stock prices appear to be positively correlated. A possible explanation might be that oil price fluctuations influence the stock prices and corporations' values, even beyond the industries that are normally exposed to oil price changes. Based on the assumption that a stock's price represents the sum of the discounted expected future cash flows provided to investors by the issuer of the stock, as long as these future cash flows are impacted by the macroeconomic developments at the level of price fluctuations, then stock values are connected to oil prices.

Our research hypothesis builds on this economy-wide impact of oil price fluctuations, particularly for small open economies, such as the ones from Central and Eastern Europe (CEE). Thus, our goal resides in investigating the exposure to oil price changes of a set of financial companies from the region, that are not directly affected by variations in oil price. Our paper contributes to the academic literature and debate on the relationship between oil price fluctuations and the market value of companies from various sectors in CEE. We show that CEE financial companies are surprisingly exposed to systemic risk in a rather pervasive manner and that the specific exposure to oil price changes is one of the main sources of systemic risk for them.

The paper is structured as follows. Section 2 presents the empirical literature on the relationship between oil price changes and stock returns. Section 3 describes the data and the research methodology. Our findings and results are presented and then discussed in Section 4. Finally, Section 5 concludes.

2. Literature review

The academic literature on the impact of oil price risk on the market value of financial companies is still growing, as only a few studies have tackled this topic of research. The current empirical evidence indicates that oil price changes correspond with fluctuations in stock prices although the results are rather mixed. For example, authors like Hamao (1988), Huang et al. (1996), Jones and Kaul (1996), Cong et al (2008), or Jammazi and Aloui (2010) found no relationship between oil price fluctuations and stock market returns. Nevertheless, other authors like Sadorsky (1999) or Ciner (2001) provided opposite findings. These authors concluded that oil price fluctuations proved to be essential for analyzing the stock market returns.

The investigation of the impact of oil price fluctuations on the stock market industrial sectors was quite reticent thus far even though it is absolutely imperative taking into consideration the fact that every single industry may present specific responses to oil price fluctuations and investors must take these responses into account in the form of risk premiums. Also, the aggregate stock market indices from different countries are not capable to incorporate the comprehensive link between oil price movements and stock market returns and research at the stock market industrial sector level would be considerably useful. Some noteworthy examples of studies on the impact of oil price fluctuations on the stock market industrial sectors are Arouri and Nguyen (2010) and Arouri (2011), which both conclude that stock prices' reactions to changes in oil prices depend significantly on the activity sector. Thus, Arouri and Nguyen (2010) studied the relationship between oil price changes and European stock market returns using the Dow Jones Stoxx 600 index and twelve industrial sector indices from European countries. They conclude that the Food and Beverages, Health Care and Technology sectors display negative responses to oil price increases, while other sectors like the Financial, Oil and Gas, Industrials, Basic Materials and Personal and Household Goods sectors show positive responses. One year later, in a subsequent study, Arouri (2011) found that the Oil and Gas sector exhibits a positive response to oil price movements, while the Financials and Consumer Goods sectors exhibits a negative response to oil price movements. Also for Europe, Scholtens and Yurtsever (2012) found that the impact of significant changes in oil prices at the industry level in the Euro area varies considerably depending on the industry over the period 1983-2007. At the same time, they show that most Euro-area industries would benefit from a decline in oil prices.

The same year, Narayan and Sharma (2011) investigate the relationship between changes in oil price and stock prices of a number of 560 American companies listed on NYSE. With the help of a GARCH-based methodology, they show that oil price changes induce asymmetric effects on stock returns, moderated by the specific activity sector of the company. Thus, while some sectors exhibit a negative response to positive oil price shocks – Banking, Chemical, Computer, Food, General Services, Manufacturing, Medical Services, Real Estate, Supply and Transportation -, other sectors such as Energy have shown positive responses to positive oil price shocks. At the same time, the results proved to be inconclusive for the Electricity, Engineering and Financial sectors. Also for the United States, Elyasiani et al. (2011) examined the impact of oil price fluctuations on industry stock returns for thirteen US industries. The industries were divided in four main categories, based on their relationship to oil: oil-users, oil-substitute, oil-related and financial industries. The authors revealed that oil price changes have positive effects on oil-related and oil-substitute industries, but this effect is negative for the industries that are mainly oil-users and also for financial industries. Degiannakis et al. (2013) continue the previous investigations of the afore-mentioned authors and examine the time-varying relationship between oil prices and industrial sector indices in Europe. Their results confirm that the link between industrial sectors' indices returns and oil price changes is influenced by the type of industry but further conclude that this link is influenced by the origin of oil price shocks.

Specifically concerning the financial sector, the results presented in the literature tend to be inconclusive until now. Generally, the findings show the effects of oil price changes might be inconsiderable for the financial sector, which is a non-oil-related sector.

Gogineni (2010), for example, confirmed in his study these findings and clarified them by the supply chain dependency to oil markets that represents the key to proving the impact of oil price fluctuations in any sector.

So far, only few studies have tackled the impact of changes in oil prices on the various industrial sectors in Central and Eastern European countries, as researchers seemed less interested in examining the particularities of this phenomenon in this region. Of these few studies, we mention Asteriou and Bashmakova (2013) that use an international multi-factor model in a panel data framework to examine the link between oil price shocks and stock prices returns from CEE. They identify a negative exposure of stock returns to changes in oil prices, which becomes more significant when oil prices are low. At the same time, Mohanty et al. (2010) studied the link between oil price changes and stock prices of oil and gas companies in a selection of CEE countries between 1998 and 2010, but their findings showed no significant exposure of CEE companies to changes in oil prices.

3. Data and research methodology

Our empirical analysis is conducted on seven economies from Central and Eastern Europe, all European Union members and oil importers - Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia -, for the sample period between January 2011 and December 2018. We use Brent crude oil prices, financial companies' stock prices (logarithmic return from end-of-month values) and the following local stock market indices: CROBEX for Croatia, FTSE for Hungary and Czech Republic, WIG for Poland, BET for Romania, SAX for Slovakia and Blue-Chip SBITOP for Slovenia. Table 1 presents the specific set of 20 selected financial companies and the local stock market indices employed for each CEE country in our sample. The financial companies were selected based on the maximum data availability for the period included in our analysis.

Table 1. Data on companies and market indices used in our research

Country	**Local stock market index**	**Financial company**	**Market capitalization[1] (EUR billion)**
Croatia	CROBEX	Zagrebacka Banka	2.620
Czech Republic	FTSE CZECH REPUBLIC	Erste Group Bank AG	12.293
		Komercni Banka	5.987
		Vienna Insurance AG	2.971
Hungary	FTSE HUNGARY	OTP Bank	10.364
		Takarek Mortgage Bank	0.130
		CIG Pannonia	6.592
		Forras Vagyonkezelesi Befektetesi	3.217
Poland	WIG	UniCredit	21.376
		Powszechna Kasa Oszczednosci (PKO) Bank Polski	11.271
		Santander Bank Polska	7.218
		Powszechny Zaklad Ubezpieczen (PZU SA)	7.394
		ING Bank Slaski	5.664
Romania	BET	Erste Group Bank AG	12.284
		Banca Transilvania	2.587
		BRD Groupe	1.985
		Patria Bank	0.054
Slovakia	SAX	Vseobec Uverova Banka	0.653
Slovenia	Blue-Chip SBITOP	Pozavarovalnica Sava dd (Sava Reinsurance Plc)	0.262
		KD Group	0.209

Note: [1] Market capitalization is calculated in euro at the current market exchange rates of the local currencies against the euro on August 26, 2019.

Source: Authors' own research

Also, we include in our analysis the Dow Jones Europe Financials Index as a leading EU market indicator of financial sector performance, as well as the local currencies exchange rates against the USD. The exchange rates are important transmitters of risks in any open economy, as is the case with all the countries included in our sample; moreover, changes in exchange rates also incorporate the effects of changes in net foreign direct and portfolio investments, which influence the performance of the financial sector in the CEE region – see, for example, Gal (2013) and Eller, Haiss and Steiner (2006). In addition to these variables we include in our investigation a measure of stress at the level of financial sector, specifically the Country-Level Index of Financial Stress (CLIFS) published by the European Central Bank. The calculation of the index is based on the work of Duprey, Klaus and Peltonen (2015) and includes six measures of financial stress associated to three financial market segments (equity, bond and foreign exchange), as well as the co-movements across these market segments. Data was collected with monthly frequency from The World Bank, Eurostat database, European Central Bank Data Warehouse and Bloomberg. All variables are included in the analysis in a log format of their initial values.

In order to determine the relationship between stock prices of CEE financial companies, oil prices and other macroeconomic variables, we consider the panel data as the base econometric model. The benefits of panel estimation are related, according to Greene (2018), to higher data variability and number of degrees of freedom, as well as less collinearity among the variables, which results in more efficient and robust estimates. We apply first the traditional Panel Ordinary Least Square (OLS) approach in order to estimate the long-run relationship between all these variables, but it further sophisticates the OLS approach with a Dynamic Panel estimation in an ARDL (Auto-Regressive Distributed Lags) framework with the aim of identifying the idiosyncrasies of the short versus long-run exposure of CEE financial companies to oil price changes.

The OLS specification is based on the following equation:

$$Y_{it} = \alpha_{it} + \beta_{it} X_{it} + \gamma_{it} + \varepsilon_{it} \qquad (1)$$

Where Y_{it} is the dependent variable represented by the logarithmic return of the selected financial companies' stock prices (PRICE), i denoting firms (the cross-section dimension), while t denoting time, α_{it} is is the overall constant of the model that captures the effects of those variables that are constant over time, β_{it} denotes the exposure coefficients and X_{it} is a vector which includes independent variables: Oil price (OIL), Domestic stock market index (INDEX), Dow Jones Europe Financials Index (DJFI), the Country-Level Index of Financial Stress (CLIFS) and the domestic currencies' exchange rate against the USD (FX). γ_{it} capture the cross-section fixed effects, α_{it} is the overall constant of the model and α_{it} is the error terms for i=1 to M cross-sections observed for periods t=1 to T; $\alpha_{it} \sim N(0,\sigma_{\varepsilon}^2)$, where M=20 and T=96. Ten OLS panels have been estimated, including no effects and fixed cross-effects, and varying the independent variables in order to test the robustness of our results.

ARDL models became popular for estimating long-run relationships between variables in recent years, although econometricians used them for a rather long time.

Unfortunately, the use of ARDL models that include among the regressors lags of the dependent variable and independent variables becomes challenging in a panel framework that contains cross-section effects, due to the potential bias that may be caused by the correlation between the mean-differenced regressors and the error term (Pesaran and Shin, 1999). While the bias fades when the number of observations (T) is high, given that the number of cross-sectional units in our panel is smaller than the number of periods we address this issue by employing GMM estimators in a Dynamic panel data framework (Arrellano-Bond, 1991). In large panels, the assumptions behind Dynamic GMM tend to be inappropriate and the estimators fail; when this happens, the Pooled Mean Group (PMG) estimator proposed by Pesaran, Shin and Smith (1999) is a viable alternative to the Dynamic GMM. The PGM model adapts the cointegration format of the traditional ARDL in a panel framework by allowing the intercepts, cointegrating terms and short-run coefficients to be different between cross-sections. The ARDL model is written as follows:

$$\Delta Y_{it} = \varphi EC_{it} + \sum_{j=0}^{q-1} \beta_{ij} \Delta X_{i't-j'} + \sum_{j=1}^{p-1} \delta_{ij} \Delta Y_{it-j} + \varepsilon_{it} \qquad (2)$$

$$EC_{it} = Y_{it-1} - \theta X_{it'} \qquad (3)$$

The model assumes that the same number of lags is present in each cross-section for the dependent variable and the independent variables. Overall, five ARDL panels were estimated for the identification of long-run and short-run cross-section coefficients; similar to the OLS panel estimation, we vary the number of independent variables included in the model in order to test for results' robustness. The optimal model in terms of number of lags is found based on the Akaike criterion (AIC). Eviews 10 has been used for estimating the panel equations. All results are presented and discussed in the next section.

4. Main results and discussions

A number of stationarity tests have been applied to our series and panels, such as Levin-Lin-Chu t test (Levin et al., 2002) for commom unit root processes, and Im-Pesaran-Shin test (Im et al., 2003) and the ADF-Fisher Chi-square test (Choi, 2001) that assume individual unit root processes. These tests indicated that panels were stationary at first difference in all specifications[1].

We present first the results of the OLS panel estimation in Table 2. For all panel specifications we interpret and discuss only statistically significant coefficients at least at 5% level. The first observation to be made is that all variables, except for CLIFS, show statistically significant coefficients in at least one panel specification. We interpret the

[1] Results are available from the authors.

lack of statistically significant coefficients for CLIFS, which is an indicator of stress at the level of the financial sector, as an inclusion of financial stress by market investors in the overall level of market risk, which is significantly indicated by the coefficients attached to the domestic market indices. We also note that the CEE financial companies' exposure to market risk is present and positive in all panel specifications, thus suggesting a risk premium included in financial companies' valuation by market investors. This exposure is accompanied by the pervasive exposure to the global financial risk, taken into account in our analysis by the DJFI; the positive signs of the coefficients indicate, as in the case of domestic stock indices, a risk premium included by market investors in the return of CEE financial companies.

The exposure to oil price fluctuations revealed by the OLS panel estimations has interesting particularities; as such, the statistically significant coefficients are all negative, suggesting that CEE financial companies stock returns benefit from a decline in the price of oil. This is consistent with the expectation that CEE economies generally benefit from reductions in the price of oil, as this positively impacts their imports of oil. At the same time, and rather curious, the exposure to oil price of CEE financial companies is present when both domestic market indexes and DJFI are included in panel specifications; although this needs further investigation, at first sight we might interpret it as a lack of acknowledgement by market investors of the exposure to oil price fluctuation of financial companies in the region in the absence of their exposure to market risk. Thus, it seems that market investors consider the financial companies' exposure to oil price fluctuations as a residual exposure that is emphasized by the companies' general exposure to market risk.

Last, but not least, we observe a negative exposure to foreign exchange rates of local CEE currencies against USD, which links an appreciation of the USD and a depreciation of local currencies to higher returns of CEE financial companies; this is rather surprising, as a stronger USD is associated to higher oil import bills and current account deficits and, in the end, higher market risk.

Table 2. OLS Panels estimated for CEE countries

Panel specification	**α**	**INDEX**	**DJFI**	**OIL**	**CLIFS**	**FX**	**Adj. R^2**	**S.E. of regression**	**F-stat**
No effects	0.0012	0.6930*	0.2171*	-0.0328**	0.0001	-0.0007	0.433	1.001	290.802*
Fixed effects	-0.0004	0.6961*	0.2133*	-0.0319	0.0002	-0.0007**	0.436	1.006	62.266*
No effects	0.0020	--	0.5141*	-0.0114	-0.0023	-0.0012**	0.128	1.000	70.857*
Fixed effects	0.0014	--	0.5125*	-0.011	-0.0020	-0.0010**	0.131	1.005	13.457*
No effects	0.0016	0.8170*	--	-0.0039	-0.0016	-0.0010*	0.386	1.000	298.970*
Fixed effects	-0.0009	0.8205*	--	-0.0037	-0.0014	-0.0010*	0.392	1.005	54.236*
No effects	0.0012	0.6931*	0.2169*	-0.0329**	--	-0.0007	0.433	1.000	363.721*
Fixed effects	-0.0004	0.6961*	0.2128*	-0.0319**	--	-0.0007**	0.437	1.006	65.011*
No effects	0.0010	0.6969*	0.2241*	-0.0319**	0.0000	--	0.433	1.000	362.891*
Fixed effects	-0.0005	0.7006*	0.2205*	-0.0309*	0.0000	--	0.436	1.006	64.750*

Note: * and ** denote statistical significance at 1% and 5% levels, respectively. INDEX – local stock market index, DJFI – Dow Jones Europe Financials Index, OIL – price of oil, CLIFS - Country-Level Index of Financial Stress, FX – local currency exchange rate against the USD, Adj. R^2 - Adjusted R-squared, S.E. - Standard Error of the Regression, F-stat – F statistic. The -- cells indicate that the variables were eliminated from the panel equation.

Source: Authors' own research results.

The cross fixed-effects panel specifications do not show different results compared to the no effects specifications, which might indicate the rather homogeneous financial sector frameworks among CEE countries. Moreover, the indicators of panel regression fit demonstrate insignificant differences between the fixed cross-effect and the no effects specifications, thus confirming our previous conclusion.

Still, besides the interesting results obtained when we employed the OLS panel regressions, their static approach is not sufficient for a comprehensive understanding of CEE financial companies to oil price risk. Therefore, we complement and extend the

OLS panel regressions with a dynamic OLS panel estimation in the ARDL framework. The main advantage of this methodology resides in identifying and contrasting the long-term versus short-term relations between the variables, which allows for a better view of the valuation of CEE financial companies' stocks by investors in the market. Moreover, the ARDL approach is superior to the standard OLS panel estimation given its ability to better handle cross-sections specificities. Table 3 presents the results of the ARDL panels estimated for CEE countries' financial companies.

First, we notice the presence of a significant cointegration between the returns of CEE financial companies and the set of variables included in the ARDL panel estimations, which shows a long-run relationship between them. Second, there is a long-run exposure of CEE financial companies to market and financial risk, indicated by the statistically significant positive coefficients for INDEX and DJFI in the Long run equation. At the same time, the long-run exposure to oil price fluctuations is less strong, compared to the results obtained in the case of the OLS estimation, and somehow confusing, as the identified statistically significant coefficients – in Panels 2 and 3 – are positive and negative; overall, we interpret this result as an absence of a long-run exposure of CEE financial companies to oil price risk.

Table 3. ARDL Panels estimated for CEE countries

Panel	**Selected model**	**Long run equation**								**S.E.**	**LL**
		INDEX	**DJFI**	**OIL**	**CLIFS**	**FX**					
Panel 1	ARDL(2,1,1,1,1,1)	1.345*	0.577*	-0.084	0.015	0.109				0.078	2682.74
		Short-run equation									
		Cointeq1	**PRICE(-1)**	**INDEX**	**DJFI**	**OIL**	**CLIFS**	**FX**	□		
		-0.054*	-0.043	0.614*	0.206	-0.015	0.000	-0.104	-0.408*		
		Short-run statistically significant cross-section coefficients - number and signs				9 (+); 5 (-)					
Panel 2	ARDL(2,1,1,1,1)	**Long run equation**								0.084	2395.99
		INDEX	**DJFI**	**OIL**	**CLIFS**	**FX**					
		--	2.269*	-0.053*	0.095	1.919*					
		Short-run equation									
		Cointeq1	**PRICE(-1)**	**INDEX**	**DJFI**	**OIL**	**CLIFS**	**FX**	□		
		-0.029*	-0.065	--	0.392*	0.015	-0.005	-0.292**	-0.266*		
		Short-run statistically significant cross-section coefficients - number and signs				8 (+); 6 (-)					
Panel 3	ARDL(2,1,1,1,1)	**Long run equation**								0.083	2579.48
		INDEX	**DJFI**	**OIL**	**CLIFS**	**FX**					
		1.356*	--	0.215**	-0.102*	0.488					
		Short-run equation									
		Cointeq1	**PRICE(-1)**	**INDEX**	**DJFI**	**OIL**	**CLIFS**	**FX**	□		

		-0.048*	0.000	-0.044	0.705*	-0.007	-0.001	-0.292*	-0.420*		
		Short-run statistically significant cross-section coefficients - number and signs				6 (+); 6 (-)					
Panel 4	ARDL(2,1,1,1,1)	**Long run equation**								0.078	2672.02
		INDEX	**DJFI**	**OIL**	**CLIFS**	**FX**					
		1.342*	0.553*	-0.080	--	0.112					
		Short-run equation									
		Cointeq1	**PRICE(-1)**	**INDEX**	**DJFI**	**OIL**	**CLIFS**	**FX**	□		
		-0.050*	-0.040	0.611*	0.204	-0.010	--	0.307	-0.410*		
		Short-run statistically significant cross-section coefficients - number and signs				6 (+); 9 (-)					
Panel 5	ARDL(2,1,1,1,1)	**Long run equation**								0.079	2658.20
		INDEX	**DJFI**	**OIL**	**CLIFS**	**FX**					
		1.368*	0.588*	-0.100	0.014	--					
		Short-run equation									
		Cointeq1	**PRICE(-1)**	**INDEX**	**DJFI**	**OIL**	**CLIFS**	**FX**	□		
		-0.050*	-0.040	0.634*	-0.010	-0.012	0.000	--	-0.406*		
		Short-run statistically significant cross-section coefficients - number and signs				6 (+); 11 (-)					

Note: * and ** denote statistical significance at 1% and 5% levels, respectively. INDEX – local stock market index, DJFO – Dow Jones Europe Financials Index, OIL – price of oil, CLIFS - Country-Level Index of Financial Stress, FX – local currency exchange rate against the USD, Adj. R^2 - Adjusted R-squared, S.E. - Standard Error of the Regression, LL – Log likelihood. The -- cells indicate that the variables were eliminated from the panel equation.

Source: Authors' own research results.

For what concerns the short-term exposure of CEE financial companies to our independent variables, we observe no overall exposure to oil price risk, but statistically significant cross-section coefficients in all estimations. At the same time, five companies show positive exposure in all ARDL panel specifications, five show negative exposure, four have both positive and negative exposure and one financial company (Patria Bank from Romania) has no exposure to the oil price risk. In the case of the latter, the lack of exposure may be explained by its small size (it is the smallest of the 20 financial companies included in our analysis). Thus, no categorical result on the idiosyncratic exposure of CEE financial companies' exposure to oil price risk may be observed.

Another interesting result is the lack of long-run exposure of CEE financial sector to currency risk, accompanied by a presence of a negative short-term exposure to foreign exchange rate fluctuations (in two of our panel estimations). Also, the panel regressions indicate no relevance of the lagged values of stock prices and returns for the actual values. At the same time, the statistically significant coefficients for the panel regression constant in all specifications point towards the existence of other influences on the CEE financial companies' returns, which deserve to be further explored.

5. Conclusion

The main purpose of this paper was to investigate the exposure to oil price risk of financial companies listed on stock exchanges from Central and Eastern European countries using monthly datasets covering the period between January 2011 and December 2018. This empirical analysis was conducted on seven economies from Central and Eastern Europe, all EU members and net oil importers: Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia.

Our results suggest that oil price fluctuations impact the stock prices of financial companies from CEE countries, but the link between stock return and oil price risk has some specificities. The oil price changes have a negative impact on the financial companies' stock returns, when the static OLS approach was considered, thus proving that they should be understood as a risk factor for the financial sector. On the other hand, the dynamic panel analysis shows that the exposure of financial companies' stock prices and returns is a long-term one, which makes the link to market risk more obvious. Moreover, given the lack of financial companies' exposure to oil price changes when the domestic market index and the Dow Jones Financial index are included, we believe that our results indirectly highlight the ubiquitous exposure of CEE economies to market risk factors and the worrying role of economy-wide risk transmitter of the financial sector. Thus, this raises serious challenges for macroeconomic policy authorities, as shocks in oil price may have the potential to impact the foreign currency reserve policy of central banks, on one hand, and to induce higher trade balance deficits and cost-push inflation, on the other hand. Moreover, the existence of this link between oil price changes and financial companies' stocks' returns could help financial investors to better diversify their portfolios and implement more efficient investment strategies.

Certainly our research has limits and one of the most important of them is represented by the rather small number of financial companies included in our sample; nevertheless, we believe that enlarging the sample, although it would offer better insight into the

pervasive exposure of financial companies to oil shocks, it would just reinforce our results. In this framework, an interesting future research direction resides in investigating in more detail the concrete channels that make possible the financial sector's exposure to changes in oil prices, including here the use of more sophisticated quantitative methodology.

References

Arouri, M.E.H., Nguyen, D.K. (2010). "Oil prices, stock markets and portfolio investment: evidence from sector analysis in Europe over the last decade". *Energy Policy*, 38(8), pp. 4528-4539.

Arouri, M.E.H. (2011). "Does crude oil move stock markets in Europe? A sector investigation". *Economic Modelling*, 28(4), pp. 1716–1725.

Arrellano, M., Bond, S. (1991). "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations". *Review of Economic Studies*, 58(2), pp. 277-297

Asteriou, D., Bashmakova, Y. (2013). "Assessing the impact of oil returns on emerging stock markets: A panel data approach for ten Central and Eastern European Countries". *Energy Economics*, 38, pp. 204–211.

Choi, I. (2001). "Unit root tests for panel data", Journal of International Money and Finance, 20(2), pp. 249-272.

Ciner, C. (2001). "Energy shocks and financial markets: nonlinear linkages". *Studies in Nonlinear Dynamics and Econometrics*, 5(3), pp 1079-1079.

Cong, R-G., Wei, Y-M., Jiao, L-J., Fan, Y. (2008). "Relationships between oil price shocks and stock market: An empirical analysis from China". *Energy Policy*, 36(9), pp. 3544-3553.

Degiannakis, S., Filis, G., Floros, C. (2013). "Oil and stock returns: Evidence from European industrial sector indices in a time-varying environment". *Journal of International Financial Markets, Institutions and Money*, 26, pp. 175-191.

Dritsaki, C., Dritsaki, M. (2014). "Causal Relationship between Energy Consumption, Economic Growth and CO2 Emissions: A Dynamic Panel Data Approach". *International Journal of Energy Economics and Policy*, 4(2), pp. 125-136.

Duprey, T., Klaus, B., Peltonen, T. (2015). "Dating systemic financial stress episodes in the EU countries", European Central Bank Working paper Series No. 1873, https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1873.en.PDF

Eller, M., Haiss, P., Steiner, K. (2006). « Foreign direct investment in the financial sector and economic growth in Central and Eastern Europe: The crucial role of the efficiency channel". *Emerging Markets Review*, 7(4), pp. 300-319.

Elyasiani, E., Mansur, I., Odusami, B. (2011). "Oil price shocks and industry stock returns". *Energy Economics*, 33(5), pp. 966-974.

Gál Z. (2013). "Role of financial sector FDI in regional imbalances in Central and Eastern Europe". in the *Eurozone enlargement: challenges for the V4 countries*, pp. 20-28 Agataí Gostyńska, Paweł Tokarsk, Patryk Toporowski, Damian Wnukowski (ed.). Warsaw: The Polish Institute of International Affairs.

Gogineni, S. (2010). "Oil and the stock market: an industry level analysis". *Financial Review*, 45(4), pp. 995-1010.

Greene, W.H. (2018). Econometric Analysis, NY:Prentice Hall

Hamao, Y. (1988). "An empirical examination of the arbitrage pricing theory: using Japanese data". *Japan and the World Economy*, 1(1), pp. 45–61.

Huang, R.D. et al, (1996). "Energy shocks and financial markets". *Journal of Futures Market*, 16(1), pp. 1–27.

Im, K. S., Pesaran, M.H., Shin, Y. (2003). "Testing for unit roots in heterogeneous panels". *Journal of Econometrics*, 115(1), pp. 53-74.

Jammazi, R., Aloui, C. (2010). "Wavelet decomposition and regime shifts: Assessing the effects of crude oil shocks on stock market returns". *Energy Policy*, 38(3), pp. 1415-1435.

Jones, C.M., Kaul, G. (1996). "Oil and the stock markets". *The Journal of Finance*, 51(2), pp. 463–491.

Levin, A., Lin, C-F., Chu, C-S.J. (2002). "Unit root tests in panel data: Asymptotic and finite sample properties". *Journal of Econometrics* 108(1), pp. 1-24.

Khandelwal, P. et al, (2016). *The Impact of Oil Prices on the Banking System in the GCC*. IMF Working Paper WP/16/161, International Monetary Fund, https://www.imf.org/external/pubs/ft/wp/2016/wp16161.pdf

Mohanty, S.K. et al, (2010). "Oil shocks and stock returns: The case of the Central and Eastern European (CEE) oil and gas sectors". *Emerging Markets Review*, 11(4), pp. 358-372.

Narayan, P. K., Sharma, S. S. (2011). "New evidence on oil price and firm returns". *Journal of Banking and Finance*, 35(12), pp. 3253-3262.

Pesaran, M.H., Shin, Y. (1999). "An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis." in the *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium*, Strom, S. (ed.) Cambridge: Cambridge University Press.

Pesaran, M.H., Shin, Y., Smith, R.P. (1999). "Pooled Mean Group Estimation of Dynamic Heterogeneous Panels". *Journal of the American Statistical Association*, 94(446), pp. 621-634

Sadorsky, P. (1999). "Oil price shocks and stock market activity". *Energy Economics*, 21(5), pp. 449–469.

Scholtens, B., Yurtsever, C. (2012). "Oil price shocks and European industries". *Energy Economics*, 34(4), pp. 1187-1195.