Fragility of Central European Economy

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Abstract

The Russian military advancement to Ukraine, which began in February 2022, has greatly affected Russian energy supply to EU, and consequently the Central European economy. First, in order to illuminate the industrial weaknesses/strengths of Central Europe, we used a slightly revised Heckscher－Ohlin model in Chapter Ⅱ, and the typical currency value determination models in Chapter Ⅲ. Second, we formed a hypothesis that says the gradual currency devaluation in Central European minor currencies against Euro is positively linked to the increase of governmental bond interest rates since 2015. In this paper, we dealt with Polish Zloty and Hungarian Forint, against Euro.

The overall purpose of this paper is neither to forecast future values of the minor currencies nor to determine the future inflation rates, but to investigate underlying causes of sluggishness and fragility of the economies of Central European countries. Russian military advancement to Ukraine has simply magnified the speed and degree of this fragility.

Keywords: Three Seas Initiative, Visegrad Group, Central Europe

Ⅰ. Introduction

The Russian military advancement to Ukraine, which began in February 2022, is still ongoing, and has gradually been affecting the economies of Central European countries. Observing the European map (Figure 1), it can easily be observed that all the eastern borders of the Three Seas Initiative[1] (3SI) countries are directly surrounded by either Russia, Ukraine or Belarus, the conflict area. Thus, Central Europe is fragile and susceptible, not only geographically but also politically, and economically in due course and in the end. In fact, the Central Europe's economy had already started to deteriorate even before this military advancement. Before 2022, what kind of economic damages have occurred? Since the introduction of the unified European currency named Euro, the process of economic advancement and/or retreat especially in Central Europe area has been patchy and meandering. All the twelve 3SI countries cannot be generalized as the same, politically and economically.

Figure 1 The Three Seas Initiative (3SI) countries in Europe

Source: Own drawings by using MapChart

Among the 3SI countries, the Visegrad Group (V4) was politically formed on 15 February, 1991 at the meeting of the President of the Czechoslovak Republic, Václav Havel, the President of the Republic of Poland, Lech Wałęsa, and the Prime Minister of the Republic of Hungary, József Antall, which was held in Visegrad, Hungary, in the same year of the collapse of the Soviet Union as a country.

A decisive factor to form V4 was clearly mentioned in the official V4 website[2] as the desire to eliminate the remnants of the communist bloc in Central Europe. In this sense, V4 was the first international cooperation, after the World War II, that intended to provide a new framework to a political independence from the former Warsaw Pact, although economically their energy resources dependency on Russia still remained at a very high level.

First, we will illuminate a trade structure between Russia and a V4 country, by using a typical international trade model.

Ⅱ. Method 1: Application of the Heckscher－Ohlin Model

The Heckscher-Ohlin is one of the traditional theories of international trade that was originally elaborated in 1918, 1919 & 1920 by Eli Heckscher, and subsequently developed by Bertil Ohlin, over 100 years ago from now. Does this model still hold good now?

In the Heckscher－Ohlin (HO) model, its key idea of factor endowment is that “each

country is incompletely specialized in production of a certain good that intensively uses production factors that are relatively abundant in each country, and exports it to the other."

Hungary and Russia will be explored using the HO model to provide a simple example. Russia is blessed with natural resources inherited to its vast land, while, Hungary has abundant and relatively inexpensive labor force and thus a thriving automobile industry.

Ⅱ-1. Material[3]

Ⅱ-1-1. From Russia to Hungary:

In 2020, Russia exported $2.15B (US billion dollar equivalent) to Hungary. The main products Russia exported to Hungary were Crude Petroleum ($1.05B), and Petroleum Gas ($536M). In the last 25 years up to 2020, the exports of Russia to Hungary have increased at an annualized rate of 1.36%, from $1.53B in 1995 to $2.15B in 2020.

Ⅱ-1-2. From Hungary to Russia

In 2020, Hungary exported $1.95B to Russia. The main products that Hungary exported to Russia were Automotives and Computers ($320M), and Packaged Medical Products ($176M). In the last 25 years up to 2020, the exports of Hungary to Russia have increased at an annualized rate of 3.62%, from $803M in 1995 to $1.95B in 2020.

Ⅱ-2. Application

The HO model is generally applied to a puzzle of what kind of goods and how a country should produce and export when resources are imbalanced. However, our simplified model pinpoints a preferable and optimal balance between two countries, each with its limited resources.

In the HO model, there are traditionally 2 countries, 2 goods, and 2 factors (the 2-2-2). Yet, we found that it was difficult to apply the original model directly to this case, mainly for the following three reasons. First, the HO model assumes a free and competitive market economy consisting of consumers and private firms and other conditions are the same. Nevertheless, Russia is a communist country where a free and competitive market economy is limited. Second, the technology levels of the two countries are not identical, rather, each good uses one of the unique factors more intensively, and key technologies to produce goods come internationally from countries other than Hungary and Russia. Third, other conditions which include, but not limited to, tariff treatment, trade margins, liquidity of local currencies, and international migration of labor are non-identical.

Ⅱ-3. Analysis and Discussion

In this analyzing process, we learned a lot about relative endowments of factors what to choose, and finally 3SI countries' degree of dependence on energy resources.

In the following Table 1, we analyzed two countries – Russia and Hungary, and two types

of goods – energy resources and automotives, based on two factors – labor and land.

Ⅱ-3-1. Labor; the first factor

Table 1 Average Monthly Salary Data

Industry	Country	Average Monthly Salary	Equivalent to
2022 Automotive Industry	In Hungary	322,000 Forint	
	In Russia	80,700 Ruble	= 415,605 Forint ※
	Relative cheapness of labor in Hungary compared to Russia is 322,000/415,605 = 77.5%		
2022 Oil/Gas/Energy/ Mining Industry	In Hungary	444,000 Forint	
	In Russia	93,400 Ruble	= 481,010 Forint
	Relative cheapness of labor in Hungary compared to Russia is 444,000/481,010 = 92.3%		

Source: Own compilation, data provided by Salaryexplorer.com[4]

※ Based on 1 Ruble (RUB) = 5.15 Forint (HUF), an average middle price by several European banks' exchange rates as of 29 Dec. 2022.

【Automotives】

A person working in the automotive industry in Hungary typically earns around 322,000 HUF per month. Salaries range from 147,000 HUF (lowest average) to 917,000 HUF (highest average, actual maximum salary is higher). The average monthly salary includes housing, transport, and other benefits.

The same source revealed that a person working in the automotive industry in Moscow typically earns around 80,700 RUB per month. Salaries range from 36,800 RUB (lowest average) to 230,000 RUB.

【Energy Resources】

A person working in Oil / Gas / Energy / Mining industry (energy resources industry) in Hungary typically earns around 444,000 HUF per month. Salaries range from 161,000 HUF (lowest average) to 1,030,000 HUF (highest average, and actual maximum salary is higher). On the other hand, a person working in energy resources in Russia typically earns around 93,400 RUB per month. Salaries range from 34,000 RUB (lowest average) to 216,000 RUB.

According to Matusiak and Masuyama (2022), Hungary has received the largest flow of FDI in 2019 among twelve 3SI states. Hungarian major industries are automotives and machinery.

Ⅱ-3-2. Land; the second factor, and technology; the third factor

We acknowledged that land supply is conditionally limited in industrial areas of automotive production in Russia due to the complicated Russian governmental approval processes[5]. In addition to these two factors (labor and land), another factor of technology is needed in the automotive industry where most advanced technologies mainly come from Germany and Japan. Also, in labor perspective, German and Japanese automotive factories in Hungary employ a total of over 50 thousand (T) people. For example, Audi employs 13.4T,

Table 2 Data on Availability of Land

Industry	Country	Large or Small	Comments
2022 Automotive Industry	In Hungary	Large	
	In Russia	Small	Land supply is limited in industrial areas of car factories, in Russia.
	In this industry, a relative availability of land in Hungary compared to Russia is larger.		
2022 Oil/Gas/Energy/ Mining Industry	In Hungary	Small	Inland oil and gas supply power is weak.
	In Russia	Large	
	In this industry, a relative availability of land in Russia compared to Hungary is larger.		

Source: Own compilation

Mercedes-Benz employs 4.4T, and Suzuki employs 2.7T, in 2020[6]. Some key engineers come from abroad.

For another example, in the energy resources industry, major rigging and exploitation technologies of oil and gas come from Western Europe, USA and Japan, such as Shell, ExxonMobil, and Mitsi &Co., i.e. jointly with the Russian companies such as Gazprom[7], the largest listed energy company, and Nord Stream Ⅰ&Ⅱ, the gas pipeline and transportation joint projects, exporting from Russia to EU finally.

Therefore, the third factor "technology" is implicitly incorporated in this model, because those third-party countries provided advanced technologies to joint ventures. Consequently, we found out that the third factor was not originally assumed in the original 2-2-2 HO model.

Ⅱ-4. Conclusion

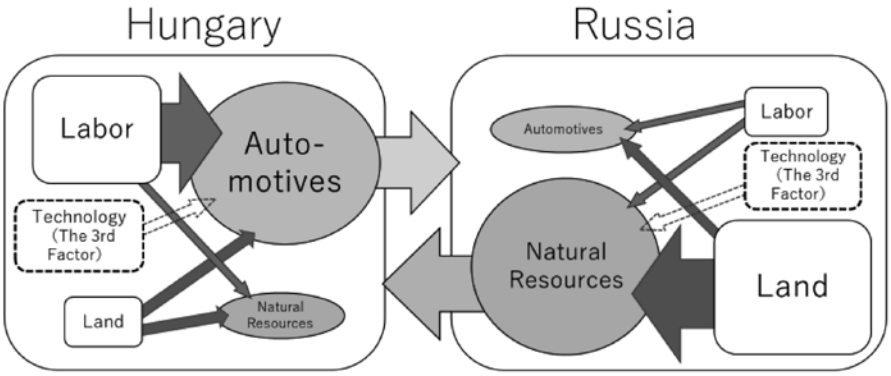
In both industries, labor cost is cheaper in Hungary. Also, in both countries, labor cost is cheaper in automotive industry. As to industry preference which to pick, relative cheapness of labor in Hungary compared to that of Russia is much cheaper in the automotive industry (77.5% compared to 92.3%, explained in Table 1). Therefore, according to the HO model, producing automotives in Hungary and exporting automotives from Hungary to Russia is an optimal solution to this case.

Russia has more oil, gas, and coal mining fields, exploitation, production areas than Hungary has. Historically, Hungary is a net importer of these natural resources from Russia (Table 3). Therefore, according to the HO model, producing oil and gas in Russia and exporting those natural resources from Russia to Hungary is an optimal scenario in this case.

Overall, the HO model made much sense if we added the third factor, "technology."

Our 2-2-3 model, where the third factor is technology, is depicted as follows.

Figure 2 The 2-2-3 model



Source: Own drawing

Ⅲ. Method 2: Application of the currency value determination models

In Chapter Ⅱ, we learned that our HO model emphasizes the benefits of international trade when each country puts the most effort into exporting resources that are domestically naturally abundant such as energy resources of Russia. The other gets benefits when they import those resources they naturally lack.

In Chapter Ⅲ, we dealt with some currency value determination models in order to explain the fragility of Central European economy.

Krugman, P. (1979) developed a model called New Trade Theory (NTT) as an alternative to older theories that explain patterns of international trade as based on comparative advantage and natural resource endowments.

The next applications demonstrate how an international trade occur in a simple case between two countries with two currencies (Euro and a minor Central European currency).

The traditional NTT suggests that critical factors in determining international patterns of trade are the very substantial economies of scale, technology and network spread-out effects that can occur in key industries. In this sense, NTT became one factor in explaining the overall growth of globalization. Also, Shiozawa, Y. (2017) discussed a global value chain concept in his new international trade framework and cost explanation. However, since 2022, Russia has broken a traditional globalization model by halting energy resources supply to EU, and setting a stricter regulation on joint ventures according to the New Russian Presidential Decree[8] (2022).

Ⅲ-1. Material

Table 3 shows dependency of the European Union (EU) on energy imports, particularly oil and natural gas from Russia. High dependency on Russia concerns the security of energy policy in each country. Countries with especially high dependency in natural gas are Hungary

Table 3 Percentages of Imports from Russia in Gross Available Energy in 2020

Country	Total	Natural gas	Oil	Coal
EU 27 countries Total in 2020	24.4 %	41.1 %	36.5 %	19.3 %
Belgium	24.3 %	7.9 %	46.1 %	35.8 %
Bulgaria	15.4 %	72.8 %	13.1 %	8.2 %
Czechia	23.7 %	86.0 %	35.7 %	1.7 %
Denmark*	21.1 %	52.4 %	27.6 %	86.3 %
Germany	31.1 %	58.9 %	35.2 %	21.5 %
Estonia*	21.4 %	86.5 %	279.4 %	0.1 %
Ireland	3.2 %	0.0 %	6.1 %	5.2 %
Greece	46.5 %	38.9 %	73.0 %	8.9 %
Spain	7.5 %	10.5 %	8.8 %	43.2 %
France	8.4 %	20.0 %	15.7 %	29.7 %
Croatia*	24.7 %	55.0 %	14.2 %	74.7 %
Italy	23.8 %	40.4 %	17.4 %	49.8 %
Cyprus	1.7 %	unavailable	1.3 %	105.4 %
Latvia	31.0 %	100.1 %	25.5 %	95.6 %
Lithuania	96.1 %	50.5 %	202.7 %	69.1 %
Luxembourg	4.3 %	27.2 %	0.0 %	7.7 %
Hungary	54.2 %	110.4 %	57.4 %	11.3 %
Malta	7.5 %	0.0 %	8.7 %	unavailable
Netherlands	49.0 %	35.8 %	70.5 %	50.3 %
Austria*	16.5 %	58.6 %	7.3 %	9.2 %
Poland	35.0 %	45.5 %	76.3 %	13.4 %
Portugal	4.9 %	9.6 %	6.0 %	0.0 %
Romania*	17.0 %	15.5 %	37.0 %	11.8 %
Slovenia*	17.6 %	81.0 %	24.9 %	0.8 %
Slovakia	57.3 %	75.2 %	159.4 %	26.6 %
Finland*	45.0 %	92.4 %	141.2 %	30.0 %
Sweden	8.5 %	13.9 %	32.5 %	22.7 %
Iceland	0.0 %	unavailable	0.0 %	0.0 %
Norway	3.9 %	0.2 %	10.5 %	18.7 %

Explanations: The column "Total" shows how important imports from Russia are in the overall energy mix of a country, in other words, an indicator of how a country is reliant on energy imports from Russia. A percentage of above 100% means put in stock or the inventories that a country imports more than its needs for domestic consumption and exports as different energy product (e.g. oil in Estonia, Lithuania, Slovakia and Finland) to other countries.

Words of indemnification: assumptions were made for those countries that did not identify imports from Russia (*Denmark, Estonia, Croatia, Austria, Romania, Slovenia, Finland).

Also, there exist some unavailable data and others.

Source: Own Compilation, data provided by Eurostat[9]

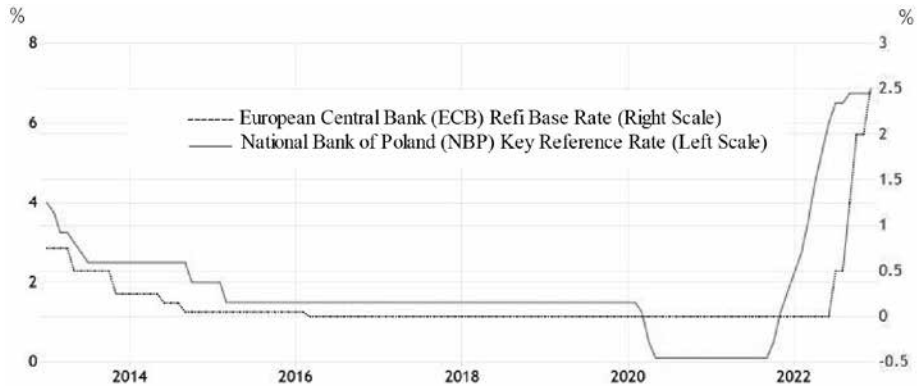
(the worst, 110.4%), Latvia (100.1%), Estonia (86.5%) and Czechia (86.0%).

Overall, more than half (57.5 %) of the EU's gross available energy in 2020 came from imported sources, of which 42.4% were coming from Russia, according to another Eurostat[10] data extracted on 22 December, 2022. We suspect that Central European countries' high dependency of energy on Russia has been a key factor of continuous weakness of those local currencies.

Among twelve 3SI countries, Matusiak and Masuyama (2022) showed that Romania (－3.8%) and Hungary (－1.5%) were the worst two in 2020, in terms of their net financial account deficit, percentage of GDP data. In this study, we checked the 2021 current account deficit data (Table 4, in the second column), and found out that Romania (－19.8 USD Billion) was again the worst, which ranked the 186th out of all 191 countries worldwide, and Hungary (－5.8 USD Billion) ranked the 176th. Undesirable numbers were observed in other V4 member states as well. Poland ranked the third worst (－4.6 USD Billion) among twelve 3SIs, followed by Czechia and Slovakia (respectively, －2.6 USD Billion, and －2.3 USD Billion.) We also checked the Euro based data of this same category, because Euro has weakened against US Dollar sharply since 2008, after the US's financial recovery from its stagnant Lehman shock according to Masuyama, T. (2017). Eurostat revealed the most recent data (in the second half of 2022) of current account deficits of EU. The overall EU current account of the balance of payments recorded a huge deficit of Euro 37.4 billion (－1.0% of GDP), down from a surplus of Euro 8.8 billion (0.2% of GDP) in the first quarter of 2022, and down from a surplus of Euro 104.8 billion (2.9% of GDP) in the second quarter of 2021, the same period one year ago, according to the estimation released by Eurostat.[11]

Also, we compared accumulated governmental deficit to GDP percentage in 2021, and found that a similar trend was observed. All V4 countries (Hungary (76.8%), Slovakia (63.0%), Poland (53.8%) and Czechia (42.0%)) have gradually accumulated the nations' debts, which they will not be able to repay easily. It will result in heavy burdens in the future. From the

Figure 3 Central Bank Reference Rates forthe last 10 years up to15 December, 2022



Source: Own drawing, by using Tradingeconomics.com'schartfunction

Table 4 Current Account Deficits, Country Deficits Percentage of GDP, Ratings, and CPI Data

Country	2021 CURRENT ACCOUNT DEFICITS (USD Billions)	2021 ACCUMULATED Countries' Deficits, percentage of GDP	Country's Ratings S&P, Long-Term Government Bond, as of 2022 December 20	CPI (HIPC) monthly, Annual Rate of Change	
				2022 March	2022 November
Total EU-27	+396.0 ※	—	—	7.8%	11.1%
Bulgaria	−0.32	22.8	BBB	10.5%	14.3%
Czechia	−2.62	42.0	AA−	11.9%	17.2%
Estonia	−0.59	17.6	AA−	14.8%	21.4%
Croatia	+2.30 ※	79.8	BBB+	7.3%	13.0%
Latvia	−1.11	45.7	A+	11.5%	21.7%
Lithuania	+0.93 ※	44.7	A+	15.6%	21.4%
Hungary	−5.78	76.8	BBB	8.6%	23.1%
Austria	−2.50	82.9	AA+	6.6%	11.2%
Poland	−4.57	53.8	A−	10.2%	16.1%
Romania	−19.83	51.9	BBB−	9.6%	14.6%
Slovenia	+2.35 ※	74.4	AA−	6.8 %	10.8 %
Slovakia	−2.26	63.0	A+	9.6.%	15.1%
Total 3SI	−34.0	—	—	—	—
3SI (% of EU)	Negative 1% Contribution to EU	—	—	—	—

※ "+" means "Surplus", and "−" means "Deficit"
Source: Own compilation, data provided by Statista.com
and Eurostat Harmonized Indices of Consumer Prices (HICP) History: PRC_HICP_MANR

financial investors' viewpoint, Romania, Hungary and Bulgaria are just at the edge of bankruptcy, especially for Romania which had a BBB-rating. It has a risk of falling into a non-investment grade (BB rating category) as of 7 December, 2022 (S&P). Hungary was also labeled a negative downward sign (↓) of BBB, as of 22 December, 2022.

Ⅲ-2. The PPP and UIP Application to the Currency Devaluation of EU

The Euro's devaluation against US Dollar is ongoing. Above all, we are more concerned about the continuous devaluation of minor European currencies against Euro. In the traditional exchange rate determination theory such as Purchasing Power Parity (PPP, to be explained later), where the currency depreciation tends to directly link to inflation which leads to stagflation in the end. However, for the last 15 years in EU until 2022, sudden and high inflationary phenomena had not occurred, but took place only in 2022 caused by a sudden

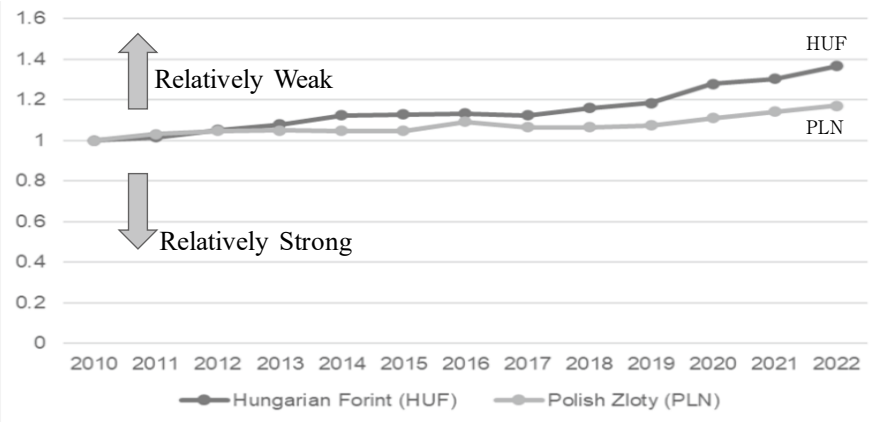
spike in energy prices that occurred right after Russia's military advancement to Ukraine. Another set of evidence is observed, in the EU countries' Consumer Price Index (CPI, Table 4) and in the short-term official reference rate transition (Figure 3), where cautionary/preventive actions were taken by central banks of each member country. For instance, the 2022 CPI figures (Hungary 23.1 %, Poland 16.1 %, in November, annual rate of change) skyrocketed from March 2022. Faltering energy supply raised stagflation concerns. In our understanding, other than the energy price spikes, another decisive reason is that the European minor currencies have gradually devaluated until 2022 against Euro.

We formed a hypothesis that says the gradual currency devaluation in 3SI's minor currencies against Euro has positively been linked to the increase of those governmental bond interest rates. In this paper, we dealt with Polish Zloty (PLN) and Hungarian Forint (HUF).

Ⅲ-3. Analysis and Discussion

First, we drew Polish Zloty's and Hungarian Forint's relative currency weakness (an index) to Euro since 2010, set 2010 = 1. Those rates are nominal, not adjusted by annual inflation rate such as Polish and Hungarian consumer price indices.

Figure 4 Comparative Currency Rate Index compared to Euro (Year 2010=1)



Source: Own drawing, provided by International Financial Statistics (IFS) Meta Data[12]

Table 5 Comparative Currency Rate Index compared to EURO (Composite Data)

Year End (Set 2010 = 1)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Hungarian Forint (HUF)	1	1.016	1.051	1.080	1.122	1.127	1.132	1.124	1.159	1.183	1.278	1.304	1.364
Polish Zloty (PLN)	1	1.030	1.046	1.049	1.046	1.046	1.090	1.064	1.065	1.074	1.110	1.141	1.171

Source: Own compilation, data provided by IFS Meta Data[12] (the same as above)

Figure 4 illustrated each local currency's relative weakness to Euro when the value in each year exceeds 1, and we realized both currencies have been weaker than Euro since 2010. In addition, we observed that Hungarian Forint has consistently been weaker than Polish Zloty throughout the period of 2012–2022.

In a short period of time, say, in a year (in the short run), currency depreciation should boost exports and have a positive effect on current account surplus, but this has not been applicable to either Hungarian Forint nor Polish Zloty since 2010 due to continuous devaluation of these two currencies against Euro, as it can be seen from the countries' macro data in Table 4. In the short run, there exists another foreign currency decisive forecast theory called "uncovered interest parity (UIP)." Its first model was designed by Keynes, J. (1923), and developed by many other researchers, one of whom is Fama, E. (1984).

The UIP traditionally uses short-term nominal interest rate differences between two countries in order to explain and adjust the degree of appreciation/depreciation of currencies in the end. Fama, E. (1984) developed the idea of "uncovered forward rate" which can anticipate a near future's value of a counterparty's currency based on certain conditions. In our case, we have long-term empirical evidence of depreciation of currencies, unexplainable by the UIP. So, we must find other factors to explain it, than UIP.

When we observed a long-term period over one year (in the long run), there is a model called Purchasing Power Parity (PPP).

PPP was contrived by Cassel, G. (1918, 1819 &1920). In the PPP model, finding proper expected inflation rates is a nuisance and a difficult task for most researchers. CPI, PPI (Producer Price Index) and some deflators are used, but there are arguments that these are not well fitted in Adachi, K. and Hiraki, K. (2021)

Instead, in this study, we tried to use long-term government bond yield differences to explain it. The rationale behind this trial is that we believe that there should be a "risk premium" factor existing over a country's sovereign stability and trust as a freely tradable country. Selling or buying of such a local minor currency is now freely traded. Of course, this kind of analysis needs more sets of data, regression, and currency liquidity tests. Also, an observatory period we select would be crucial to this verification. The reason why we picked April 2015 as the starting point was that long-term relative Euro currency strength against US Dollar was the strongest in the mid of 2015, and the weakest in the mid of 2022 during the period of 2008–2022.

In Table 6, we found that an annual compound rate increase in 10 year-government bonds in each country since April 2015 to date is positively correlated to annual compound rate decrease in such a local currency against Euro. In line with this analysis methodology, we found that the Hungarian Forint has been comparatively weaker than Polish Zloty since 2012. This relative weakness between those two minor currencies is positively correlated with the 10 year-government bond yield difference between the two countries.

Table 6 Each Country's 10-Year Government Bond, and Yield Differences compared to Euro Bond

	10 -Year Gov't Bond Yield (%) as of April 13, 2015	10 -Year Gov't Bond Yield (%) as of Dec. 15, 2022	Annual Compound Rate of Increase in Yield for 7.7 yrs (%, Average)	Arithmetic Simple Yield Difference (%)	Annual Compound Rate of Decrease In Currency against Euro (the same period)
Euro (Composite) Benchmark Bond	0.09%	3.00%	0.37% (a)	—	—
Germany	0.10%	1.90%	0.23% (b)	(b) − (a) = −0.14%	—
Hungary	3.50%	9.00%	0.68% (c)	(c) − (a) = 0.31%	2.6 % Decrease
Poland	2.30%	6.55%	0.53% (d)	(d) − (a) = 0.16%	1.5 % Decrease

Own Compilation, provided by European Central Bank – Statistical Data Warehouse: https://sdw.europe.eu

Ⅲ-4. Conclusion

Our hypothesis that nominal governmental bond yield difference is linked to the currency's weakness holds good. In other words, confidence in the country's long-term stability of government is more fundamental to maintain stability of currency in each non-Euro EU countries. For non-European trade partners and financial investors, reviewing the country's budgetary and political risk of counterparty is inevitable and useful.

On 1 January, 2023, Croatia became a new Euro-member country in EU. To review the process Croatia has experienced in the past, especially budgetary constraint could be a guidepost for other non-Euro EU countries. The annual update of the Stability and Convergence Program (SCP) is an element of the budgetary surveillance in EU, and constitutes an obligation for the remaining non-Euro EU countries. Every year, detailed reports are prepared in line with guidelines on the format and content of SCP. By carefully reviewing these SCP reports, we can feel and understand where that particular country's government politically and economically wants to go. Participating in Euro is not always the sole optimal solution for all the countries in EU. Bagoly, E. (2021) said that foreign policy toward Russia was one of the areas where there was significant non-coherence between V4 and EU. Within the V4, the Slovakia－Hungary axis pursues a pragmatic foreign policy toward Russia.

We cannot generalize all the twelve 3SI countries are the same in economic categories, or toward the same political direction. Some countries inevitably choose continuous energy resources imports from Russia, regardless of sanctions. Nevertheless, for heavily accumulated deficit countries like Hungary, at least they have to escape from currency crisis which actually took place in Asia in the late twenty century.

Ⅳ. Integrated Summary and Implications for the Future Study

In order to illuminate the industrial weaknesses/strengths of the Central Europe, especially, V4 countries among 3SIs, in Chapter Ⅱ, we made the best use of a slightly revised HO model. Also, in Chapter Ⅲ, we tried to utilize the currency value determination models such as the UIP and PPP to lighten relative weakness of non-Euro adopted local Central European currencies such as Hungarian Forint and Polish Zloty, compared to Euro.

The overall purpose of this paper is neither to forecast the future values of those minor currencies nor to determine the future inflationary levels, but to investigate underlying causes of sluggishness and fragility of Central European economy. Russian military advancement to Ukraine has simply magnified the speed and degree of this fragility. Fundamental causes definitely exist somewhere else, other than this military phenomenon. As a clue to these solutions, we found out long-term treasury bond yield differences among those Central European countries. Financial investors have been keen to smell and wise enough to judge fundamental weaknesses of the Central European economy, and rank all these countries according to their political and economic default risk. Political risk is just an element of long-term default possibilities. In line with this method of analysis, we found a clue, which was a proportional relation between currency weaknesses and long-term governmental bond rate hikes. There is a certain tendency or principle of marginal currency rate devaluation per long-term governmental bond yield increase. We will challenge to find out this kind of principle in the next paper.

Notes

1 The Three Seas Initiative (3SI) has been established in 2016 as relatively a new platform of political communication and financial cooperation among 12 EU member countries (states) located between the Baltic, the Black and Adriatic seas. These twelve states are Austria, Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Reference to Matusiak and Masuyama (2022).

2 'History of the Visegrad Group' is cited in their original homepage. https://www.visegradgroup.eu/about/history (accessed: 12 Dec. 2022).

3 This information was provided by The Observatory of Economic Complexity (OEC). https://oec.world/en/profile/bilateral-country/rus/partner/hun (accessed: 12 Dec. 2022).

4 This information was provided by Salaryexplore. This organization says their sources of information are submitted by their users, and a database of salary information gathered from requirement agencies, companies and employers. http://www.salaryexplorer.com/salary-survey.php?loc=98&loctype=1&job=39&jobtype=1 (accessed: 12 Dec. 2022).

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manufacturer/ (accessed: 20 Dec. 2022)

7 A Russian company, Gazprom (Газпром)'s official homepage is temporary suspended. https://www.gazprom.ru (checked: 20 Dec 2022).

8 Presidential Decree No. 520 on 5 Aug. 2022 is descripted by an international law firm group, Dechert, LLP in their *News and Insights* titled "New Russian Presidential Decree Further Restricts Sales of Certain Russian Companies," on 11 Aug 2022. https://www.dechert.com/knowledge/onpoint/2022/8/new-russian-presidential-decree-further-restricts-sales-of-certa.html (accessed: 12 Dec. 2022)

9 This Eurostat data is provided by its own "Energy Mix 2020." The Eurostat is an official EU's database source. https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fec.europa.eu%2Feurostat%2Fstatistics-explained%2Fimages%2F2%2F24%2FEnergyMixDependencyImports_25-03-2022.xlsx&wdOrigin=BROWSELINK (accessed: 12 Dec. 2022)
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