Foreign Exchange and Oil Exposure of CEE Companies: Risks for Investors in Financial and Energy Industries

Georgiana Maria VRÎNCEANU
Bucharest University of Economic Studies, Faculty of International Business and Economics, Romania
vrinceanugeorgiana16@stud.ase.ro

Alexandra HOROBEȚ
Bucharest University of Economic Studies, Faculty of International Business and Economics, Romania
"Lucian Blaga" University of Sibiu, Faculty of Economic Sciences, Romania
alexandra.horobet@rei.ase.ro

Abstract

The main aim of this paper is to analyse the exposure to exchange rate risk of 24 financial and energy companies from 4 Central and Eastern European countries, i.e., Romania, Hungary, Poland and Czechia, using datasets covering the period between January 2010 and December 2017. The largest listed companies from financial and energy industries were selected by market capitalization and based on available data for this period. This study investigates the link between stock prices and a number of variables, such as stock market indices, monthly changes in the exchange rate of the domestic currencies to the EUR and USD, real GDP growth rate, Brent crude oil prices and 1-year bond yields. Applying the panel data methodology, the findings indicate that for both types of companies, when considering the stock market index, significant exposure to this variable is discovered. When excluding this variable from the equation at the financial companies, there is a significant exposure to the change in the exchange rate of the domestic currencies to the both EUR and USD and unexpectedly, to the oil price changes, fact that displays a remarkable result for the financial companies. The price of crude oil had a much greater impact on the stock prices of the financial companies than it was expected and at the same time, it seemed to be a risk factor. For the energy companies, when removing the stock market index from the equation, significant exposure is found to the change in the exchange rates of domestic currencies to the EUR and to the change in the price of oil. The exposure to Brent crude oil price turned out to be positive in both situations.

Keywords: currency risk; stock prices; stock market indices; panel data analysis; Central and Eastern Europe (CEE);

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1. Introduction

The exposure to foreign currency risk represents a major source of uncertainty for all businesses due to the fact that unexpected changes in exchange rates may have an impact on the future cash flows of the companies, but also on their decisions regarding their competitive positions. Unexpected fluctuations in exchange rates may influence and impact the value of the firms through various ways. For example, a corporation which sells goods abroad is clearly exposed to foreign currency risk because the value of the external sales in terms of the national currency changes at the same time with the exchange rate. The same corporation may also have assets and liabilities abroad, but this fact may increase or

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decrease the company's exposure to foreign currency risk. At the same time, the exposure to currency risk is not relevant only for some types of business, like exporters, importers, or multinational companies, as even a national company with no business abroad may be exposed to currency risk if there is competition on import. The exposure to currency risk is considered a general and sensitive issue for all companies and has a particular importance to any firm that operates and is involved in international transactions.

Crude oil is considered nowadays the most influential natural resource for the entire world economy. The COVID-19 pandemic, also known as the coronavirus pandemic, has radically altered global oil markets and the behaviour of every participant at them (Yager, 2020). In the early stages of the COVID-19 pandemic, the price of Brent crude oil has dropped significantly and starting June 2020, it seemed to have only relatively regained the pre-pandemic price levels. As shown in Figure 1, the price of Brent crude oil has recovered partially in June 2020 and it was trading at $41.04 per barrel.

Figure 1. Evolution of the price of Brent crude oil between 2000 and 2020

Source: BBC (2020), based on Bloomberg data.

An alarming situation which fascinated the researchers over time is that oil prices and stock prices seem to be positively correlated. A plausible explanation for this fact might be that oil price movements impact the stock prices and companies' values, even beyond those industries that are generally exposed to oil price fluctuations. On the basis of 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 changes, then stock values are linked to oil prices.

The rest of the paper is arranged as follows. The following section offers insights into the research directions and results in the existing literature. Section 3 presents the data and the research methodology. The main findings are presented and discussed in Section 4. Section 5 concludes, discusses the limits of this research, and outlines a few directions for future research.

2. Literature Review

Adler and Dumas (1984, p. 42) defined for the first time the exposure to currency risk as "*the amounts of foreign currencies which represent the sensitivity of the future, real domestic-currency (market) value of any physical or financial asset to random variations in the future domestic purchasing powers of these foreign currencies, at some specific future date*". The authors used this approach in order to determine the exposure to currency

risk of the US companies and found that even national companies have been affected by the exchange rate changes. It is important to note that most studies on this topic followed the approach of these two authors.

The literature in this field has been developed since the beginning of the ’90s and it was initially focused on the case of firms from developed countries, considering the higher data availability for performing tests.

Jorion (1990) was one of the first authors who made progress on the subject of exposure of US multinational corporations to foreign currency risk. He investigated the exchange rate exposure during 17 years between 1971 and 1987 and found out that stock prices of these corporations were not systematically influenced by changes in nominal exchange rates. He discovered that a relationship between the stocks’ prices and foreign exchange rates exists only in the situation when the firm is engaged in international business. In spite of the fact that such an exposure exists, the author points out that the risk seems to be diversifiable and hedging is not needed. Overall, empirical research regarding the exposure to currency risk has provided mixed results.

Some authors like Bartov and Bodnar (1994) or Choi and Prasad (1995) confirm Jorion’s results. At the same time, Miller and Reurer (1998) seem to discover a meaningful relationship between the US corporations’ stock prices and changes in the exchange rate of various currencies to the US Dollar.

Until now the authors were not keen on investigating the companies from CEE as they seemed to be in investigating companies from developed economies. Murinde and Poshakwale (2004) investigated the stock markets from Hungary, Poland and Czech Republic before and after an important historical event, the Euro adoption. Although the results were mixed for these three countries in the period before the adoption of the EUR, then, in the second period, the exposure to the exchange rates was significant for all the countries.

Vanhoutte (2012) investigated 58 exporting and national companies from Czech Republic, Hungary and Poland and examined the relationship between the stock prices and the exchange rates of the EUR and the USD between 1995 and 2012. The results showed that 60% of the investigated companies were exposed to the daily changes in the exchange rate of the Euro, while 50% of them had a significant exposure to the US Dollar. Moreover, the exposure to Euro is significant and positive for both exporters and national firms and higher compared to exposure to USD. Consequently, the depreciation of domestic currencies against the Euro had a negative impact on firms’ performance.

Horobet and Lupu (2005) are the first authors who analysed the exposure to currency risk of Romanian companies. They found insignificant exposures to the changes in the exchange rate of the national currency to the both Euro and US Dollar between 2000 and 2005.

The small number of studies on CEE countries is rather surprising as several factors make them an interesting region for analysing the exposure to currency fluctuations. The firms from the region have less access to financial instruments for hedging due to the less liquid financial market, which may also lead to a currency mismatch. The lack of opportunities to hedge and the high degree of trade integration show that the companies from CEE countries should be more vulnerable to currency shocks. Therefore, the analysis of their exposure to the Euro and US Dollar is relevant.

An interesting study on companies at the European Union level belongs to Horobet et al. (2019) who examined the linkage between financial companies’ stock prices and Brent crude oil price employing a large sample of financial firms with head offices in countries

from the European Union. The connection between stock prices and oil price risk was modelled employing several macroeconomic variables that consists of local stock market indices, the EUR/USD exchange rate, the oil imports dependency, the inflation rate, and global volatility indices. The authors employed the panel data as the base econometric model and as well an ARDL extension. Their findings indicate that the financial sector is exposed to oil price movements over the long-run and also, the authors detected signs of a different behaviour of market investors over the short-versus the long-run regarding the valuation of financial firms' stock prices in connection with oil prices and other macroeconomic variables.

3. Methodology

The analysis is undertaken for the period January 2010 – December 2017 and it includes four CEE countries: Romania, Hungary, Poland, and Czech Republic. This study investigates the exchange rate exposure of 24 financial and energy companies from these four countries and the long-term exposure is examined using monthly prices and returns. The largest listed companies from financial and energy sector were selected by market capitalization with available data for the investigated period. The relationship between stock prices of these listed companies and a number of variables are researched, such as stock indices (BET for Romania and MSCI for the other countries), monthly changes in the exchange rate of the domestic currencies (Romanian leu, Magyar forint, Polish zloty and Czech koruna) to the Euro and US Dollar, real GDP growth rate, oil price and 1-year bond yields of these selected countries. Data was collected from Bloomberg. Table 1 describes the particular set of exchange rates employed for each country in the sample.

Table 1. Data description

Country	Exchange Rates	Stock Market Indices	Sample period
Czech Republic	CZK/EUR, CZK/USD	MSCI Czech Republic	January 2010 – December 2017
Hungary	HUF/EUR, HUF/USD	MSCI Hungary	
Poland	PLN/EUR, PLN/USD	MSCI Poland	
Romania	RON/EUR, RON/USD	BET	

Note: BET – Bucharest Exchange Trading, CZK – Czech Koruna, EUR – Euro, HUF – Hungarian Forint, MSCI - Morgan Stanley Capital International, PLN – Polish Zloty, RON – Romanian Leu, USD – US Dollars.

Source: Authors' own research.

In order to determine the exposure to currency risk, the panel data was used as econometric model. Many recent studies on companies used the same methodology. For example, Hunter and Isachenkova (2002) analysed the failure of English industrial companies using this methodology. One year later, Lalinsky (2013) investigated the determinants of business competition using the panel data methodology. Another example belongs to Migliardo and Schiliro (2016), who analyzed the profitability of medium-sized companies from Italy. One year later, Belascu (2017) investigated foreign direct investment and economic growth in the CEE countries using the same methodology.

Baltagi (2005, p. 4) considers that "*panel data suggests that individuals, firms, states or countries are heterogeneous. Time-series and cross-section studies not controlling this heterogeneity run the risk of obtaining biased results*". At the same time, this methodology is more capable to determine and measure effects which are not so easily detectable in pure

cross-section or time-series data. Also, panel data models offer more informative data, as well more variability, less collinearity among the explanatory variables, more degrees of freedom in order to produce more efficiency. Moreover, panel data methods permit us to establish and evaluate more difficult behavioural models than purely cross-section or time-series data.

Taking into consideration the fact that this analysis includes monthly data over a period of eight years and data of many companies, using panel data model was the most appropriate econometric methodology.

The software program used for estimating panel equations parameters is EViews 10. The two types of panel models used were panel with no effects and panel with fixed effects in the cross-section dimension. No effects represents a highly restrictive specification that avoids the possible presence of some differences in the coefficients between companies or time. The intercept α is allowed to vary depending on the company in the cross-section fixed effects model. Thus, the heterogeneity hypothesis is introduced in the sample of companies, induced by the different characteristics. Overall, 4 panel equations were estimated for financial sector companies and 4 for the energy sector.

The panels were estimated based on the following general equation:

$$Y_{it} = \alpha + \beta_{it} X'_{it} + \delta_{it} + \gamma_{it} + \varepsilon_{it} \quad (1)$$

Where Y_{it} is the dependent variable represented by the logarithmic return of the companies' stock prices, i denoting firms (the cross-section dimension), while t denoting time, α is is the overall constant of the model that captures the effects of those variables that are constant over time, β_{it} represents the exposure coefficients, X'_{it} is a vector which includes independent variables: monthly changes in the exchange rate of the domestic currencies to the EUR and USD, real GDP growth rate, oil price and 1-year bond yields, δ_{it} and γ_{it} capture the cross-section specific fixed effects and ε_{it} represents the error terms.

4. Results

In this section the main results are presented by firstly showing and discussing the results for financial companies, followed by the results for energy companies and in the end, the results are compared.

The results of the estimations are presented in Tables 2 to 5. For both panel specifications considered are reported only statistically significant coefficients at least at 5% level. Tables 2 and 3 display the results for financial companies.

The panels that include the stock index show the residual exposure to foreign exchange risk, while panels that exclude this variable show the total exposure to currency risk. The residual exposure to currency risk represents that type of exposure which is not included by the investors in the market risk through the stock market index.

Table 2. Panel least squares results for financial companies (variables)

Panel Specifications	α	Index	EUR	USD	GDP	OIL	1-Year Bond Yield
No effects	-0.001	0.771*	0.173	-0.222*	0.110	0.022	0.001
No effects and no Index	-0.001		-0.626*	-0.249*	0.181	0.140*	0.001
Fixed cross-effects	-0.001	-0.774*	0.186	-0.223	0.111	0.022	0.001
Fixed cross-effects and no Index	-0.001		-0.632*	-0.248*	0.176	0.140*	0.001

Note: * denotes statistical significance at least at 5% level. EUR - Exchange rate of the domestic currencies to the Euro, GDP – Gross Domestic Product, Index – Stock market index, OIL – price of oil, USD - Exchange rate of the domestic currencies to the United States Dollar.
Source: Authors' own research results.

In the no effects panel that does not include the stock market index there is a significant exposure to the stock index and to the change in the exchange rate of the domestic currencies to US Dollar. The second panel specification is the one that eliminates the stock market index in order to investigate the total exposure to currency risk. Statistically significant regression coefficients are found. This may indicate that investors include the currency risk exposure to EUR as a supplementary risk, beyond market risk. The exposure of financial companies to the oil price fluctuations is an interesting and unexpected result for the financial sector. Still, if consider the change of oil price as a global risk factor, then it can be stated that the stock prices of financial companies react to such factors.

In the fixed cross-effects panels it is noticed the same statistically significant regression coefficients. In both cases, in the model with index and in the model without index, there is an identical situation as the one presented above from the panels with no effects. The estimations show statistically significant coefficients for the same variables.

Table 3 below illustrates the robustness tests results for the panels on financial companies. The panel with no effects is the best panel specification because the value of the Adjusted R-squared is the highest for this type of panel. Moreover, all the values of the Adjusted R-squared are closer to 0 than 1, which means that the independent variables from the model do not have a decisive influence on the dependent variable and there are other variables not considered in this model that have an influence on the performance of the financial companies. Also, the no effects panel that includes the stock index is confirmed by the F-statistic as the best model for investigating the currency exposure of financial companies.

Table 3. Robustness results: panels for financial companies

Panel Specifications	Adj. R^2	S.E. of regression	F-statistic	Prob (F-statistic)	Akaike info criterion	Schwarz criterion	Durbin – Watson stat
No effects	0.274	0.068	72.650	0.000	-2.516	-2.486	2.067
No effects and no Index	0.061	0.077	15.836	0.000	-2.260	-2.233	2.067
Fixed cross-effects	0.271	0.068	25.977	0.000	-2.504	-2.424	2.080
Fixed cross-effects and no Index	0.056	0.078	5.259	0.000	-2.246	-2.171	2.077

Note: Adj. R^2 - Adjusted R-squared, Akaike info criterion - Akaike information criterion.
Source: Authors' own research results.

The Akaike information criterion has the power to estimate the quality of these models. A good model is the one that has the minimum value of the Akaike information criterion among all the other models. From this point of view, a good model is the panel specification with no effects and with the stock index included.

Similar to the Akaike information criterion, the model with the lowest Schwarz information criterion is preferred. Also, it is preferred the panel with no effects and with the stock index included.

The Durbin–Watson (DW) statistic represents a measure of autocorrelation in residuals from regression analysis. In all cases the DW values are close to 2, consequently, it is interpreted as normal. The values from the models show that the successive error terms present a weak negative correlation and also show the fact that these models are correct.

The signs of the statistically significant regression coefficients at least at 5% level indicate the link between the dependent variable from the model and the independent variables. The sign of the stock index shows a positive link between the returns of the financial companies and the return of the stock index. On the other hand, the sign of the statistically significant regression coefficients for the domestic currency exchange rate against the EUR and USD are negative and show a contrary relationship between the stock prices of the financial companies and the exchange rate of the domestic currencies to the both EUR and USD. Concerning the signs of the coefficients for the oil price, these are positive and indicate a direct and positive relationship between the two variables.

Tables 4 and 5 present the values resulted from the equations estimated for energy companies.

Table 4. Panel least squares results for energy companies (variables)

Panel Specifications	α	Index	EUR	USD	GDP	OIL	1-Year Bond Yield
No effects	-0.002	0.799*	-0.014	-0.047	-0.012	0.040	0.001
No effects and no Index	0.000		-0.771*	-0.159	0.012	0.159*	0.001
Fixed cross-effects	-0.003	0.805*	-9.460	-0.045	0.036	0.040	0.001
Fixed cross-effects and no Index	-0.001		-0.773*	-0.157	0.062	0.160*	0.001

Note: * denotes statistical significance at least at 5% level.
Source: Authors' own research results.

The first panel specification type is the one with no effects which includes the stock index. It is noticed a single statistically significant regression coefficient at least at 5% level at the stock index. The panels that include the stock market index show the residual exposure to currency risk for the energy companies.

For the second panel type, no effects and without the stock index, there are found statistically significant regression coefficients for the Euro and oil price. As in the financial companies' case, it is detected here the existence of an exposure to currency risk, which cannot be found in the case of panels that include the stock market index. This fact can indicate that the investors include the change of the exchange rate against the Euro in a separate category as market risks.

In the case of energy companies, it is obvious why the stock prices are reacting to the change in the price of oil. The regression coefficients are positive.

As in the case of the panel with no effects and with the stock index included in the equation, in the case of the panel with fixed cross-effects and with the stock index included in the equation, it is observed the existence of a statistically significant regression coefficient only for the stock index. When removing the stock index from the equation, it is discovered significant exposure to the change in the exchange rate of the domestic currencies to the European currency and to the oil price.

Table 5 below illustrates robustness tests results for the panels on energy companies.

Table 5. Robustness results: panels for energy companies

Panel Specifications	Adj. R^2	S.E. of regression	F-statistic	Prob (F-statistic)	Akaike info criterion	Schwarz criterion	Durbin – Watson stat
No effects	0.158	0.095	36.737	0.000	-1.863	-1.832	2.171
No effects and no Index	0.037	0.102	9.717	0.000	-1.729	-1.703	2.187
Fixed cross-effects	0.167	0.095	14.413	0.000	-1.864	-1.784	2.214
Fixed cross-effects and no Index	0.043	0.101	4.177	0.000	-1.726	-1.651	2.222

Source: Authors' own research results.

Similar to the case of the financial companies, the values of the Adjusted R-squared are closer to 0 than 1, which means that there is a set of unconsidered variables by this model that have an influence on the efficiency of the energy companies.

Taking into consideration the values of the Adjusted R-squared, it is preferred the panel with fixed cross-effects and with the stock index included in the equation because the value is the highest at this type of panel. But taking into account the F-statistic and the Schwarz criterion, it is chosen as the best panel the no effects panel with the stock market index included in the equation because it has the highest value of the F-statistical and the lowest value at the Schwarz criterion.

Regarding the signs of the statistically significant regression coefficients at least at 5% level, it is observed the same relationships as in the case of the financial companies. The sign of the coefficient for the stock market index is positive, which means that when the index return is increasing, the returns of financial and energy companies are also increasing. Also, there is the same link between the oil price and the stock prices of the financial and energy companies because the sign of the coefficient is positive. Regarding the exchange rate of the domestic currencies to the EUR, the regression coefficient is negative, which denotes a contrary relationship between the stock prices of the energy companies and the exchange rate of the domestic currencies to the EUR.

Comparing the results for financial and energy companies, in both cases the best panel model was the one with no effects and with the stock index included in the equation. Concerning the regression coefficients, for energy companies there are significant regression coefficients at the exchange rate of the domestic currencies against the USD, while there were not found such coefficients for energy companies. The stock prices of both types of companies react to the change in oil prices and to the change in the exchange rate of the domestic currencies to the EUR.

There is only one difference between the two types of panels. At least in the case of energy companies their reaction to oil price changes is perfectly understandable, while in the case of financial companies, the result is surprising. It seems that the price of oil had a much greater impact on the stock prices of the financial companies than it was anticipated, but

this may be interpreted as an exposure of financial companies to global risk factors approximated by oil price changes.

5. Conclusion

This study aimed at shedding light on the relationship between stock prices of listed financial and energy companies from Central and Eastern Europe and a number of macroeconomic variables, i.e. stock market indices, monthly changes in the exchange rate of the domestic currencies to the official currency of the EU and US Dollar, real GDP growth rate, oil price and 1-year bond yields of these selected countries. The methodology used is the panel data methodology with various panel specifications which are capable to capture the characteristic of this type of relationship. This research adds to the existing debate in the economic literature on the exposure to currency risk. Regarding the relationship between stock prices of both type of companies and the other variables used in this study, the real Gross Domestic Product growth rate and the 1-year bond yields, no significant exposure to them has been found.

There are found significant exposure of both financial and energy companies to domestic market risks, as approximated by local stock indices. Moreover, this exposure is by far more important than the individual exposures to the other risk factors considered in this research. Still, it was discovered significant exposure to the EUR and USD currency risk for both types of companies. This exposure is negative for financial and energy companies. Thus, a depreciation of local currencies against both EUR and USD would hurt both types of companies. As expected, energy companies are exposed to oil price risk, but the most surprising result is that financial companies are also exposed to this risk. This result can be interpreted as an exposure of financial companies to global risk factors encapsulated in changes in oil prices.

Undoubtedly, this research has some limits and one of the most prominent of them is represented by the rather small number of financial and energy companies included in the sample. As a possible future direction for the research, an inclusion of more companies, maybe at the European Union level, would offer better insight into the exposure of the financial and energy sectors to risk sources. As well, more sophisticated methodologies may be employed.

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