# THE IMPACT OF EXCHANGE RATE MOVEMENTS ON FIRM VALUE IN VISEGRAD COUNTRIES

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## Abstract

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Company's involvement in global activities through international trade is the primary source of their foreign exchange exposure. Many empirical studies suggest the negative impact of uncertainty about the development of the exchange rate on cash flow and profitability of companies, and thus their market values. Some economic studies show that foreign revenues are positively correlated with the exchange rate exposure and in a short period, currency depreciation negatively affects the market value of listed companies. On the other hand, there are studies that show no statistically significant links between the value of the companies and exchange rates. The aim of this paper is to evaluate the effect of exchange rates on the value of companies listed on stock exchanges in the Visegrad countries. Paper applies Jorion's model and panel data regression for the sample period 2002–2016. Estimations for the whole period revealed negative relationship between exchange rate and value of stock companies. The highest exposure is observed in case of Hungary and Czechia. Positive tendency can be seen in comparison of pre-crisis and post-crisis period. Except the case of Hungary, all markets showed decreased exchange rate exposure in time.

Keywords: exchange rate, firm value, currency exposure, Jorion's model

## INTRODUCTION

Company's involvement in global activities through international trade is the primary source of its foreign exchange exposure. Companies could be exposed to this risk in different ways. If the company performs international sales or has purchases in foreign currencies, then change in the exchange rate would affect the value of international revenues. However, this company could reduce this risk by using different hedging strategies. Nevertheless, it is important to note that not only companies engaged in export or import activities are exposed to foreign exchange risk. Even pure domestic firms operating only in domestic currency could face this kind of risk. Indirect impact of the exchange rates is through the market competition, and domestic macroeconomic conditions such as development of aggregate demand, employment and output. Thus, a potentially wide range of firms could be exposed

to movements in foreign exchange rates, regardless of their direct financial exposure (Flota 2014).

Many empirical studies suggest the negative impact of uncertainty about the development of the exchange rate on cash flow and profitability of companies, and thus their market values (e.g. Frazer and Pantzalis, 2004; Muller and Verschoor, 2006). Some economic studies show that foreign revenues are positively correlated with the exchange rate exposure and in a short period, currency depreciation negatively affects the market value of listed companies (e.g. He and Ng, 1998). On the other hand, there are studies that show no statistically significant links between the value of the companies and exchange rates (e.g. Stavárek, 2005).

Although the characteristics of relationship between exchange rate and firm value already motivated other researchers to publish several similar studies, this paper extends the research in geographic area of Visegrad countries (V4).

The V4 seems to be attractive and suited for such an analysis for many reasons. Czechia, Hungary, Poland and Slovakia are geographically close, open economies, which have successfully completed the transition process to the market economies. The transformation process influenced their economic structure, involvement in international economic activities, capital markets and exchange rates regime as well. This study contributes to the current evidence by showing differences in the relationship between the exchange rate and stock prices of companies operating in a small open economy with strong connections to the EU and the euro area. The topicality of this research is underlined by the fact that Slovakia is already member of the Eurozone, firms in Hungary have huge portion of debt denominated in foreign currency and Czech National Bank abandoned the exchange rate interventions as a monetary policy instrument in April 2017. Therefore, exchange rate effects seems to be important determinants of firm's value in the sample countries.

According to Adler and Dumas (1984), exchange rate exposure is a regression coefficient. Jorion (1990) followed this assumption in the pilot study explaining changes in stock prices by changes in the market index and exchange rates. Market approach for foreign exchange exposure identification is based on Jorion (1990) and with various modifications according to the methodological development has been used continually by applying for various geographic areas and timeframes. The aim of this paper is to evaluate the effect of exchange rates on the value of companies listed on stock exchanges in the V4. There are few empirical studies concerning the effects of exchange rate on firm value in the V4 (e.g. Stavárek, 2005; Stavárek and Tomanová, 2014; Tomanová, 2014; Akel, 2014; Tomanová, 2016), but they indicate mixed results. This paper fully addresses the criticism of existing studies on the determinants of firms' exposure to exchange rate movements which tend to use cross-sectional analysis, which ignores the temporal dimension of both dependent and explanatory variables. Therefore, this study uses Jorion's model and panel data approach, which pools the data across firms and time, in order to improve estimation efficiency. Furthermore, exposure coefficient can be insignificant as a result of aggregation of all firms in the sample. Therefore, grouping firms by certain characteristics, notably country, industry sector and firm size can lead to a less noisy estimate of their currency exposure. Paper takes into account also last financial crisis what allows to test the persistency of exchange rate exposure. Therefore, this study substantially contributes to scientific discussion in this field and fills the gap in literature about the exchange rate exposure of companies operating in V4.

To this end, the next section reviews relevant literature published in the examined field. The following section introduces the empirical model and data used in estimation. The next section presents and discusses the empirical results. Finally, the last section makes conducting remarks.

## Literature Review

Theoretical expectation of a link between firm performance and exchange rates has led to many empirical researches. Initial empirical studies predominately showed almost no impact of currency value on the stock prices of companies (e.g. Jorion, 1990; Bartov and Bodnar, 1994). However, more recent research provides mixed results. For instance, Dominguez and Tesar (2006) tested many publicly listed companies from eight industrialized and emerging markets. They found that exchange rate movements do matter for a significant fraction of firms, though which firms are affected and the direction of exposure depends on the specific exchange rate and varies over time, suggesting that firms dynamically adjust their behavior in response to exchange rate risk. Exposure is correlated with firm size, multinational status, foreign sales, international assets, and competitiveness and trade at the industry level.

Nevertheless, as Ampomah *et al.* (2013) state, several firm-level studies reveals the weak empirical findings. Foreign exchange exposure is specified as the slope coefficient resulting from relationship between stock returns and changes in the exchange rate. Exposure can be positive, negative, or zero if company's returns are uncorrelated with the exchange rate development. This paper assumes three basic determinants of overall foreign exchange exposure:

- firm characteristics;
- industry characteristics;
- macroeconomic characteristics.

Firstly, firm characteristics, especially international economic activities, hedging, size, leverage, liquidity and growth opportunities are shown to affect foreign exchange exposure. Companies involved in international economic activities can benefit from a depreciation of the domestic currency. Assuming the unchanged export sales, company's revenues increase in proportion to the currency depreciation. Furthermore, the company's competitiveness is increasing by the decreasing of the international price of the exported goods. For example, Jorion (1990) find that companies with high levels of export activities reveal more positive exchange rate exposure in case of USA. Furthermore, Bodnar and Wong (2003) show that small firms are more exposed to currency value development than large companies. Some studies shows that exposure increases as firm size increases (He and Ng, 1998). This can be caused by the fact that larger firms can have more international activities, but also be more likely to hedge than the smaller firms (e.g. Allayannis and Ofek, 2001; Hagelin and Pramborg, 2006; Brown and Minton, 2010). Use of derivatives can reduce exchange rate exposure (Nguyen and

Faff, 2003). Nance *et al.* (1993) reveal that hedging is often used by companies with considerable growth opportunities.

Exchange rate exposure can be furthermore determined by company's debt in foreign currency (e.g. Booth and Rotenbery, 1990). However, direction of the impact of currency depreciation on the firm's value is ambiguous. De Jong *et al.* (2006) suggest that multinational companies with debt nominated in foreign currency can lead to decreasing of foreign exchange exposure. The overall impact of currency depreciation is largely dependent on proportion of coverage cost on foreign debt to profits derived from exports in the same foreign currency. As mentioned before, economic theory suggests that domestic currency depreciation can increase the competitiveness of the net-exporting companies. Hence, increased sales can dominate the additional costs of their foreign debt. However, if currency depreciation is followed by contraction in economy, company with revenues and expenses in domestic currency can force problems with servicing debt denominated in foreign currency. Therefore, companies can be impacted even negatively by the depreciation.

Economic theory further suggests industrial sector affiliation correlated with exposure (Marston, 2001). Even some empirical studies confirm the assumption that foreign exchange exposure is significantly different across industries. Bodnar *et al.* (2002) discuss company's exposure as a dependent variable of its ability to pass on the increased expenses or prices caused by exchange rate changes to the consumers. As Ampomah *et al.* (2013) states, this, depends on industry competitiveness, which determines the price elasticity of demand, and the degree of substitutability of the goods.

Country's macroeconomic fundamentals and their impact on company's exchange rate exposure is examined for example by Patro *et al.* (2002). They find that imports, exports, credit ratings and tax revenues significantly affect currency risk. Even the openness can have an impact on the company's degree of foreign exchange rate exposure. Significantly positive relationship between openness of the domestic country and a company's exposure to the exchange rate changes is revealed for example by De Jong *et al.* (2006) or Hutson and Stevenson (2010). However, currency depreciation can increase competitiveness even of the purely domestic companies. This situation can occur if the company competes with import-oriented companies. Hence, depreciation might lead to a net positive impact on its stock prices. However, this indirect impact is limited by the characteristic of the depreciation as depreciation often signals more fundamental problems. Therefore, declines in the currency value might often be accompanied by economic contractions and stock prices decreasing.

As was mentioned above, exposure coefficient is determined by many economic factors. However, empirical researches can suffer from measurement biases. Fraser and Pantzaliz (2004) show that the exposure of US multinationals to exchange rate changes depends on the foreign exchange index used in the exposure regression. Rees and Unni (2005) examined that European firms exhibit more exposure to bilateral exchange rates than currency indices. Empirical findings can be affected even by the length of return horizon (e.g. Chow *et al.*, 1997), or by asymmetrical reaction to exchange rate movements (e.g. Muller and Verschoor, 2006). Furthermore, exposure coefficient can be insignificant as a result of aggregation of all firms in the sample. Therefore, grouping firms by certain characteristics, notably industry sector and firm size can lead to a less noisy estimate of their currency exposure. Existing studies on the determinants of firms' exposure to exchange rate movements tend to use cross-sectional analysis, which ignores the temporal dimension of both dependent and explanatory variables. Therefore, this study uses a panel data approach, which pools the data across firms and time, in order to improve estimation efficiency.

## MATERIALS AND METHODS

To measure foreign exchange exposure, this paper employs a regression model based on Jorion (1990). It is a two-factor model (1), where the return on the market index is the first factor and exchange rate change is the second factor. Exchange rate and market index represents the independent variables. The model is formed into equation as follows:

$$R_{it} = \alpha_i + \beta_i RM_t + \delta_i RFX_t + \varepsilon_{it} \tag{1}$$

where $\alpha_i$ is the constant term, $R_{it}$, is the stock return of firm $i$ over time period $t$, $RM_t$ is the return on the market index, $\beta_i$ is the firm's market beta and $RFX_t$ is the real effective exchange rate in relevant V4 country. Hence, the coefficient $\delta_i$ reflects the change in returns that can be explained by movements in the exchange rate after recognition on the market return.

All time series used for estimation are on a monthly frequency, due to the exposure of foreign exchange rate the impact can be even indirect and comes from the competitive situation. The measures of change in exchange rate coefficients provide the relationship through the effect of the exchange rate on stock return. Real effective exchange rate indexes (REER) are used as variables *FX* and are obtained from Eurostat database. REER represents the trade-weighted average of a country's currency relative to basket of other major currencies, adjusted for the effects of inflation. Deflators for computing REER are consumer price indices and trade-weighting is based on 42 major trading partners of each tested country. Data for market indices are obtained from the OECD iLibrary statistical database.

Standard models usually employ cross-sectional data to estimate trade patterns in a given year. We employ a panel data regression which pools the data across firms and time to avoid the risk of choosing an unrepresentative year and to monitor unobservable individual effects. This can provide additional insight into tested relationships.

Before estimating ordinary least squares regression on panel data, it is necessary to determine dataset effects as random or fixed. Fixed effects are present when the heterogeneity in the model is unobservable but correlated with any variable included in model. Per contra, the heterogeneity in random effects is also unobservable, but it is not correlated with any other variable. In this case we use the Breusch-Pagan Langrage multiplier test. The test criteria are calculated from equation (2), where $T$ is the length of time series, $n$ is the number of units in the cross-sectional dimension, and $e_{it}$ is a residual term. The Breusch-Pagan Langrage multiplier test revealed random effects in this case.

$$LM = \frac{nT}{2(T-1)} \left[ \frac{\sum_{i=1}^{n}\left(\sum_{t=1}^{T} e_n\right)^2}{\sum_{i=1}^{n}\sum_{t=1}^{T} e_{it}^2} - 1 \right]^2 \qquad (2)$$

Sample period for the estimation covers the period from 2002 to 2016. This period covers data after the transformation period, thus the capital markets are based more on the market rules without significant market deformation. Analysis involves stock companies with the highest market capitalization in the tested country's official stock exchange. Due to the fact that period of companies operating on the market can differ, panels used for the regression testing are unbalanced.

## RESULTS AND DISCUSSION

As was already mentioned, grouping firms by certain characteristics can lead to a less noisy estimate of their currency exposure. Therefore this paper consider country of the listed company as a way how to see differences of estimated effects between macroeconomic environments in sample countries. Industry sector and firm size are also used as criterions for creating the panel

regressions. The regressions were estimated for three periods: whole sample (2002/01-2016/06), pre-crisis period (2002/01-2008/09) and post-crisis period (2008/10-2016/06). This splitting allows to test the persistency of exchange rate exposure. The results of the cross-sectional panel regressions in relation to sample country are presented in Tab. I.

All tested markets seems to be exposed to the exchange rate risk at least at 10% significance level during the sample period. However, level and even direction of exposure differs across countries presented by the selected companies listed on their stock exchanges. It can be seen that relationship under estimation is different also in the same country but another period. All estimations for the whole period revealed negative relationship between exchange rate and value of stock companies. Negative exposure coefficient suggest that depreciation of domestic currency is followed by a decrease of firm's stock returns. Results obtained from this paper are similar of those by Tomanova (2014, 2016) and Stavárek and Tomanová (2014) provided for Poland, Czechia and Hungary.

The highest exposure is observed in case of Hungary and Czechia. Positive tendency can be seen in comparison of pre-crisis and post-crisis period. Despite the financial crisis, except the case of Hungary, all markets showed decreased exchange rate exposure in time. In Hungary, higher increased exposure coefficient can be explained by the high ratio of company debt denominated in foreign currency. On the other hand, decreasing of exposure can be due to the using of more sophisticated instruments on the hedging markets and companies can have good resources and strategies to hedge against exchange rate risk. In case of Slovak stock companies can be crucial fact that Slovakia become a member of the Eurozone. In case of the Czech Republic can be results influenced by the interventions on the foreign exchange market provided by the Czech National Bank, which could decrease the uncertainty about Czech koruna's value development. After the adopting the exchange rate interventions as a standard monetary policy instrument, the exchange rate against Euro as the most important currency was stable, without significant fluctuations. The exchange rate exposure in CZK/EUR operations was almost zero and companies had no reason to hedge their international activities. Therefore, the total currency exposure could decrease.

I: *Stock prices exposure results in relation to sample country*

| Country | Sample size | Exposure coefficient | | |
|---|---|---|---|---|
| | | 2002–2016 | 2002–2008 | 2008–2016 |
| **Czech Republic** | 13 | –0.39* | –0.41*** | –0.18* |
| **Hungary** | 25 | –0.46** | –0.48* | –0.54* |
| **Poland** | 20 | –0.04*** | –0.11 | 0.09 |
| **Slovakia** | 7 | –0.19 | –0.24* | 0.10 |

Note: ***, **, * denote significance level at the 1%, 5% and 10% level, respectively

According to Tab. II, this paper shows that there is no statistically significant impact of exchange rates on stock prices for almost no industry except the health care and consumer staples. There was detected a direct relationship between the exchange rate and the share prices in mentioned industries, where this influence was demonstrated for the whole period, and in the post-crisis period this effect seems to be even stronger. The results showed that the depreciation of the home currency leads to increases of the share prices of these companies. Depreciation of home currency seems to have a positive effect on the volume of their exports or on the import expenses, what increases profit, and ultimately increases stock prices.

Foreign exchange risk strategy is different across the different industries. Despite the fact that many companies use variety of hedging instruments as an automatic financial instruments, for example selected health care companies do not automatically use any of them. They only actively access the tools provided by regular monitoring of the development of the exchange rate fluctuations. During the tested period, they did not use any hedging instruments according to their annual reports. This fact suggests that exchange rate risk exposure could be caused be their hedging strategy.

The results of the cross-sectional panel regressions in relation to firm size are presented in Tab. III. Due to the fact that tested companies are mostly large-sized and in few cases medium-sized, for this analysis only two panels were estimated. One panel regression was performed for companies with less than 500 employees and another for companies with higher number of employees. The economic literature suggest that smaller firms are more exposed to currency value development than larger companies. Despite this fact the results for the larger companies were not statistically significant, there was proved effect of exchange rates on values of smaller companies. This is in accordance to findings by Allayannis and Ofek (2001), Hagelin and Pramborg (2006) or Brown and Minton (2010). Smaller companies tend to hedge less than larger ones and therefore we can observe currency exposure in more cases.

II: *Stock prices exposure results in relation to industry sector*

| Sector | Sample size | Exposure coefficient | | |
|---|---|---|---|---|
| | | 2002–2016 | 2002–2008 | 2008–2016 |
| **Financials** | 12 | 0.15 | –1.01 | 0.24 |
| **Utilities** | 6 | –0.62 | –0.54 | –0.05 |
| **Consumer discretionary** | 7 | –0.14 | –0.37 | –0.12 |
| **Consumer staples** | 8 | –0.22** | –0.15* | –0.29** |
| **Energy** | 7 | 0.54 | 0.65 | –0.09 |
| **Health care** | 5 | –0.13* | –0.12** | –0.20** |
| **Industrials** | 6 | –0.12 | 0.23 | –0.23 |
| **Technology** | 3 | –0.08 | –0.34 | –0.11 |
| **Telecommunication** | 5 | 0.73 | 0.61 | 0.15 |
| **Materials** | 6 | –0.18 | –0.03 | –0.45 |

Note: ***, **, * denote significance level at the 1%, 5% and 10% level, respectively

III: *Stock prices exposure results in relation to firm size*

| Number of employees | Sample size | Exposure coefficient | | |
|---|---|---|---|---|
| | | 2002–2016 | 2002–2008 | 2008–2016 |
| **<500** | 19 | –0.31** | –0.29* | –0.44 |
| **≥500** | 46 | 0.26 | –0.47 | 0.18 |

Note: ***, **, * denote significance level at the 1%, 5% and 10% level, respectively

## CONCLUSION

Company's involvement in global activities through international trade is the primary source of its foreign exchange exposure, but there are many factors which can cause the indirect exposure as well. The aim of this paper was to evaluate the effect of exchange rates on the value of companies listed on stock exchanges in the V4 countries. Paper applies Jorion's model and panel data regression for the sample period 2002–2016. Panel data approach was applied to pool the data across firms and time, in order to improve estimation efficiency. Grouping firms by certain characteristics, notably country, industry sector and firm size, was also used in this paper. This could lead to a less noisy estimate of the currency exposure. Paper takes into account also last financial crisis what allows to test the persistency of exchange rate exposure.

This paper showed that in the Czech Republic, Hungary, Poland and Slovakia is revealed significant relationship between exchange rate movements and value of the stock prices of the companies with highest market capitalization. However, level and even direction of exposure differs across countries presented by the selected companies listed on their stock exchanges. It can be seen that relationship under estimation is different also in the same country but another period. All estimations for the whole period revealed negative relationship between exchange rate and value of stock companies. Negative exposure coefficient suggest that depreciation of domestic currency is followed by a decrease of firm's stock returns. The highest exposure is observed in case of Hungary and Czechia. Czechia, Poland and Slovakia also showed decreased exchange rate exposure in the post-crisis period. In Hungary, higher increased exposure coefficient can be explained by the high ratio of company debt denominated in foreign currency. On the other hand, decreasing of exposure in other countries can be not only due to the using of more sophisticated instruments on the hedging markets, but also due to the macroeconomic conditions in the tested country. In case of Slovakia, adopting euro as a home currency seems to be crucial. In case of the Czech Republic, can be results influenced by the interventions on the foreign exchange market provided by the Czech National Bank, which decreased the fluctuations of the Czech koruna against most important currency – euro.

The results of the cross-sectional panel regressions in relation to firm size proved effect of exchange rates on values of tested smaller companies, what indicate that smaller companies tend to hedge less than larger ones and therefore we can observe currency exposure in more cases. The hedging strategy is different also across different types of industries. The results from the cross-sectional panel regressions in relation to industry sector suggest that hedging against currency risk can cause the character of exchange rate risk exposure in significant way.

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