IMPACT OF UNCERTAINTY ON HUNGARIAN, CZECH, AND POLISH CURRENCIES

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Abstract: The present study examined the impact of uncertainty on the exchange rates of currency pairs traded at the Visegrad Group, except the currency of Slovakia. The USD/EUR exchange rate is considered the main influential factor affecting the exchange rates of the currency pairs of Hungary, Czech Republic, and Poland. The study analysed the exchange rates return of these three countries from 1 January 2010 to 31 December 2020. This period covers the announcement and implementation of Brexit; therefore, USD/GBP is considered the second influential factor affecting the exchange rates of the stated currencies. Moreover, the VIX, EMV, and EPU indices are selected as additional uncertainty indicators. The proposed regression model measures the impact of uncertainty on the exchange rates of the selected currencies. It has been discovered that the USD/EUR exchange rate returns significantly influenced the exchange rate returns of the stated currencies during the period under study. In addition, USD/GBP exchange rate returns also had a statistically significant impact on all the currency pairs at the beginning of the analysed period. However, its influence keeps fluctuating throughout the analysed period. The impact of VIX was weak throughout but statistically significant for USD/HUF and USD/PLN exchange rates. On the other hand, the study finds that EMV and EPU indices do not have a pronounced impact on the analysed exchange rate returns. As demonstrated, the uncertainty indices had a relatively higher impact on the development of the observed exchange rate returns. However, the study finds that their impact was often not statistically significant; moreover, the index impacts themselves were quite low.

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Introduction

The paper aims to analyse the possible impact of uncertainty on the exchange rates of Hungarian, Czech, and Polish currencies and to identify the factors influencing it. It is known that exchange rate fluctuations are sensitive to worldwide uncertainties covering the financial crisis, political uncertainty like Brexit, and health crises like the COVID-19 pandemic. The issue of uncertainty in investments was already analysed by Miller (1977). There are many studies measuring the impact of uncertainty on the financial sector, for example, Chen *et al*. (2020) and Byrne *et al*. (2018). Many investors and big companies make important decisions based on market uncertainty. When market uncertainty is high, companies are less willing to make new investments because deciding where and whether to make large investments with long-term returns is usually challenging at these times and is usually rejected. As far as the financial sector is concerned, uncertainty usually translates into lower financial asset prices and increased prudence on banks' lending, which may then have wider negatively affect the economy.

The exchange rate plays an important role in investments and investment planning. For this reason, the study aims to analyse the impact of the economic uncertainty imposed by Brexit and the EPU, the UK's daily newspaper-based economic uncertainty index developed by Baker *et al*. (2016) on the exchange rate fluctuations of USD/GBP. Furthermore, due to growing health uncertainty (Covid-19 pandemic), the study also referred to the EMV index (a daily infectious disease Equity Market Volatility tracker) introduced by Baker *et al*. (2020). This paper analysed the impact of all these factors along with the impact of USD/EUR on the exchange rates of Hungarian forint, Czech crown, and Polish zloty against USD.

The next section deals with the literature review, followed by subsequent sections on data and research methodology, results, and conclusion.

Literature review

Many international experts have already addressed the impact of uncertainty on exchange rate developments. Nasir *et al*. (2018) analysed Edwards`s exchange rate model under Brexit referendum uncertainty. They discovered that Brexit became a real issue, and the exchange rate can be taken as an indicator to determine the economy’s underline strength. Byrne *et al*. (2018) explained the sources of uncertainty in exchange rate predictability. They presented a systematic approach to describe time-

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variation in the exchange rate forecasting regression coefficients. Through quantile regression analysis, Chen *et al*. (2020) examine the impact of Economic Policy Uncertainty (EPU) on China's exchange rate volatility. They discovered an asymmetric impact of EPU on exchange rate volatility in China with a positive and significant impact at all quantiles. Moreover, they discovered a heterogeneous effect of EPU on exchange rate volatility across different quantiles. Olanipekun et al. (2019) explored changes in foreign exchange reserves and exchange rates of the 20 countries through foreign exchange market forces. They examined the role of economic policy uncertainty in foreign exchange market fluctuations while controlling the effects of domestic and external factors. The authors discovered a long-term relationship between economic policy uncertainty and foreign exchange market pressures from 2003 to 2017. Caporale *et al*. (2020) used a partial integration framework to analyse the stochastic behaviour of RTSVX and RVI, Russian stock market volatility indices from 2010 to 2018. They revealed that the Russian stock market is not permanently influenced by shocks. Mueller *et al*. (2017) document that Federal Open Market Committee (FOMC) announcements have an economically and statistically significant impact on multi-currency excess returns against the US dollar. Relying on high-frequency data, their business strategy reported significantly higher average excess returns on days with scheduled FOMC announcements than on other regular days. These excess returns were reported higher for currencies with higher interest rate differentials than the USD, increased with market participants' uncertainty about monetary policy, and higher when the Federal Reserve adopts a monetary easing policy. Huynh *et al*. (2020) investigated asymmetric spillovers and connectedness while introducing economic policy uncertainty (EPU) into their model. Nilavongse *et al*. (2020) showed that EPU significantly affected exchange rate fluctuations after the Brexit referendum.

Many studies point out that economic and political uncertainty affects exchange rates. The present study is an attempt to study the exchange rates of Hungary, Czech Republic, and Poland in detail.

Data and Methodology

The study is based on the historical exchange rates data of the three Visegrad Group currencies (Czech crown, Polish zloty, Hungarian forint, Euro) and the British pound. All FX Rates are denominated in USD. The Volatility Index VIX, data on the uncertainty index EMV (Daily Infectious Disease Equity Market Volatility Tracker), and EPU (Daily newspaper-based Economic Policy Uncertainty Index for the United Kingdom) are considered as uncertainty measures. The study analysed the exchange rates from 1January 2010 to 31 December 2020 without considering the weekend data. The analysed period covers 1924 total observations. Exchange rate data were obtained from Fusion Media Ltd. (2022). Uncertainty data were obtained from the Economic Policy Uncertainty website (2022). EPU index data was created by Baker *et al*. (2016) as an index reflecting economic uncertainty, including G10 economies. After that, the EMV data index was developed by Baker *et al*. (2019). EMV index explores the development of the news reported by journalists. The index also reflects the impact of infectious disease as Covid 19, Ebola, SARS, etc., on exchange rates because infectious diseases stay the dominant news in the newspapers (Altig *et al*., 2020). VIX index is widely used as a measure of the volatility of the financial markets.

For the analysis, the study uses log returns calculated by the following formula:

$$R_t = ln\left(\frac{P_t}{P_{t-1}}\right) \quad (1)$$

where R_t is the log return, and P_t is the close price of the exchange rate at time *t*.

The proposed model explains log-returns of the exchange rates $USD/CZK_t, USD/PLN_t$ and USD/HUF_t by log returns $R_USD/EUR_t, R_USD/GBP_t$, changes in the volatility index VIX_t, changes of uncertainty indices EPU_t, and EMV_t in time *t*.

Hence, the proposed model can be expressed as:

$$y_t = a_0 + a_1\, R_USD/EUR_t + a_2\, R_USD/GBP_t + a_3 \Delta\, VIX_t + a_4 \Delta EPU_t + a_5\, \Delta EMV_t + e_t \quad (2)$$

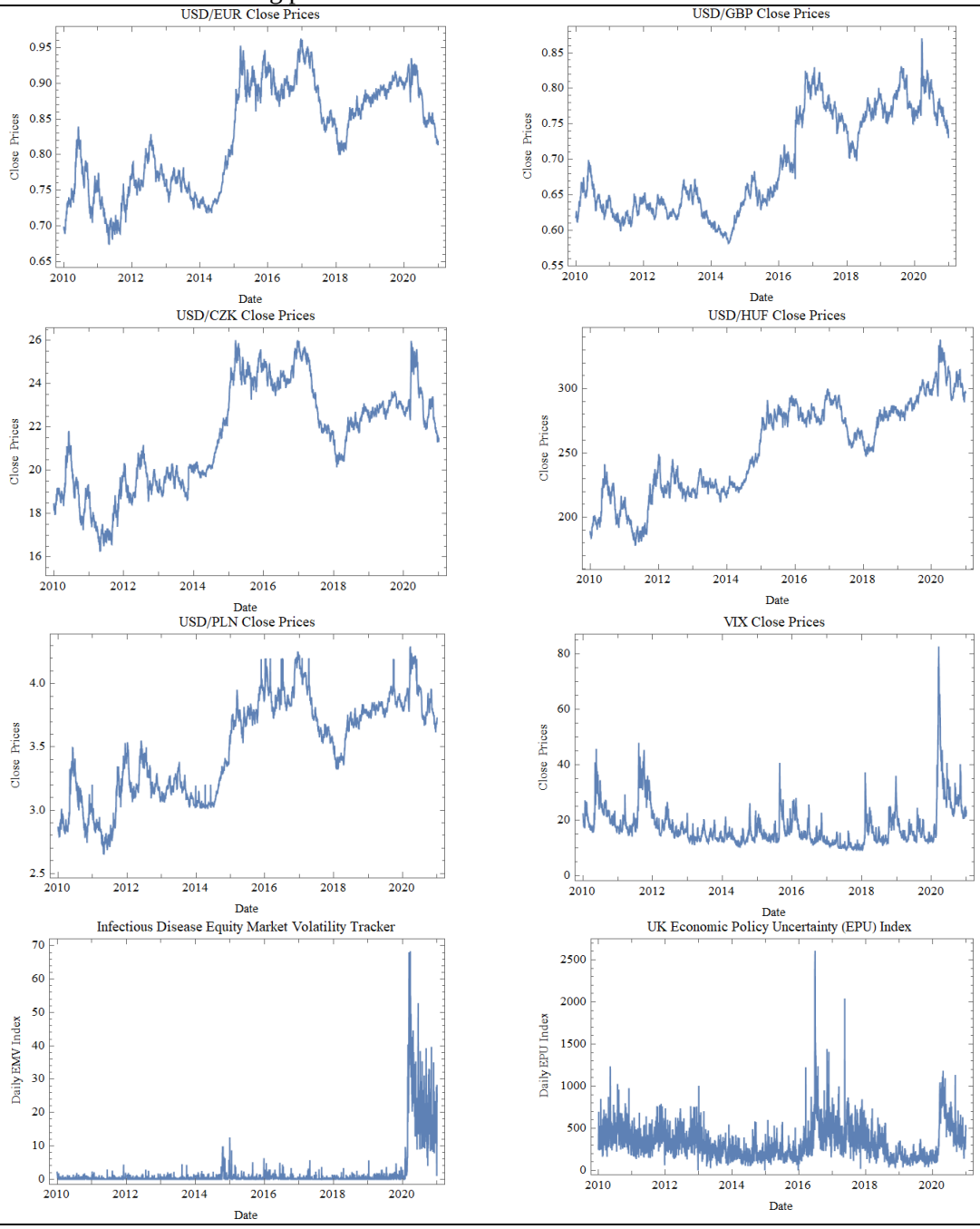
where e_t is an error term and y_t is one of $R_USD/CZK_t, R_USD/PLN_t$ and R_USD/HUF_t exchange rate log returns.

Results

Figure 1 presents the time series analysis of the historical development of the exchange rates of the selected currencies. The development of the exchange rates of the selected V4 countries is in line with

the exchange rate of USD/EUR. The EMV index slightly mirrors the VIX index, but after March 2020, information about the COVID-19 pandemic clearly dominated the newspapers, and therefore EMV index reached its record low. Throughout the 10-year old history of the EPU index, the Brexit referendum on 23 June 2016, has been a major issue. It can be seen that the Covid-19 pandemic has also caused a decline in the foreign exchange rates and significant fluctuations in uncertainty indices. However, Brexit had a greater impact on the values of the EPU index than Covid-19.

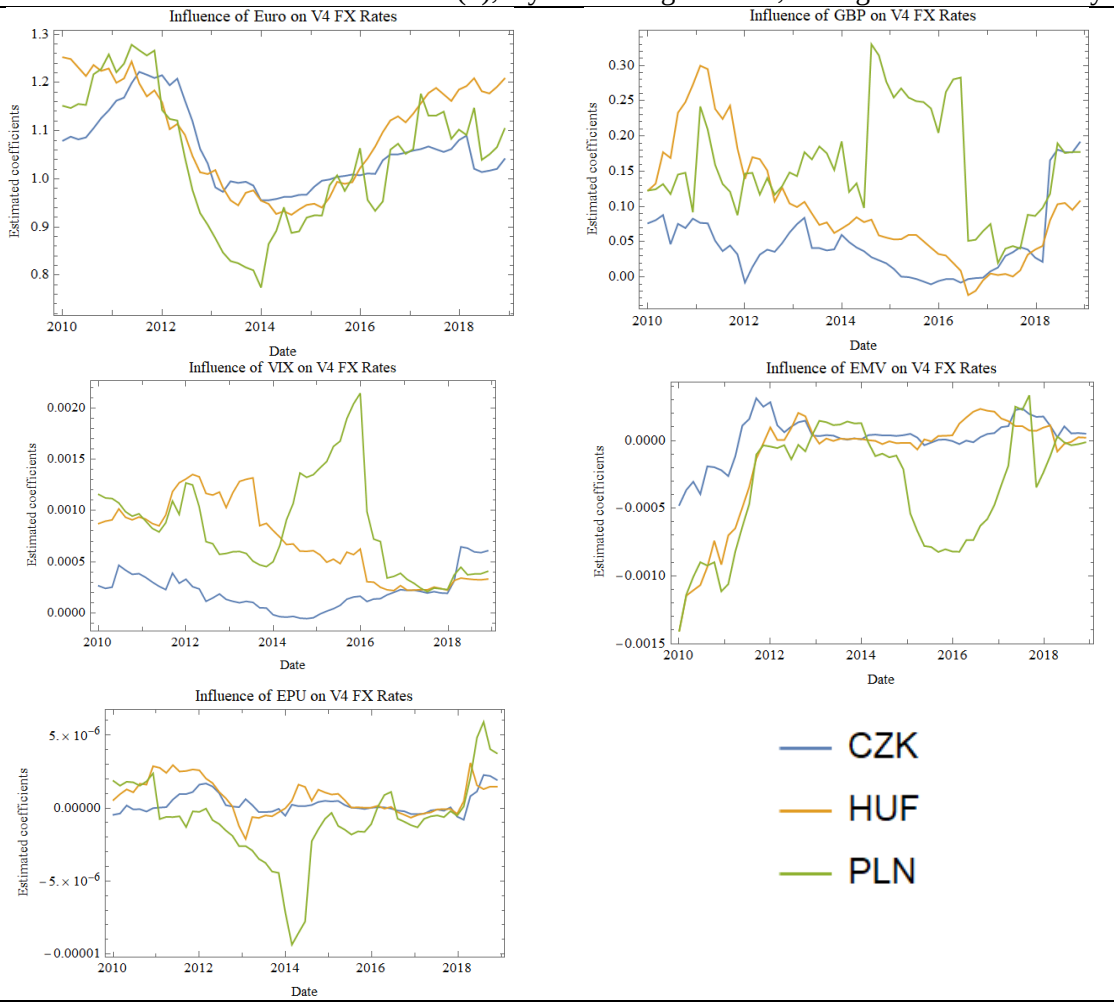
Figure 1: Historical data during period 2010-2020



Source: Authors

The coefficients of the model (2) for a 2-years rolling window (522 business days) were estimated to analyse the impact of uncertainty on the V4 countries' exchange rates. This window was moved by 8 weeks, and model (2) was re-estimated. The development of the estimated coefficients is presented in Figure 2. The blue line represents estimated regression coefficients for the Czech crown, the yellow line for Hungarian forint and the green line for Polish zloty OLS coefficients.

Figure 2: Estimated coefficients for model (2), 2 years rolling window, rolling movement= 40 days



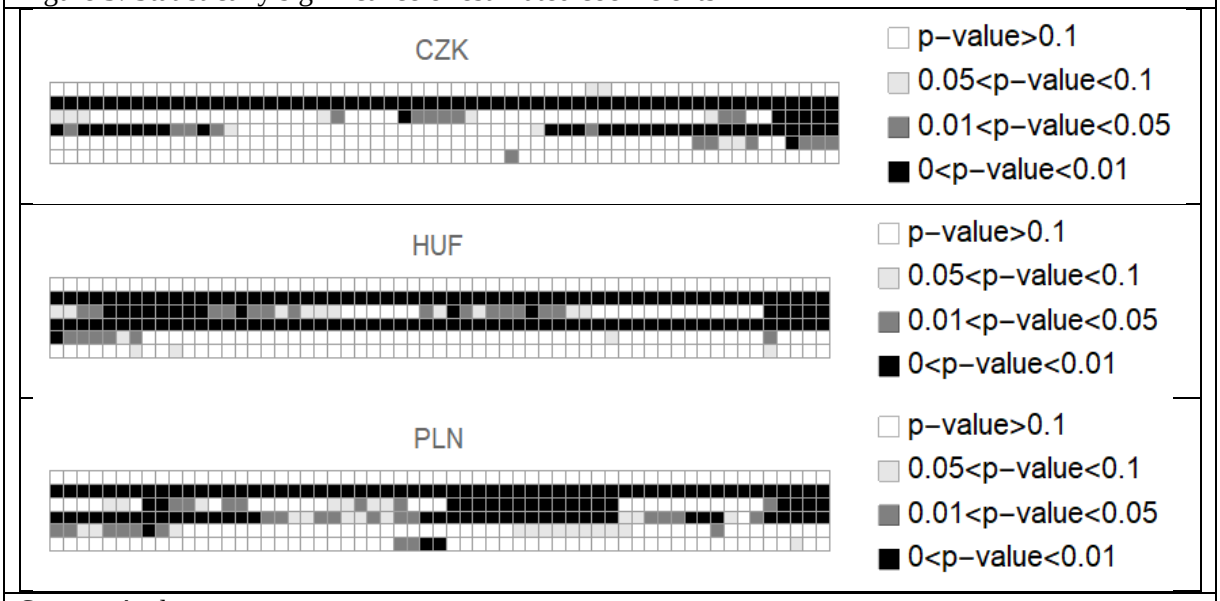
Source: Authors

Figure 2 contains five sub-images. Each sub-image belongs to one explanatory variable for model (2). As Figure 2 shows, an increase in USD/EUR causes a positive increase in the exchange rates of all V4 currencies; the effect is statistically significant at the 0.01 significance level during the analysed period. The slope for the Czech crown changed from 0.955602 and reached the highest value equal to 1.22226 within the window from 12.30.2013 to 12.28.2015. This value was recorded for the period from 7.18.2011 to 07.16.2013. The impact of the Euro on the Hungarian forint was the lowest from 08.08.2014 to 08.09.2016, when the slope reached the value of 0.925401. The highest value of the slope (1.2525) was recorded for the period from 04.04.2010 to 03.01.2012. The Euro had the lowest impact on the Polish zloty in the same period as the Czech crown, but the slope reached 0.77424. The highest impact of Euro on exchange rate returns of Polish zloty in the amount of 1.27868 was recorded from 5.23.2011 to 5.21.2013. The Polish zloty recorded the highest variability among all the currencies considered in this paper. A relatively stable relationship was recorded between the Euro and the Czech crown. The impact of British pound on the Czech crown was the minimum among the analysed V4 currencies. The values and significance of the British pound's impact on selected Visegrad group exchange rate return varied over time. The influence of the British pound on the Polish zloty experienced the largest statistically significant fluctuation between the years 2013 and 2017. The impact of the exchange rate returns of the British pound on the exchange rate returns of Czech crown and Hungary forint decreased after the Brexit announcement. It increased significantly after 2017. The VIX had the lowest impact on the considered currencies. It had a statistically significant impact on the Polish zloty and the Hungarian forint during the period under study. Again, the largest fluctuation was observed for the Polish zloty. A unit change in the EMV index caused a statistically significant increase in Czech crown returns after 2016. From 2010-2012 a unit change in the EMV index brought a decrease in the

exchange rate returns of the Hungarian forint and the Polish zloty. From 2013-2014, the EPU index had a negative impact on the Polish zloty.

Figure 3 illustrates the statistical significance of the estimated OLS coefficients. White colour denotes that the regression coefficient is not statistically different from zero because the *p*-value is greater than 0.1. The light grey colour indicates that the regression coefficient is statistically different from zero, with a *p*-value ranging from 0.05 to 0.1. When *p*-value is greater than 0.01 and less than 0.05, the significance is denoted by the dark gray colour. Finally, the black colour denotes significance smaller as 0.01. The first row of the grid (Figure 3) shows the *p*-value for the constant of the model (2), and the next rows correspond to the explanatory variables of this model. Their order is consistent with the order presented in model (2). The given order is log returns of USD/EUR, log-returns of USD/GBP, and changes of VIX, EMV, and EPU indices. Values of VIF were approximately equal to 1, and therefore, it is concluded that explanatory variables in the model (2) are not multicollinear.

Figure 3: Statistically significance of estimated coefficients



Source: Authors

Conclusion

This paper addressed the impact of the uncertainty on the exchange rate returns of the Czech crown, Hungarian forint, and Polish zloty (3 of Visegrad Group exchange rates). The study proposed a new model to analyse this problem. The main findings highlight a significant impact of the USD/EUR on the exchange rate returns of all the currencies under study. The effect of Euro returns is higher compared to USD/GBP. Moreover, British pound returns significantly influenced analysed currency only during selected periods (see Figure 3). The volatility index VIX had a significant impact mainly on the Hungarian forint and Polish zloty. Information about Covid-19, included in the EMV, caused only a temporary decrease in the exchange rate returns. Similarly, the contribution of the EPU index to changes in the given currencies was low and statistically significant only during a few specific periods.

Based on the results, it is concluded that fluctuations of the Czech crown after the impulse of uncertainty are only temporary and only the euro has a long-term impact on the analysed exchange rates. On the other hand, changes in the level of uncertainty have the biggest impact on the Polish zloty.

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