CHANGES IN THE KEY ECONOMIC INDICATORS IN JAPAN, POLAND, THE UNITED STATES AND THE EURO AREA IN THE 21ST CENTURY

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Abstract

The aim of the article is to identify the changes of selected economic variables in Japan, Poland, the USA and the euro area and to evaluate the impact of these variables on these economies in 2000–2022.

The hypothesis posed in the article: The economies of Japan, Poland, the USA and the euro zone have overcome the economic shocks that occurred in the first two decades of the 21st century.

Methodology: The study included a review of the literature on the subject, the presentation and analysis of statistical data, including its graphical presentation. Six economic indicators were selected for analysis, such as: the unemployment rate, inflation, General Government debt, long-term interest rates, GDP per capita, and GDP growth in Japan, Poland, the United States and the euro area in 2000–2022.

Results of the research: Over the past 20 years, economies have been hit by unprecedented crises such as the Global Financial Crisis (GFC) and Covid-19, and yet we note that the surveyed countries and the euro zone showed positive economic growth for most of the period and successfully fought unemployment. Japan tried to get out of periods of deflation, but out of the examined 23 years, deflation was recorded in Japan for 15 years. In the years 2000–2022, the highest economic growth was most often recorded in Poland and the lowest in Japan, but the highest inflation was also most often recorded in Poland. In all the surveyed countries and the euro zone, a tendency to increase the GG of debt was clearly noticed.

Keywords: economic variables, unemployment, economic growth, GDP per capita, interest rates, inflation, General Government debt, quantitative easing.

JEL Class: E5, E61, F60.

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INTRODUCTION

Economic indicators are statistical datasets that allow us to analyze the performance of an economy and predict its future performance. In this paper selected six economic indicators were considered: the unemployment rate, inflation, General Government debt, long-term interest rates, GDP per capita, and GDP growth in Japan, Poland, the United States and euro area. In the literature, three main types of indicators are differentiated: lagging, coincident and leading. Lagging indicators are inflation, General Government debt and unemployment rate. They show the state of the economy with a time lag. GDP per capita and GDP growth are both coincident indicators (they show the contemporary state of the economy), while long-term interest rates are a leading indicator (it predicts the future economy). We analyze six macroeconomic indicators (1 leading, 2 coincident, 3 lagging) and examine the Quantitative Easing usage in Japan, Poland, the United States and euro area. The review of the indicators will later enable us to consider the development of the economy in the 21st century[1]. The aim of the article is to identify the changes of selected economic variables in Japan, Poland, the USA and the euro area and to evaluate the impact of these variables on these economies in 2000–2022. The hypothesis posed in the article is as the following: the economies of Japan, Poland, the USA and the euro zone have overcome the economic shocks that occurred in the first two decades of the 21st century.

The structure of the paper is as follows: The article begins with an introduction. Section 1 presents the findings of a review of studies on the impact of the most important economic variables on economies in theory and practice. In Section 2, we analyze selected economic variables in Japan, Poland, the USA and the euro zone in the years 2000–2022. Section 3 presents the information on unconventional monetary policy tools used in Japan, Poland, the USA and the euro zone. The last section presents the conclusions.

1. LITERATURE REVIEW

The economic variables described in this article are important for every economy. These variables are used in research on economic phenomena and thus find their place in many theses and laws that have been created on the basis of empirical research. The paper will present some of the laws or economic theories that are associated with the variables selected. The first discussed variable is unemployment. According to OECD, the unemployed are people of working age

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[1] The study covers the years 2000–2022, where only the period 2001–2022 belongs to the 21st century, but to extend the analysis time we decided to add the year 2000.

who are without work, are available for work, and have taken specific steps to find work (OECD, 2023d). The unemployment rate is calculated as a percentage relation between the unemployed and the total labor force. Historically, the negative correlation between GDP growth and unemployment is usually referred to as Okun's law. According to Okun's research, an increase in unemployment by every percentage point above the natural unemployment level (of 4%) leads to an increase in the GDP gap by 3% (Okun, 1962). Although there are different studies conducted for different countries and in different years, Okun's law, in the so-called the "gap version" means that for every 1% increase in the unemployment rate, a country's GDP will be approximately an additional 2% below its potential GDP (Knotek, 2007). Originally, a 1% increase in real GDP was associated with a decrease in the unemployment rate of approximately 0,3 percentage points (Guisinger et al., 2017). However, during the subprime crisis this relationship was disturbed e.g. in 2009:Q4 with a 0,5% decrease in GDP, the unemployment rate rose by 3% compared to 2008:Q4. In turn, for example, between the fourth quarter of 2009 and the fourth quarter of 2011, it was noticed that a four-percent-point increase in the unemployment rate corresponds approximately to a one-percent decrease in GDP (Sanchez and Liborio, 2012). There is no rigid relation between GDP and unemployment, but we can assume that growth slowdowns will coincide with rising unemployment and vice versa (Knotek, 2007). Moreover, as already mentioned, Okun's law has been measured in many countries and appears to be valid in most of the studied economies although Okun's coefficients have different values in different countries. For example, Perman and Tavera (2005) noted that in the European Union countries one can find countries with similar values of Okun's coefficients, which proves the similarity of labor markets.

When presenting statistical data on unemployment, it is also worth referring to statistical data on inflation and mentioning the relationship between unemployment and inflation. We can observe a negative relation between inflation rate and the unemployment rate. The Phillips curve states that higher inflation causes unemployment to fall (Phillips, 1958). Relation exists only in the short-run. In the long-run unemployment remains on the natural level (about 5%), hence inflation does not affect it. The Phillips curve is vertical (Friedman, 1969b). A. Okun developed the misery index that is the sum of unemployment and inflation rates. This indicator was supposed to indicate how increased unemployment and inflation reduce well-being. D.G. Blanchflower, D. Bell, A. Montagnoli and M. Moro, based on the economies of European countries in the years 1975–2013, found that both higher unemployment and higher inflation reduce prosperity. Additionally, they noticed that unemployment contributes to lower welfare more than inflation. Using the misery ratio in their study, they found that an increase in the unemployment rate by one percentage point reduces well-being more than five times more than an increase in the inflation rate by one

percentage point (Blanchflower et al., 2014). Inflation measured by the consumer price index (CPI) is defined as the change in the prices of a basket of goods and services that are typically purchased by specific groups of households. Although low inflation stimulates GDP, high inflation will make people reluctant to hold money, increase the variability in relative prices, increase the taxation of the poor, and cause price-changing related costs. Hyperinflation can even lead to the collapse of the financial markets or the economic authorities' trust loss.

At this point, it is worth mentioning the research of Sargent and Wallace (1981), who wrote about effective monetary policy in controlling inflation, which depends to a large extent on coordination with fiscal policy. This is due to the fact that even in the case of a traditional relationship between the money supply and inflation, restrictive monetary policy may still result in an increase in inflation. This happens when, in a situation of increased demand for government bonds, part of the government's liabilities would have to be covered by seigniorage. What is also related to this phenomenon is the fiscal theory of the price level (FTPL), where public debt is identified as a channel of fiscal impact on inflation. The increase in public debt by increasing the wealth of households increases the demand for goods and services and thus leads to inflationary pressure (Buiter, 1999; Woodford, 1994; Canzoneri et al., 2001). On the other hand, higher inflation means higher interest rates (the Fisher effect), which increases the price of future loans. When the inflation rate rises, nominal interest rates should also rise to keep the real interest rate unchanged; therefore, the real interest rate equals the nominal interest rate minus the expected inflation rate. When inflation grows, central bank heightens the interest rates. In the short-run high inflation increases the GDP growth, but in the long-run it slows GDP growth down, or can even cause recession. J. Bhattacharya, J. Haslag and A. Martin showed in their research that, for logarithmic utility, zero inflation is never optimal if the economy is dynamically efficient. For this reason, the optimal monetary policy shouldn't support zero inflation. The authors justify this point by the Tobin-Mundell effect stating that an increase in inflation causes an increase in capital investment and in succession an increase in GDP (Bhattacharya et al., 2009).

General Government debt accumulation may raise interest rates, which can crowd out private investment (the crowding out effect). The crowding out effect is a theory stating that increasing the public sector spending drives down private sector spending. To spend more, the government must obtain more money. It does so by increasing taxes or borrowing money through the sale of Treasury Securities. These actions can lead to a reduction in the incomes of individuals and as a result lower spending (www1). However, generally if the real average wages are increasing slower than labor productivity, and the gap between labor productivity and real median wages is becoming wider and wider, most of the income generated by GDP growth goes to the rich part of society. People with

high income are less likely to consume additional money, which decreases the aggregated demand, hence decreasing the GDP growth (OECD, 2018).

Below, Chart 1 shows the relationship between labor productivity, real average wages and real median wages in 13[2] selected OECD countries in the years 1990–2022.
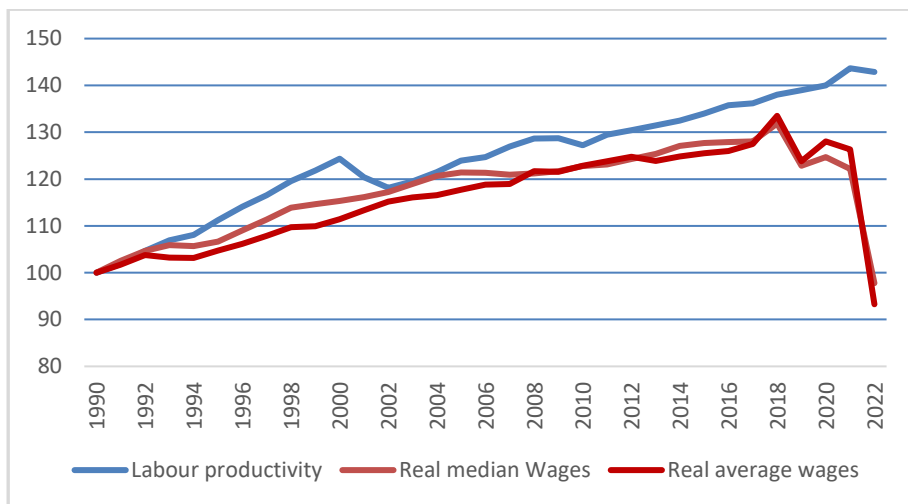

Chart 1. Real median wages – labor productivity gap

Source: www2.

One way to increase the aggregated demand in the market is to increase the public spending. Government can stimulate the GDP growth by investing borrowed money in infrastructure, healthcare, or education. When demand in the private sector is low, higher public spending shouldn't cause the crowding out effect. Quite the contrary, they may create new opportunities for workers, and corporations (Federal Reserve Bank of St. Louis, 2017).

M. Connolly and Ch. Li did not find any significant effects that consumption spending or public investment would have on subsequent GDP growth. They have only spotted a significant negative effect of social spending on GDP growth (Connolly and Li, 2016).

In most of the European countries the central bank cannot provide monetary financing, but in some countries, high costs of the government debt sustainability can encourage the central bank to provide monetary financing (direct or indirect) to the government, which can cause inflation The situation of hyperinflation in

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[2] Wage average of 13 countries – Australia, Austria, Belgium, Canada, Chile, Germany, France, Denmark, Greece, Italy, Japan, Mexico, Poland.

Weimar Germany in the 1920s captures it very well. To finance the budget deficit money supply was increased (about 24% in two months). Such expansion of money supply was the main cause of the hyperinflation (Ferguson, 2010).

Regardless of the negative results of large GG debt, it can be also hard for the Government to reduce it. Authorities have to hold deliberate actions. A study held by ECB found that fiscal consolidation can inhibit GDP growth in the short-run. The study also showed that expenditure-based adjustments are in general less harmful than revenue-based adjustments. Indirect tax increases were found to have the most significant negative impact on GDP growth (Attinasi and Klemm, 2014).

Long-term interest rates refer to ten-year government bonds. The level of interest rates is a crucial macroeconomic indicator that shows how much borrowing money costs. Central banks can affect the level of interest rates. According to the Keynesian view, lower levels of interest rates increase money creation and stimulate investments. For this reason, most central banks (if inflation remains low and stable) tend to reduce interest rates in order to increase investments and consumption in the economy. That can positively increase the aggregated demand in the country, which (by causing upward pressure on prices) can generate the risk of demand-pull inflation. By heightening the interest rates central banks can lower the demand and decrease inflation or the probability of the future inflation (OECD, 2023a).

By conducting a restrictive monetary policy, i.e. among others keeping the interest rates at a steady higher level, central banks can influence inflationary expectations. That may reduce the risk of the wage push (workers who expect an increase in future inflation are likely to demand higher wages, which expands the money supply of consumers, hence boosting their spending power and the demand for goods) (Tepper, 2022).

M. Friedmann by creating the Friedman's rule argued that monetary policy should aim at the nominal interest rate being at, or near zero. With positive interest rates, people would tend to keep less liquid money, which is not socially optimal. To raise the GDP and optimize the economy, opportunity cost of holding money, should equal the social cost of creating additional fiat money. Hence, rates of interest should be zero, which means that the central bank should aim at an inflation or deflation level equal to the real interest rate (Friedman, 1969a).

At the end of the literature review, reference was made to basic information regarding Gross Domestic Product (GDP) and the GDP growth rate. There are some ways of defining the Gross Domestic Product (GDP). IMF writes that it is the monetary value of final goods and services. OECD defines it as the standard measure of the value added created through the production of goods and services in a country during a certain period, and a measure of the total income earned from that production or spent on final goods and services. GDP is one of the most

important economic indicators showing the economic activity of a country, however, it fails to show an adequate look at people's well-being. GDP growth showed in percent measures the total annual increase in the country's wealth. It is a significant indicator of the overall economic state of a country. The most important aim for all the countries' governments is to enlarge the GDP by leading suitable considered policy.

2. SELECTED ECONOMIC VARIABLES IN JAPAN, POLAND, THE USA AND THE EURO ZONE IN THE YEARS 2000–2022

2.1 Unemployment rate

While in Poland unemployment was decreasing steadily from 20,2% in 2002 to 2,89% in 2022, in the USA, euro area, and Japan unemployment didn't change significantly (Table 1). In Poland after contracts (signed during the privatization process with Polish companies) that guaranteed a specific level of employment expired, unemployment rate soared to 20% (Zdrojewski and Toszewska, 2010). After Poland became a member of the EU in May 2004, the unemployment rate declined. Opening the European labor market created an opportunity of seeking jobs abroad. It is estimated that two million people emigrated from Poland in 2006–2007 to work abroad (Bobrowska, 2013). Collaterally, foreign investment and the funds from the EU financing these programs helped Poland reduce the unemployment rate. From 2013 we can observe a rapid decline in the unemployment rate. Now, Polish employers are often struggling with staff shortages and have to employ foreigners. We can suppose that the war in Ukraine and mass immigration may help Poland solve this problem.

Table 1. Unemployment in Japan, Poland, the USA and in the euro area between 2000–2022

Unemployment rate			
Time	**Location**		
	JPN	**POL**	**USA**	**Euro area**
2000	4,72	16,08	3,99	8,88
2001	5,03	18,31	4,73	8,31
2002	5,38	20,03	5,78	8,60
2003	5,26	19,75	5,99	9,12
2004	4,72	19,14	5,53	9,36
2005	4,43	17,93	5,07	9,22
2006	4,14	13,97	4,62	8,49

2007	3,84	9,61	4,62	7,60
2008	3,99	7,04	5,78	7,68
2009	5,07	8,13	9,27	9,66
2010	5,05	9,98	9,62	10,23
2011	4,58	9,95	8,95	10,26
2012	4,35	10,39	8,07	11,47
2013	4,03	10,61	7,38	12,09
2014	3,59	9,21	6,17	11,68
2015	3,38	7,68	5,29	10,92
2016	3,12	6,28	4,87	10,08
2017	2,81	4,96	4,35	9,12
2018	2,44	3,88	3,90	8,23
2019	2,35	3,31	3,67	7,62
2020	2,78	3,22	8,09	7,95
2021	2,82	3,38	5,37	7,73
2022	2,60	2,89	3,65	6,72

Source: OECD (2023d).

In comparison to the unemployment level and the unemployment rate at the end of September 2022 to the end of February 2020, before the COVID-19 pandemics, the number of unemployed people decreased by 116,8 thousand and the registered unemployment rate was lower by 0,7 percent point. It makes Poland the second country in the European Union (EU) with the lowest unemployment rate (2,6%), after the Czech Republic (2,4%) (Ministry of Family and Social Policy, 2022)

In the countries surveyed and in the euro area, the unemployment rate increased during the recession caused by the subprime mortgage crisis of 2008–2009. It strongly affected the USA, where the unemployment rate soared in 2009 from 5,78% to 9,27%. It took the country seven years to achieve the previous level of the unemployment rate. During the study period of 2000–2022, Japan had the lowest average unemployment rate that totaled 4%. In the USA it amounted to 5,86%, in the euro area 9,17% and in Poland 10,25%. It is worth mentioning that in Poland the average unemployment rate does not show the real state of the market, because it varied significantly in that period.

2.2. Inflation

In Poland, 2022 is the year in which galloping inflation occurred. In 2022, inflation in Japan was 2,5%, in the USA 8%, and in the euro zone countries 8,4%. In Poland it occurred in the analyzed period between 2014–2016. In turn, in Japan, deflation occurred very often in the period under study, namely in 2000–2005, 2009–2012, 2016 and 2020–2021. Deflation in the USA was recorded in the analyzed period only in 2009.

As indicated, we can observe some deflationary intervals in Japan in the analyzed period. According to the speech of H. Kuroda (Governor of the Bank of Japan) on M. Camdessus Central Banking Lecture, the main cause of chronic deflation in Japan were: decline in natural rate of interest, the asset bubble and subsequent financial crisis occurrence (Kuroda, 2019). However, some economists claim that monetary policy, not external factors, caused Japan's stagnation and in later years contributed to deflation. Combination of policy mistakes turned mild recession of 1990–1994 into the extended stagnation. Asset price declines (after their soaring during the asset price bubble) lasted long and therefore had large real effects on the Japanese economy (Posen, 2003).

Table 2. Inflation in Japan, Poland, the USA and in the euro area in 2000–2022

Inflation				
Time	**Location**			
	JPN	**POL**	**USA**	**Euro area**
2000	-0,66	10,09	3,38	2,20
2001	-0,73	5,48	2,83	2,40
2002	-0,91	1,94	1,59	2,30
2003	-0,25	0,84	2,27	2,10
2004	-0,01	3,49	2,68	2,20
2005	-0,28	2,13	3,39	2,20
2006	0,24	1,03	3,23	2,20
2007	0,06	2,49	2,85	2,20
2008	1,38	4,22	3,84	3,30
2009	-1,34	3,45	-0,36	0,30
2010	-0,70	2,58	1,64	1,60
2011	-0,28	4,27	3,16	2,70
2012	-0,04	3,70	2,07	2,50
2013	0,35	0,90	1,46	1,30

2014	2,73	-0,03	1,62	0,40
2015	0,80	-0,93	0,12	0,20
2016	-0,13	-0,58	1,26	0,20
2017	0,48	1,98	2,13	1,50
2018	0,99	1,67	2,44	1,80
2019	0,48	2,31	1,81	1,20
2020	-0,02	3,40	1,23	0,30
2021	-0,25	5,10	4,70	2,60
2022	2,50	14,30	8,00	8,40

Source: OECD (2023b).

We can see that after the Bank of Japan (BOJ) introduced *Quantitative and Qualitative Monetary Expansion – QQE* in 2013, inflation increased in Japan. From 2019 to 2020 we observed a decline in inflation in analyzed countries and the euro area, except Poland. Poland was the only country where inflation did not decrease in 2020. It increased steadily from 2019 to reach 14,3% in 2022. In the period 2000–2022, Japan most often had the lowest inflation rate among the surveyed countries, whereas the euro zone and Poland most often had the highest inflation rate.

In Hanke's Annual Misery Index (HAMI), which measures the sum of unemployment, inflation, and bank-lending rates minus the annual change in GDP growth rate (the index shows the average standard of living in a country), Japan scored eight points ranking 153 out of 156 countries. It means that (according to the indicator) only three countries' economies did better than Japan in 2020 (Hanke, 2021).

2.3. General Government Debt

The general government debt-to-GDP ratio measures the gross debt of the general government as a percentage of GDP. It is a key indicator for the sustainability of government finance. According to the OECD definition – the GG debt is calculated as the sum of the following liability categories (as applicable): currency and deposits; debt securities, loans; insurance, pensions and standardized guarantee schemes, and other accounts payable (OECD, 2023c). Table 3 presents GG debt-to-GDP in Japan, Poland, the USA and the euro zone in 2000–2022.

Table 3. General Government debt (% of GDP) in Japan, Poland, the USA and
in the euro area between 2000–2022

General Government Debt				
Time	Location			
	JPN	POL	USA	Euro area
2000	140,80	45,95	72,14	57,73
2001	146,84	44,57	74,79	57,21
2002	157,10	54,02	80,46	57,85
2003	166,31	56,20	81,89	57,47
2004	171,68	53,77	88,83	57,45
2005	172,32	55,25	88,55	57,01
2006	172,70	54,96	85,92	54,38
2007	174,24	51,56	86,24	51,69
2008	178,16	53,88	102,01	56,33
2009	199,37	57,18	115,45	66,59
2010	204,42	62,22	125,34	70,93
2011	217,99	62,64	130,49	73,29
2012	226,65	65,99	132,28	83,33
2013	229,68	67,12	135,83	85,52
2014	234,38	71,89	135,51	90,68
2015	233,28	70,31	136,94	87,90
2016	231,37	73,41	138,80	87,40
2017	230,29	68,96	135,44	84,14
2018	234,33	66,72	137,31	81,42
2019	234,60	63,63	136,13	81,23
2020	257,46	77,51	160,22	96,02
2021	259,39	68,06	148,04	90,07
2022	254,50	58,80	144,20	n.d.

Source: OECD (2023c),

In the years 2000–2022, we can observe a steady increase in GG debt in euro
area and the analyzed countries except Poland. Japan with a GG debt equal to
260% of its GDP is one of the most indebted countries in the world and the most
indebted considering G7 countries. After the Japanese asset price bubble Japanese

GG debt started to soar. By the end of the 1990s, it reached the level of GDP. By 2010 it became twice as large as the GDP. From 2010 to 2022 it rose by another 60% point. The main cause of such a large debt can be the high costs of healthcare and social security for the elderly. From the end of 2021 Japanese GG debt is so high that an increase in interest rates or government bond yields may have serious consequences for the BOJ.

In the USA from 2000 to 2020 GG debt doubled. We can observe a rapid increase in GG debt from 2020 to 2021 that could be caused by the QE program held by FED to stimulate the economy during the Covid-19 economic slowdown. From 2021 to 2022 GG debt decreased a bit due to the *Quantitative Tightening* - QT policy. In Poland, we can observe some GG debt fluctuations. In Poland GG debt measured by OECD varied from 44,57% to 73,41%. It is worth mentioning that if we consider the Eurostat GG debt data, Poland is the only country that didn't cross the Maastricht criteria stating that "the public debt must not exceed 60 % of GDP" (European Union, 1992). In the euro area, the GG debt increased from 2010 to 2014 (after the subprime mortgage crisis that damaged the United Kingdom's and German's economy strongly) and decreased from 2014 to 2019. It increased again after the economic slowdown caused by COVID-19 in 2020 reaching 96% of GDP and decreased by approximately six percentage points in 2021.

2.4. Long-term interest rates

Japan from 2000 to 2022 held a policy of low-interest rates, in 2016, 2019, and 2020 interest rates were negative. From 2012 to 2022 the interest rate stayed below one percent. The reason for keeping interest rates so low can be the need to incur debt continuously to secure the Japanese Government's finance. Japan as stated in the article by Olivier Blanchard and Takeshi Tashiro "is suffering from a strong case of secular stagnation, in which domestic private demand is too weak to sustain full employment without the help of fiscal and monetary policy". The authors claim that one of the major factors of this fact is the declining population and the associated high private saving rate. To increase private demand, the BOJ did almost everything, from QE to negative rates, but nothing has worked satisfactorily yet. Using fiscal policy to support demand is effective but it is inextricably connected with expanding the government's expenditure. Very low-interest rates, current and prospective, imply that both the fiscal and economic costs of debt are low. Additionally, the benefits of public deficits, namely higher activity, are high (Blanchard and Tashiro, 2019).

Table 4. Long-term interest rates in Japan, Poland, the USA and the euro area in 2000–2022

Long-term interest rates				
Time	Location			
	JPN	POL	USA	Euro area
2000	1,74	-	6,03	5,44
2001	1,32	10,68	5,02	5,03
2002	1,26	7,36	4,61	4,92
2003	1,00	5,78	4,02	4,16
2004	1,49	6,90	4,27	4,14
2005	1,35	5,22	4,29	3,44
2006	1,74	5,23	4,79	3,86
2007	1,67	5,48	4,63	4,33
2008	1,47	6,07	3,67	4,36
2009	1,33	6,12	3,26	4,03
2010	1,15	5,78	3,21	3,78
2011	1,10	5,96	2,79	4,31
2012	0,84	5,00	1,80	3,05
2013	0,69	4,03	2,35	3,01
2014	0,52	3,52	2,54	2,28
2015	0,35	2,70	2,14	1,27
2016	-0,07	3,04	1,84	0,93
2017	0,05	3,42	2,33	1,17
2018	0,07	3,20	2,91	1,26
2019	-0,11	2,35	2,14	0,58
2020	-0,01	1,50	0,89	0,21
2021	0,07	1,94	1,44	0,20
2022	0,23	6,05	2,95	2,04

Source: OECD (2023a).

Now, when the inflation is soaring in Japan (it reached a 41-year high of 4,2% in January 2023) and the Yen exchange rate decreasing (it reached a 32-year low against the dollar in October 2022) the BOJ doesn't want to raise interest rates arguing that it will lower already weak demand and inhibit the slow economic recovery from the pandemic (Dooley, 2022).

Long-term interest rates have been in a downward trend since the beginning of the 21st century in the surveyed countries, i.e. Japan, Poland, the USA and the euro zone, which was mainly caused by falling or low inflation and even deflation in some periods. From 2021 interest rates started to a greater or lesser extent to rise due to a growing inflation (Table 4).

2.5. GDP per capita

As we can see while in 2000 the GDP pc PPPs (Gross Domestic Product per capita) of Japan was greater than the average GDP pc in the euro area, then in 2010 they were almost equal. In 2021 the GDP pc in the euro area exceeded the Japanese by 10 thousand dollars (Table 5). Is could be the result of recession (Lost 30 Years) in Japan.

Table 5. GDP per capita PPPs (in US dollars) in Japan, Poland, the USA and in the euro area in 2000–2022

GDP per capita PPPs (in US dollars)			
Time	**Location**		
	JPN	**POL**	**USA**	**Euro area**
2000	27289,85	10674,32	36299,66	25386,50
2001	27946,08	11120,62	37100,29	26582,87
2002	28633,70	11803,76	37954,22	27618,01
2003	29411,59	12292,07	39419,91	28072,05
2004	30837,18	13354,53	41659,66	29176,42
2005	32174,40	13898,41	44052,38	30172,26
2006	33638,84	15153,82	46234,11	32636,41
2007	35021,73	16806,71	47976,20	34531,20
2008	35278,75	18308,04	48498,45	35822,25
2009	33550,69	19075,27	47122,99	34900,46
2010	35342,82	20633,33	48570,29	35891,84
2011	36215,01	22386,23	49951,91	37382,97
2012	37628,68	23300,92	51644,99	37754,93
2013	39436,68	24028,19	53116,52	39010,50
2014	39559,76	25005,66	54914,37	40040,67
2015	40908,78	26495,81	56520,61	41133,71
2016	40642,70	27830,93	57592,69	43624,68

2017	41531,22	29609,45	59589,23	45704,29
2018	42239,05	31662,21	62449,61	47617,69
2019	42465,48	34592,71	64690,27	50324,21
2020	41699,10	34893,46	63480,86	48227,56
2021	42229,83	37710,71	70181,12	51300,17
2022	45649,00	42962,00	76291,00	56873,00

Note: This indicator is based on nominal GDP (also called GDP at current prices or GDP in value) and is available in different measures: US dollars and US dollars per capita (current PPPs). All OECD countries compile their data according to the 2008 System of National Accounts (SNA). This indicator is less suited for comparisons over time, as developments are not only caused by real growth, but also by changes in prices and PPPs.

Source: OECD (2023e).

In 2022, we notice the smallest percentage difference (among the statistical data presented in Table 5) in GDP per capita PPPs between Japan and Poland. In turn, the percentage difference between GDP pc PPPs in the euro zone and Poland in 2022 was 27,86% in favor of euro zone residents. Finally, the percentage difference between GDP pc PPPs in the USA and Poland is as much as 55,89%, obviously in favor of the residents of the United States.

2.6. GDP growth

Poland, as a developing country, expanded its wealth fastest. In the analyzed period, Poland most often recorded the highest GDP growth rate among the surveyed countries and the euro area. High growth can be explained by the fact that according to the International Monetary Fund's (IMF) definition, Poland is still a developing country. For this reason, it could benefit from the catch-up effect which states that developing countries can adopt technologies from the developed ones, hence reaching higher growth rates (Table 6).

Table 6. GDP growth in Japan, Poland, the USA and in the euro area in 2000–2022

GDP growth (in percent)			
Time	Location		
	JPN	POL	USA	Euro area
2000	2,76	4,56	4,08	3,82
2001	0,39	1,26	0,95	2,17
2002	0,04	2,04	1,70	0,91

2003	1,54	3,50	2,80	0,65
2004	2,19	4,98	3,85	2,28
2005	1,80	3,51	3,48	1,66
2006	1,37	6,13	2,78	3,22
2007	1,48	7,06	2,01	2,99
2008	**-1,22**	4,20	0,12	0,41
2009	**-5,69**	2,83	**-2,60**	**-4,49**
2010	4,10	2,93	2,71	2,14
2011	0,02	5,04	1,55	1,68
2012	1,37	1,55	2,28	-0,87
2013	2,01	0,86	2,1	-0,23
2014	0,30	3,84	2,5	1,39
2015	1,56	4,38	2,71	2,02
2016	0,75	2,95	1,67	1,86
2017	1,68	5,14	2,5	2,62
2018	0,58	5,95	2,95	1,78
2019	**-0,40**	4,45	2,5	1,58
2020	**-4,20**	**-2,02**	**-2,2**	**-6,20**
2021	2,20	6,80	5,8	5,90
2022	0,90	5,30	1,9	3,40

Source: OECD (2023f).

Japanese GDP grew the slowest of all analyzed countries. In 2008, 2009, 2019, and 2020 Japan experienced a decline in GDP. In 2002 and 2011 its growth was close to zero. The phenomenon of economic stagnation after the burst of the asset price bubble in Japan, 1992 was called the lost decade. Later, it was even called lost 30 years in the article "Japan Heading for the Lost 30 Years" by Japanese economist Nobuo Ikeda (Ikeda, 2010).

Paull Hanon says that the USA outperformed Europe – European Union in economic growth over recent decades on account of quicker population extension and significant development of fast-growing technology sectors. In 2022 Europe outpaced China and the USA in GDP growth scoring 3,5% for 2022 as a whole (Hannon, 2023).

3. QUANTITATIVE EASING

Quantitative Easing (QE) is an unconventional monetary policy form used by a central bank to stimulate the economy. During QE central bank purchases predetermined amounts of securities such as government bonds or other financial assets to increase the money supply and therefore raise the liquidity of banks, which encourages lending and investment in the market. QE is used mostly when standard monetary policy instruments have become ineffective (Bank of England, 2023).

Globally, the variety of central banks have attempted to apply quantitative easing as a tool preventing recession and deflation risk in their countries with inconclusive results. While QE policy is effective at lowering interest rates and boosting the stock market, its broader impact on the economy could be not apparent. QE is connected with some risks that include inflation hikes, currency devaluation, also with a risk that increased liquidity of banks will not imply higher lending activities, hence will not increase investments and stimulate GDP growth (Jackson, 2023). Quantitative tightening (QT) is a reverse of QE, where a central bank sells off its own held or previously purchased government bonds or other financial assets, to decrease the money supply and lower inflation. It is usually used after periods of some earlier, quantitative easing purchases (Engemann, 2019).

3.1. Quantitative Easing in Japan

QE was first used in Japan (along with other policies such as zero interest rate policy and credit-easing policy). From 2001 for over a period of five years, the Bank of Japan (BOJ) purchased Japanese Government Bonds to meet the bank reserve target of 32–35 trillion yen (Iwata and Takenaka, 2013). In March 2006 amid signs that the economy was emerging from the deflation, BOJ exited quantitative easing.
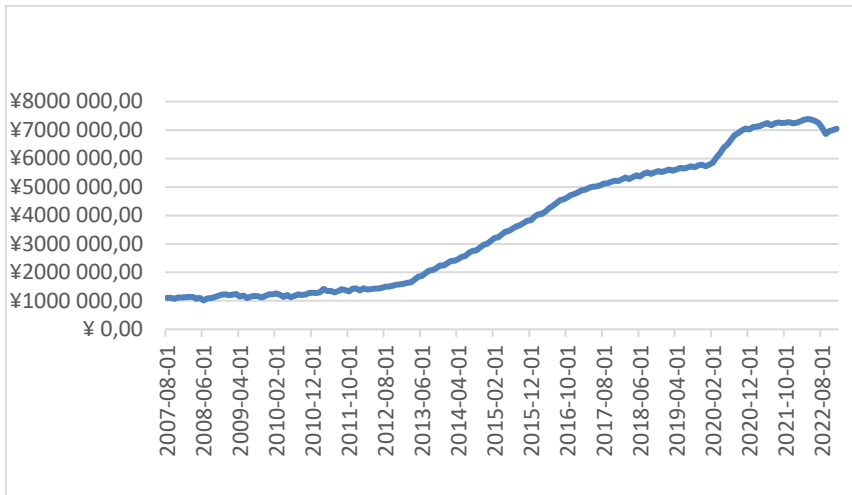
Chart 2. Bank of Japan -total assets for Japan (in 100 million Yen)

Source: www3.

In October 2010 quantitative easing was introduced again, now including purchases of risky assets to decrease their profitability (Chart 2). The BOJ launched its Comprehensive Monetary Easing (CME) policy to respond to the re-emergence of deflation. On the one hand, B. Berkmen found some evidence that the QE of 2010 supported economic activity in Japan. On the other hand, its impact on inflation was weak, which may reflect Japan's stable inflation expectations and flat Phillips curve that needs large changes in money supply to move inflation (Berkmen, 2012). The study by Raphael Lam shows that the BOJ's monetary easing of 2011 measures has had a statistically significant impact on lowering bond yields and improving equity prices, but no notable impact on inflation expectations (Lam, 2011).

3.2. Quantitative Easing Poland

Structural Open Market Operations (SOMO) is a variant of Quantitative Easing held in Poland. It was introduced to improve liquidity in the banking sector, reduce the scale of the recession caused by Covid-19, and in the bond market. The NBP purchased assets following the market conditions through tenders. On March 16 2020, NBP Management Board announced an intention to purchase Treasury bonds in the secondary market, and the first bond purchase auction was held on March 19 (Chart 3). On April 8, 2020, the purchases were

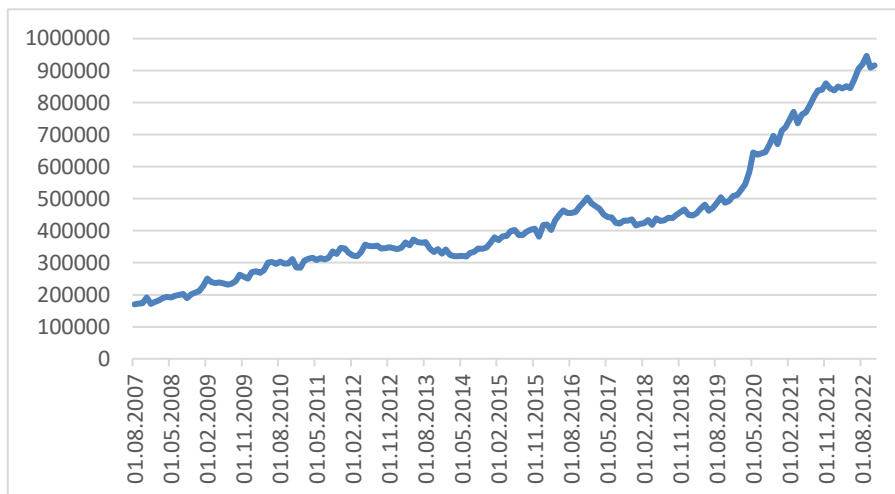extended to include securities guaranteed by the State Treasury (Hertel et al., 2022).

Chart 3. Assets of NBP in Poland (in PLN million)

Source: www4.

Until November 18, 2020 the scale of the program amounted to 4,6% of GDP (105,5 billion in the nominal value) and 11,7% of the market for purchased securities. While in 2020 the scale of asset purchases in Poland was still lower than in advanced economies, it was higher than in the majority of emerging economies (Hertel et al., 2022).

It was estimated by the NBP with the NECMOD model simulations that SOMO program could provide a higher GDP growth rate by 0,2 percentage points in 2020 and 0,6 percentage points in 2021 (Hertel et al., 2022).

3.3. Quantitative Easing in the United States

The Federal Reserve (Fed) first implemented QE1 after the subprime mortgage crisis (2008/2009 crisis). From September 2007 to December 2008 Fed funds rate was lowered from 5,25% to near zero. Regardless the economy continued to contract. To stimulate the economy Fed announced a plan to purchase large quantities of securities (Chart 4). Between March 2009 and March 2010, Fed increased its purchases to a total of $1,25 trillion, increasing purchases of mortgage-backed securities by $750 billion, raising purchases in agency debt to

$200 billion, and purchasing $300 billion in long-term Treasury debt (FOMC, 2009). The second QE2 in the USA was held in 2010 after Fed leadership announced a plan to purchase $600 billion of long-term Treasuries at $75 billion per month. Purchases ended in June 2011 (FOMC, 2010). In the third quarter of 2012, QE3 was implemented again so as to lower unemployment and stimulate business investment. In September 2012, the Fed announced monthly purchases of $40 billion in mortgage-backed securities (for September, November and December 2012) and $45 billion in long-maturity Treasury securities, bringing the total to $85 billion per month. Then, from January 2013 to December 2013, it was $40 billion of agency MBS per month and $45 billion of long-term maturity Treasury securities (FOMC, 2012) On December 18, 2013, the Fed announced a reduction in its monthly purchases to a total of $75 billion, effective from January 2014 (FOMC, 2013).

According to the study by M. Q. Rubino, three QEs positively affected the USA's economy. All the programs had statistically significant effects on inflation, QE1 and QE3 seem to have promoted spending and investment by having statistically significant effects on the amount of personal consumption expenditures, and QE3 increased the total amount of consumer loans (Rubino, 2015).

After the start of the pandemic, FOMC pursued aggressive asset purchases. The fourth and last to the present-day usage of QE took place after March 2020. The Fed announced it would buy at least $500 billion of Treasury securities and $200 billion of agency mortgage-backed securities. As of June 2020, Fed started monthly purchases of $80 billion of agency debt and $40 billion of mortgage-backed securities. Since June 2020, Fed started monthly purchases of $80 billion of agency debt and $40 billion of mortgage-backed securities (Foster, 2022).

The increase in inflation in the US caused a change in the direction of the Fed's monetary policy. To combat inflation Federal Open Market Committee (FOMC) decided to conduct restrictive policy – increase the federal funds rate and reduce the Federal Reserve's nearly $9 trillion balance sheet. In March 2022 FOMC decided to continue asset purchases at a reduced pace (tapering). In June 2022 FOMC began reducing its bond holdings through quantitative tightening (QT). We could observe a $500 billion fall in the Fed's balance sheet in the last nine months (Sengupta and Smith, 2022).
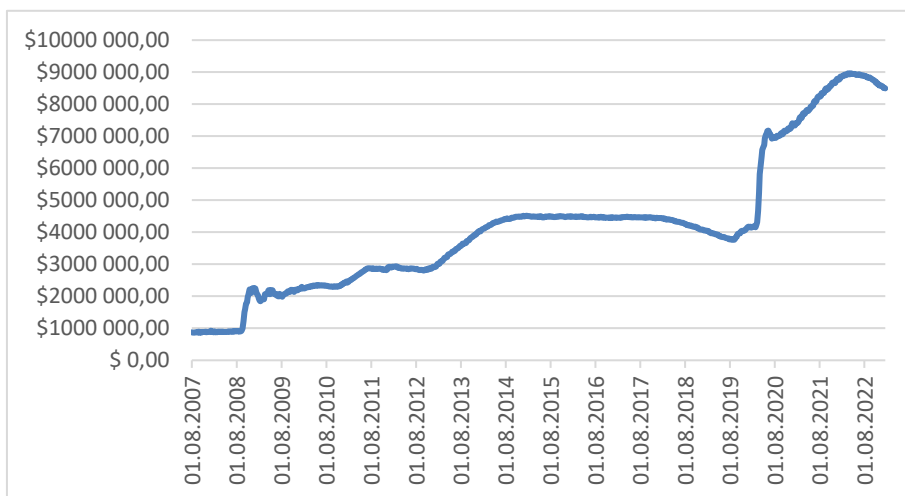
Chart 4. Total assets in the United States (in USD million)

Source: www5.

3.4. Quantitative Easing in the Euro Area

In 2015 European Central Bank (ECB) first implemented QE through an asset purchase program (APP) to affect the prolonged low inflation in the euro area (Chart 5). The APP program extended the ECB's existing programs of private sector asset purchases, about sovereign bond purchases. It means that apart from other private sector assets purchase programs APP included purchases of sovereign bonds (Andrade et al., 2016).
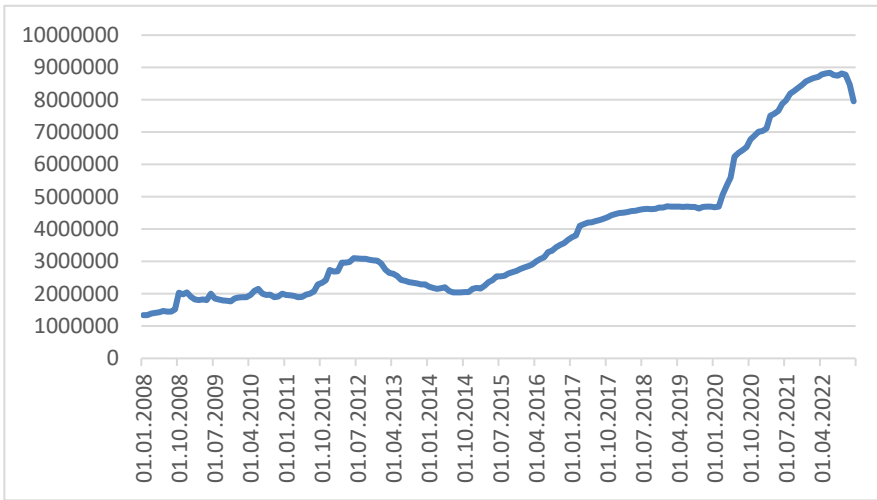
Chart 5. Central bank assets for euro area (11–19 countries) in EUR million

Source: www6.

APP was found to have a significant effect in easing the monetary policy of the euro area economy. It was caused by three main transmission channels: asset valuation, signaling, and re-anchoring of long-term inflation expectations. First, it lead to an increase in the price of sovereign bonds, which resulted in a higher valuation of the assets of banks (providing capital for them). This might have a positive effect on an expansion in lending and supporting the economic recovery. Second, it caused the market expectations of future short-term interest rates to go down, and inflation expectations to grow. Third, related to the explicit sign of future consistent policy that minimized the risk of uncertainty, thus reducing the risk of a liquidity trap (Andrade et al., 2016).

CONCLUSIONS

The following observations can be concluded from the data in the analyzed period:

- during the period under review, the most spectacular drop in unemployment occurred in Poland. In the years 2000–2022, the lowest unemployment rates were most often recorded in Japan;
- in the years 2000–2022, among the analyzed countries and in the euro zone, the lowest inflation was most often recorded in Japan; in fact, deflation occurred in Japan for 15 years out of the 23 years examined. In turn, the highest inflation was most often recorded in Poland;

- among the analyzed countries, i.e. Japan, Poland, the USA and the euro zone in the years 2000–2022, the lowest GG debt in relation to GDP calculated according to the OECD methodology was most often recorded in Poland and the highest in Japan. We can see a tendency of increasing the GG debt in all of the analyzed countries and euro area;
- in the analyzed period between 2000–2022, in selected countries and the euro zone, the lowest long-term interest rates were observed in Japan and the highest in Poland;
- in 2000, GDP per capita PPPs in the USA was 3,4 times higher than in Poland, while in 2022, GDP pc PPPs in the USA was almost 1,8 times higher than in Poland. However, in 2000, GDP pc PPPs in Japan was almost 2,6 times higher than in Poland, and in 2022, GDP pc PPPs in Japan was only 1,06 times higher than in Poland. It is worth mentioning that Poland was a developing country in the analyzed period;
- examined countries present positive GDP growth during the analyzed period except for the years of crisis, i.e. 2008 (Japan), 2009 (Japan, USA and euro zone), 2019 (only Japan) and 2020 (Japan, Poland, USA and euro zone). In the years 2000-2022, the highest GDP growth was most often recorded in Poland and the lowest in Japan;
- every analyzed country, i.e. Japan, Poland, the USA and the euro zone, demonstrated significant growth in the central bank assets, especially during the COVID-19 pandemic outbreak.

It is inconclusive to compare the analyzed countries and euro zone reviewed because they differ too much in scale and population. In the vast majority of years, countries have recorded positive rates of economic growth, which is definitely a positive phenomenon. The only exceptions were observed during the years of crises, such as the Global Financial Crisis and the COVID-19 pandemic. All the analyzed countries tried to confront the crises by applying, among others, instruments of monetary policy e.g. lowered interest rates to stimulate the economy after 2008 and heightened them to fight inflation in 2022. Trying to improve the economy even more, they started to use new and unconventional instruments of monetary policy like Quantitative Easing. Extensive fiscal packages were also used to deal with the effects of the above-mentioned crises. Therefore, we can infer that by acting to soften the results of stagnation and crises, economic authorities of the analyzed countries and euro area have been striving to overcome obstacles and have certainly defeated the apogee of these crises.

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