Master Thesis U.S.E.

The impact of macroeconomic factors on GDP growth of EU countries.

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Name: Ioannis Roumeliotis

Student number: 0959855

Email: i.roumeliotis@students.uu.nl

Supervised by: Dr. Kwabena Aboah Addo & Dr. Bilge Karatas

University of Utrecht

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Abstract

The primary purpose of this research is to investigate the impact of macroeconomic variables and their several interactions on the GDP of European Union members. This article examines the impacts of inflation, unemployment, population growth, interest rates, debt-to-GDP, foreign direct investment, the interactive effects of inflation and population, and the interaction effects of unemployment and debt on GDP. Using data from the previous two decades, from 2001 to 2020, the study sample covers 27 European Union countries. This study uses the multicollinearity test, robustness test and a dynamic panel data in GMM estimator to examine the hypotheses. In contrast to interest rates, which have a negative influence on GDP, the primary findings indicate that the interactive impacts of inflation and population, as well as unemployment and debt, have a positive effect on the economy.

Key words: GDP growth, macroeconomic factors, interaction effects, European Union

Jel codes: F62, O47, C12

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Introduction

The European Union (EU) is an economic and political union made up of 27 countries (today) mostly in Europe. Through successive enlargements, the European Union has developed from the six founding countries (Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands) to 27 members today. The EU, which accounted for 5.8 percent of worldwide population in 2020, generated a nominal gross domestic product (GDP) of nearly US$17.1 trillion in 2021, accounting for roughly 18 percent of global nominal GDP (World Economic Outlook Database). GDP is one of the most accurate methods to measure the country's or region's economy. Any country's ability to enhance production of products and services is reflected in its economic growth. The most straightforward definition of economic growth is a rise in a country's Gross Domestic Product (GDP). Annual GDP growth in the EU was extremely erratic between 2000 and 2020. Between 2001 and 2007, the economy increased at a pace of 1% to 4% each year. The EU economy was severely impacted by the financial crisis from 2008 to 2013, with GDP falling by more than 4% in 2009 and then increasing marginally in 2012. However, due mostly to the consequences of the Covid-19 epidemic, there was a reduction of little over 6% in 2020. However, not all Member States have experienced the same level of change (Eurostat).

A large fiscal, natural, or geopolitical event that has a wide influence on the economy of an area or nation is referred to as a macroeconomic factor. In general, the term "macroeconomic factor" is used. The impact of macroeconomic factors is more likely to be felt by huge populations than by a limited number of individuals. Macroeconomic variables include, but are not limited to, interest rates, unemployment rates, and inflation rates. These indexes of economic success are closely monitored by a variety of stakeholders, including consumers, governments, and companies.

It is now commonly acknowledged that a stable macroeconomic framework is required but insufficient for long-term economic development (Barro, 1991). Numerous dramatic non-regression findings also support the notion that a stable macroeconomic environment is beneficial to development. In Latin America, the resumption of economic development in Chile and Mexico was preceded by the restoration of fiscal discipline and a decline in inflation (Chenery et al, 1986). Brazil's growth dilemma is high inflation, despite stabilisation attempts, and macroeconomic instability. East Asian states with fast economic development have maintained single- or double-

digit inflation, avoided balance of payments crises, and moved quickly when they happened, as in Korea in 1980. (Gorden 1990).

Economic growth and inflation are the fundamental focus of macroeconomic policy. Inflation is one of the variables that may be mentioned as a driver of economic growth (Barro,1995).

Theories and models of economic growth show the many ways in which current economic activity may impact future economic developments and can also indicate potential sources of continuous economic growth. As indicated earlier, the GDP of European nations and the EU as a whole has fluctuated noticeably over the last few decades. As a result, several researchers and economists have been questioned as to why there are so many fluctuations and what particularly causes them. Also, they try to reinforce the importance of economic development for the progress and well-being of humanity. The theories of economic growth have developed throughout time based on the era and the economy's characteristics. Why is economic development necessary? What are the primary development factors? Numerous scholars, economists, and Nobel Prize winners have attempted to address these issues. The well-being and prosperity of billions of people may be attributed largely to economic expansion. While this is a broad range of phenomena to examine, I feel that each of these factors is essential to comprehending development patterns in the European Union.

It should be noted that the majority of governments want rapid economic growth over the long term. This objective has been difficult to attain due to a range of variables that impact economic progress. Throughout history, it has been seen that many nations focus on macroeconomic issues, such as inflation, unemployment rate, general debt, interest rates, etc. Unquestionably, since the Covid-19 pandemic, and especially in the last year, inflation has been one of the most often discussed topics. In addition, unemployment was a prominent subject during and after the financial crisis, since several European nations, including Greece, Spain, and Portugal, were affected.

The relevance of several macroeconomic parameters and their relationship to GDP growth is investigated in this research. It investigates the possibility that variables such as inflation, unemployment, population, and others influence economic growth. Under this approach, the ongoing study is humbly seen of as a means of contributing to the relevant body of literature in a

number of different ways. To the best of my knowledge, very few studies have investigated the effect that a number of different macroeconomic variables have had on economic development across a large number of countries. The vast majority of them are focused on either one nation or a small group of nations. Moreover, most of the previous studies focus on the individual effects of the factors on the economy and not in the interacted impacts of them, which is what I am going to mostly test.

Several factors may have a common effect or consequence on the economy of a nation. Consequently, I will investigate whether or not greater levels of several variables have a common impact on GDP. As a result, I made the decision to investigate the effect that a variety of factors, including inflation, unemployment, interest rates, population growth, debt-to-GDP ratio, and foreign direct investment (FDI), as well as some combination of them, have on the expansion of GDP across the entire European Union.

Based on this, the thesis will study the following research question: **What is the impact of macroeconomic factors on GDP growth of EU countries?**

In order to get more precise results, I decided to gather data for all 27 countries that form up the EU in a time frame of 20 years (2001-2020). The remainder of the thesis is structured as follows: first, I will examine prior research to better understand the theoretical arguments behind the impacts of macroeconomic factors, and then I will provide the findings of earlier studies related to this thesis. I will next explain my empirical design, describing my data and the statistical approaches I will use. I will next discuss my findings and evaluate the statistical test outcomes. In my conclusion, I will decide whether or not my hypotheses are supported by the data and analyze the consequences of my results.

Literature review and hypothesis development

Interactive effect of inflation and population growth on GDP

Money has been seen as a kind of value storage. When money realises its value, individuals feel confident conserving it. Inflation diminishes the usefulness of money as a store of value, since the worth of each unit of money decreases with the passage of time and the increase of inflation, therefore people choose to spend their money on something else that may serve as "the store of value". The majority of analysts feel that a GDP growth rate between 2.5 and 3.5 percent per year is the most that the country's economy can safely maintain without experiencing negative effects.

In general, low and steady inflation is part of a strong and growth-friendly macroeconomic environment. Inflation is and has been a contentious topic in economics. Even the term "inflation" has diverse connotations depending on the situation. Many economists, businesspeople, and politicians believe that moderate inflation is required to stimulate consumer spending, presuming that greater levels of expenditure are necessary for economic development. The Federal Reserve usually sets an annual rate of inflation for the United States, thinking that a gradually rising price level makes companies successful and stops customers from waiting for cheaper costs before buying.

The market incurs substantial actual costs due to inflation and its instability. Numerous studies indicate that a 10% inflation rate might result in losses of around 3% of the real GNP as a result of misallocation of savings and investments or depreciation of real balances (Fischer, 1981, Feldstein, 1997 and Lucas, 2000). However, it is a controversial issue about the relation between inflation and economic growth. The evidence for the link between inflation and economic growth comes from various schools of thinking. For example, structuralists believe that inflation is required for economic growth, but monetarists feel that inflation is detrimental to growth (Mallik and Chowdhury, 2001).

There are studies that show, inflation has a positive impact on GDP growth when inflation stays in a threshold level. Ghosh and Phillips (1998) looked at the relationship between inflation and economic growth in 145 countries and found that while inflation is low, there is a positive

association, but when inflation is high, the relationship turns negative. Sweidan (2004) aimed to see if there is a structural break point influence between inflation and economic growth. He discovered that at a rate of 2% inflation, there is a positive structural effect, while at higher rates, the effect becomes negative; thus, he proposed that the Central Bank of Jordan should pay attention to the inflation phenomenon when implementing new monetary policies. Mubarik (2005) calculated the inflation threshold for Pakistan. He discovered that inflation over a certain threshold adversely impacts economic growth. However, inflation below the projected level is beneficial to the economy. Using data from Bangladesh, India, Pakistan, and Sri Lanka, Mallik and Chowdhury (2001) determined that there is a positive association between inflation and economic growth.

In 1960s, Inflation and economic growth models stressed the portfolio substitution process, which stated that higher inflation made capital more captivating to hold relative to money. This resulted in a higher capital intensity, which led to higher economic growth during the transition era (Fisher, 1993). It should be mentioned that between 2000 and 2009, a study investigated the likelihood of a threshold effect of inflation on economic growth in the Azerbaijani economy. According to the estimated threshold model, there is a non-linear relationship between economic growth and inflation in the Azerbaijani economy, with a 13 percent inflation threshold for GDP growth. Inflation has a statistically significant beneficial influence on GDP growth below the threshold level, but when inflation exceeds 13%, this positive link becomes negative (Hasanov, 2010).

It is nice to be mentioned that, as it was published by European Central Bank *"Our job is to maintain price stability. This is the best contribution monetary policy can make to economic growth and job creation. We are targeting an inflation rate of 2% over the medium term".* Also, Ghosh and Phillips (1998) found a beneficial correlation between extremely low inflation rates (less than 2 to 3 percent) and economic growth.

The correlation between population growth and economic development has been widely examined (Heady & Hodge, 2009). Sethy and Sahoo (2015) and Tumwebaze and Ijjo (2015) find that population increase positively influences the economy in India and Eastern and Southern Africa. Numerous researchers assume that economic growth in high-income nations will be rather sluggish in the next years, in part because population growth is expected to decelerate substantially (Baker, Delong, & Krueger, 2005). They also concur, stating that slower U.S. population growth

is one of the reasons why future U.S. economic growth will be lower than it was for most of the 20th century. Piketty contends that economic growth in the future would likely be relatively slower, less than the rate of return on capital, in part because the population is anticipated to increase extremely slowly (Piketty, 2015). Of course, Piketty's explanation of the significance of economic growth isn't the only one. Economic development is critical for rising living standards across the globe, and the role of population expansion in this evolution is a major policy concern.

According to Kelley and Schmidt (2001) and Mierau and Turnovsky (2014), population growth coming from lower death rates encourages economic development, but population expansion originating from higher fertility rates tends to stifle it. The rationale for these opposing impacts is that decreases in mortality encourage individuals to save more, which drives growth, whilst increases in fertility reduce aggregate savings (Mierau & Turnovsky, 2014). Furthermore, Heady and Hodge (2009) discovered in a meta-analysis of studies of economic development and population growth that lowering population growth rates in high-income nations inhibit economic growth.

Martin S. Feldstein, professor of economics in Harvard University, said, in several European nations, the overall population and work force are starting to fall. Even in places where this has not happened, the labor force has grown more slowly than the overall population, resulting in a decline in the employee-to-population ratio. Furthermore, the ageing of the population will result in significant rises in the expense of government pension and health care systems. Official projections indicate that the cost of Social Security pensions in Spain will almost double over the next 50 years, from 8.4% of GDP in 2010 to 15.7% of GDP in 2050.

A country's population expansion can be translated to either an increase in births or migration. In both instances, there is a beneficial effect on the economy. First, this may be explained by the fact that the individuals who are now being born will become productive adults in the long-term. Secondly, in most of the situations of migration, it is because people tend to move to obtain better employment circumstances. Hence, migrants would contribute favorably in the production in both short term and long term. Consequently, population expansion boosts productivity and lowers the average age of a nation's inhabitants.

According to the European Central Bank, it is targeting a steady 2% inflation in the European Union countries. Also the Bank of Canada said *'Low, stable and predictable inflation is*

good for the economy—and for your finances. It helps money keep its value and makes it easier for everyone to plan how, where and when they spend. For example, companies are more likely to grow their business when they know what their costs will be in the years ahead. This helps the economy expand at a sustainable pace, generating higher incomes and new jobs'.

It may be deduced from the preceding that both population growth and low and stable inflation favorably affect labor force and productivity. We assume that the average inflation rate in EU nations during the last two decades has been between 2% and 2.5%. With the addition of population growth, we may conclude that labor force, productivity, and expenditure are on the rise. In general, increase in productivity, labor force, and expenditure, resulting economic expansion.

In light of the fact that the European Union is targeting a low inflation rate of about 2 percent and the above literature, it is hypothesized that inflation and population rise combined have a beneficial effect on the economy.

H1: The interactive effects of inflation and population growth are positively related with GDP growth.

Interactive effect of unemployment and debt on GDP

When the economy enters a downturn, the government's capacity to stabilise the economy is contingent on one thing. It is contingent upon their level of debt (Cecchetti et al., 2011). Therefore, Cecchetti and others mentioned that larger levels of public debt might restrict the government's capacity to pursue a countercyclical fiscal policy or to serve as a lender of last resort.

At a high amount of external public debt to GDP, the economic growth motivated by the depreciation of the real exchange rate and the attraction of resources toward the tradable sector is offset by the exit of resources to the exterior (high burden of external debt) and the subsequent decline in the savings-to-GDP ratio.

Several studies have shown that high average debt to GDP ratios tend to have a negative impact on GDP growth. Caner, Grennes, and Koehler-Geb (2010) establish the level at which a rise in the average public debt ratio to GDP causes a decline in the average annual growth rate for industrialised and developing nations between 1980 and 2008.

Siddique, Selvanathan, and Selvanathan (2016) utilise an autoregressive distributed lag (ARDL) model, with controls for trade, population, and capital creation, to examine whether debt as a fraction of GDP influences growth in 40 indebted nations between 1970 and 2007.Consistent with predictions, the authors demonstrate that the debt variable has a negative and statistically significant effect on GDP in both the short and long term.

Gómez-Puig and Sosvilla-Rivero (2017) apply a time series analysis for eleven Euro Area nations to assess if a public debt change over a certain threshold has a negative impact on economic development throughout the Euro Area from 1961 to 2015. As members of the Euro Area, nations are required under the Stability and Growth Pact (SGP) to maintain government debt levels below 60 percent of GDP. The research employs a two-stage least squares instrumental variable approach to estimate the final model for calibrating a neoclassical growth model with control variables for population growth, capital creation, and trade openness, among other characteristics. In all of the examined nations, with the exception of Belgium, a rise in debt has negative consequences on economic development long before the SGP debt cap is met.

The relationship between unemployment and economic growth has been sufficiently demonstrated in both domestic and international literature. Unemployment is a bad phenomenon that reveals a country's many economic and social elements. The link between economic growth and unemployment has been empirically investigated in the economic literature based on the Okun law, which demonstrates an inversely proportionate relationship between the economic growth and the change in the unemployment rate. The "Okun's law" has been put on a list of generally acknowledged "fundamental notions" in the economics profession (Alan Blinder, 1997). Okun discovered that if unemployment reduced by one percent, this would result in a three percent gain in gross domestic product (GDP) and vice versa, and as GDP increases, employment increases.

Moreover, it was said that unemployment is seen as one of the most significant obstacles to economic development (Al-Hamdi, Mohaned and Alawin, Mohammad, 2016). Between 1994 and 2010, Abdul-khaliq in 2014 examined the relationship between unemployment and the

increase of gross domestic product in nine Arab countries. He also discovered a significant negative influence of unemployment on economic growth. In a regression-based report on unemployment crises in the Western Balkans, the World Bank assessed the relationship between unemployment and economic growth, reaching the empirical conclusion that a 1 percent increase in unemployment rate is associated with a 2,7 percent decrease in the GDP growth in the Western Balkans (World Bank, 2017).

State and federal governments may pay more for unemployment benefits, food assistance, and Medicaid if the unemployment rate increases. Additionally, unemployment poses a threat to the U.S. economy. Approximately 70% of the output of the U.S. economy is allocated to personal spending and jobless people (Bureau of Economic Analysis). Even individuals who get government assistance are unable to spend at previous levels. The output of those employees departs the economy, which diminishes the gross domestic product (GDP) and pulls the nation away from the effective use of its resources.

If we believe that investment is less likely to occur if debt is assumed, this might lead to a decrease in employment prospects. Consequently, we can argue that debt and unemployment are flowing in the same direction; greater debt levels lead to higher unemployment levels. Debt prevents the nation from creating additional jobs and providing employment opportunities to its citizens. Thus, we may deduce that a country's debt has a positive relationship with unemployment. Since excessive debt has a negative effect not only on GDP but also on employment, it may be argued that the debt-to-GDP ratio and unemployment rate have a negative influence on the economy of a nation.

The points brought up before might be considered a summary of the fact that the factors like the unemployment rate and the debt to GDP ratio combined have a negative influence on the economic growth.

H2: The interactive effects of unemployment rate and the debt to GDP ratio are negatively related to GDP growth.

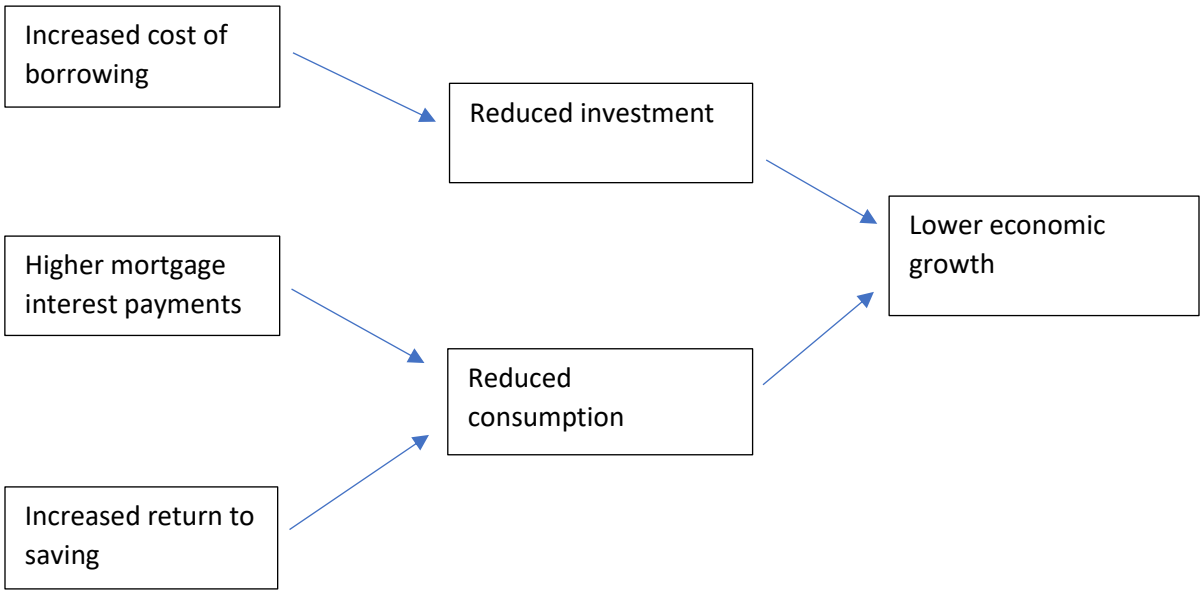
Interest rates and GDP growth

Interest rate is the cost of borrowing money over a period of time and is expressed as a percentage of the outstanding amount, which may be variable or fixed. In the context of most prevalent, interest is the amount charged to borrowers throughout the time they use the offered credit (Mutinda, 2014). Interest rate is defined by Finan (2016) as a credit cost in the economy and, more specifically, as a charge for price per year from the creditor to the borrower in order to get a loan.

Significant study has been conducted on the effect of interest rates on GDP. They are evaluating nations with varying levels of economic development and collecting data sets of varying length and frequency. A rise in interest rates increases the cost of money, especially when assets exhibit a high degree of sensitivity to changes in interest rates. This might lead to a fall in aggregate demand, both directly via investments and indirectly through a diminished wealth impact in the private sector and decreased spending. Additionally, higher interest rates might spur a rise in savings and attract foreign inflows, which could result in a currency gain. This is particularly true in a small, open economy with a flexible exchange rate system and movable capital (Briotti 2005).

In general, and to simplify, higher interest rates result in higher borrowing costs, higher mortgage interest payments, and a higher return on savings, all of which diminish investment and consumption. Reduced investment and consumption reduce economic growth.

Figure 1. How can the interest rate affect the economy?



Source: Author's compilation based on the reviewed literature

The lower the interest rates, the greater the willingness of consumers to borrow money to make a large expenditure, such as houses. Consequently, when consumers pay less in interest, they have more money to spend, which can have a cascading impact on the economy, leading to greater expenditure throughout the economy. Researchers have discovered that there is a correlation that points in the opposite direction between GDP growth and interest rates. In particular, (Ujuju & Etale, 2016) and (Linnemann & Schabert, 2015) discovered that the increase of GDP and interest rates had a negative correlation with one another. According to the findings of these research, the pace of economic growth is slowed down when interest rates are high.

According to the findings of Giovanni et al. (2009), interest rates cause a slight slowdown in quarterly real growth. Their results, which were derived from a study using ordinary least squares (OLS), suggest that an increase of one percentage point in the interest rate in the Netherlands resulted in a decrease of 0.094 percentage points in the country's real growth rate. A similar increase in interest rates in France resulted in a decrease in the real growth rate that was

equivalent to 0.015 percent. According to the findings of their investigation, the effect of interest rates on real GDP in each of the 12 European countries is, on average, -0.043.

According to research conducted by European Central Bank (ECB) analysts in 2002, the impact of a 100-basis point increase in the ECB repo rate on real GDP is -0.34 percent after one year and -0.71 percent after two years, while the impact on consumer prices is -0.15 percent after one year and -0.30 percent after two years (see Table 1). The NCB (the ECB's macroeconometric model) predicts a somewhat lesser effect, with a real GDP impact of -0.38 percent after two years and a decrease in consumer prices of -0.21 percent. In year two, the NiGEM model predicts a 0.47 percent decline in real GDP.

Saymeh and Abu Orabi (2013) utilised regression analysis to evaluate the influence of interest rates and other factors on Jordan's real GDP between 2000 and 2010. With a coefficient of -0.152, they discovered that a one-period lagging interest rate had a considerable influence on GDP. Using a generalised autoregressive conditional heteroskedasticity (GARCH) model, they calculated a lagged effect of -0.34 on real GDP from the interest rate.

In their 2017 study, Harswari and Hamza analysed the impact that varying interest rates had on the economies of a number of Asian countries. Convenience sampling was used to choose the sample of twenty companies, which represents the target population of this research, which comprises of people from forty-eight countries. According to the findings, the effect of interest rate on GDP was shown to have a negative impact that was also statistically significant. In addition, Agalega and Antwi (2013) conducted research on the effect that interest rates have on the economy of Ghana and discovered that there is a detrimental link between the two.

On the basis of the literature that is currently available, I have formed the hypothesis that interest rates have a depressing influence on the growth of GDP. As a result, a part of this thesis will investigate whether or not the above hypothesis is confirmed.

H3: The interest rate is negatively related to GDP growth.

Empirical design

Data

The data was obtained for the most part from the website of the World Bank, but in addition to that, it was collected from the websites of the European Central Bank, the Organization for Economic Co-operation and Development (OECD), and the International Monetary Fund. Data on the six study variables was gathered for each EU country and year, including GDP growth, inflation rate, long-term interest rate, unemployment rate, debt-to-GDP ratio, population growth and Foreign Direct Investment (FDI). The variables inflation&population and unemployment&debt are then formed by multiplying the relevant ratios of inflation, population, debt-to-gdp, and unemployment.

This thesis will study the 27 member states of the European Union, including the United Kingdom, between 2001 and 2020. To avoid the impact of Brexit, which took effect in 2020, the years 2021 and 2022 have been eliminated. In addition, Estonia is excluded from the analysis since its interest rates are not accessible in any of the data sources.

Description of the variables

In this part, I would like to outline the variables evaluated in this thesis, including the dependent, independent and control variables. Each is supplied with a detailed definition in the table 1 bellow.

Table 1. Description of the variables

Variable name		Description
Dependent	**GDP growth**	The GDP is the total monetary or market worth of all finished products and services produced within a country's boundaries during a certain time period.
Independent variables	**Inflation**	Inflation is the loss of purchasing power of a currency over time. When the inflation falls below 0% (negative inflation) it is called deflation. Deflation is a term that refers to a decrease in the total price level of goods and services. Inflation decreases the value of currency but on the other hand, deflation increases it.
	Interest rates	The interest rate charged to a borrower by a lender is referred to as the interest rate. Inflation is included into calculations of long-term interest rates.
	Unemployment	The unemployment rate is the proportion of the labour force that is without a job. It is the incapacity of an economy to provide employment opportunities for those who want to work but are unable to do so while being available and actively seeking to work in the labour market.
	Population	The world's population is the total number of inhabitants. Population growth rate is the global population change. This study considers yearly population change.

	Debt	A country's debt-to-GDP ratio is a measure of its economic strength and ability to repay its debts. It compares countries to discover whether one is near economic collapse.
	Inflation & Population	The rates for the variable inflation & population were found by the multiplication of the rates of inflation and population.
	Unemployment & Debt	As in the previous interactive variable the multiplication of unemployment and debt-to-GDP ratio was used for the specific variable.
Control variable	**Foreign direct investment (FDI)**	A foreign direct investment (FDI) is made when an investor expands their firm in a foreign nation. Negative numbers in FDI imply that investment outflows surpass investment inflows. This may signify, for instance, disinvestment or reinvestment outside the nation.

Dependent variable:

The dependent variable is the gross domestic product (GDP), which represents the economy of a country. It is a thorough measurement of all forms of domestic output, it offers a whole analysis of the state of an economy. The yearly change in a nation's economy (GDP) is what is used to calculate the GDP growth rate.

Independent variables:

According to the stated hypotheses, the independent variables are the interest rates, inflation & population, unemployment & debt. The inflation, population, unemployment rate and debt-to-

GDP rate, are used as independent variables due to the fact they were used to calculate the interactive factors.

Control variable:

Other variables that may affect the country's GDP is utilized to test for variations in the sample of countries in order to discover the actual relationship between the independent and dependent variables. The foreign direct investment (FDI) variable is included in this study.

Extensive research has been conducted on the connections between FDI and economic growth or the effects of FDI on the economy. Regarding the impact of FDI on economic development, the theoretical literature presents contradictory perspectives. This disagreement has permeated the world of empirical study, resulting in contradictory conclusions. Positive and statistically significant connections between FDI and growth were discovered by researchers such as Schneider and Frey (1985). In contrast, Nigh (1986) and Balasubramanyam, Salisu, and Sapsford (1996) were among the research that found no influence of FDI on economic growth.

However, Fry (1993) argues that the impact of FDI on growth varies significantly amongst groups of nations. Fry (1993) investigates the advantages of FDI in 16 developing nations. Using yearly data from 1966 to 1988, he calculates the actual growth rate gdp using a three-stage iterative least squares model. Initial data show that FDI did not affect economic growth considerably differently from domestic investment. When the country sample was divided, however, five Pacific Ocean nations exhibited a positive and statistically significant FDI-growth association. Contradictory findings were obtained for the other 11 nations (the control group), with a negative sign assigned to the FDI variable.

Whether FDI flows are beneficial for a country's growth or create more damage than good is still a topic of discussion. Indeed, scholars and economists are still divided on the nature of the link between FDI and economic growth.

Empirical model

The following regression model is designed to experimentally examine the primary hypothesis H1 to H3. It will also be examined the effect of macroeconomic factors on GDP growth. Because in the specific research there is a panel data, the problem of endogeneity should be eliminated. Consequently, it will be adopted a dynamic panel estimation technique and especially the GMM estimator. This will save the research from concerns of endogeneity. As explanatory factors, dynamic panel data estimation approaches utilize lags of the dependent variables. Therefore, the lagged values of the dependent variables are utilized as instruments to regulate the endogenous connection.

The GMM model, which is often used to panel data, gives consistent findings in the presence of many forms of endogeneity, including "unobserved heterogeneity, simultaneity, and dynamic endogeneity" (Wintoki, Linck, & Netter, 2012, p. 588). Historically, scholars (Schultz et al., 2010; Wintoki et al., 2012) have used two lags of the dependent variables, arguing that two lags are adequate to represent the persistence of the dependent variable. Also, 2 separate models, each including an interaction variable, will be estimated. This is done because there is a potential for bias if several interactions are included in the same model.

The models will be regressed in a time frame of 20 years, from 2001 to 2020. Hence, the regression models are formulated as follows:

1st model:

$$(GDP\ growth)_{i,\,t} = \beta_0 + \beta_1(GDP\ growth)_{i,\,t-1} + \beta_2(GDP\ growth)_{i,\,t-2} + \beta 3(inflation)_{I,\,t} + \beta_4(population)_{i,\,t} + \beta_5(interest\ rate)_{i.\,t} + \beta_6(FDI)_{i.\,t} + \beta_7(inflation\ \&\ population)_{i.\,t} + \varepsilon_{i.\,t}$$

2nd model:

$$(GDP\ growth)_{i,\,t} = \beta_0 + \beta_1(GDP\ growth)_{i,\,t-1} + \beta_2(GDP\ growth)_{i,\,t-2} + \beta_3(unemployment)_{i,t} + \beta_4(interest\ rate)_{i.\,t} + \beta_5(debt\text{-}to\text{-}GDP)_{i.\,t} + \beta_6(FDI)_{i.\,t} + \beta_7(unemployment\ \&debt)_{i.\,t} + \varepsilon_{i.\,t}$$

Where i represents the country (i=1...27), t is the year in the time frame (t=2001...2020) and ε is the error term. The $(GDP\ growth)_{i,\,t-1}$ and the $(GDP\ growth)_{i,\,t-2}$ are the lagged variables of GDP, this means that the first and second lag variables is the value of the GDP one year and two years before respectively. It is also possible to determine whether or not the values of prior years had an effect on the dependent variable, Gross Domestic Product, by including lagging values.

Results

Table 2. Descriptive statistics

Variables	No.	Mean	Stdv	Min	Median	Max
GDP growth	540	2,00	3,71	-14,84	2,26	25,18
Inflation	540	2,27	2,69	-4,48	1,95	34,48
Unemployment	540	8,50	4,34	1,81	7,49	27,47
Population gr.	540	0,27	0,86	-3,85	0,27	4,12
Interest rate	540	3,67	2,45	-0,51	3,88	22,50
Debt-to-GDP	540	59,40	36,14	0,04	53,21	211,22
FDI	540	12,18	39,56	-57,53	3,19	449,08
Inflation & Population	540	0,00	0,04	-0,48	0,00	0,14
Unemployment & Debt	540	5,68	6,38	0,00	3,93	49,16

The panel data comprises of 540 observations, 27 nations within the European Union, and 20 years. Table 2 illustrates the Mean, standard deviation, Minimum, Median, and Maximum for all variables were used in the regression model.

As it is observed, the highest GDP growth in European Union was 25,18%, which was found in Ireland in 2015. While the highest economic recession was in Lithuania in 2019 at 14,84% below zero. Furthermore, the economy of the EU countries was grown by an average of 2% over the last twenty years.

Table 3. Pearson Correlation Matrix

Variables	GDP gr.	Inflation	Unempl.	Populat.	Interest rates	Debt-to-GDP	FDI	Inflat. & Popul.	Unem. & Debt
GDP gr.	1								
Inflation	0,1846*	1							
Unempl.	-0,1201*	-0,1092*	1						
Populat.	-0,0212	-0,2215*	-0,3810*	1					
Interest rates	-0,0990*	0,3330*	0,3936*	-0,2727*	1				
Debt-to-GDP	-0,3144*	-0,2759*	0,4033*	-0,0170	0,0598	1			
FDI	0,0310	-0,0268	-0,0417	0,1523*	0,0607	0,0065	1		
Inflation & Popul.	-0,0833	-0,6181*	-0,1636*	0,6296*	-0,1566*	0,0881*	0,0611	1	
Unempl. & Debt	-0,2654*	-0,2263*	0,7580*	-0,1695*	0,2848*	0,8109*	-0,0150	-0,0075	1

The correlation between the variables is represented by the numbers 0 to 1 in Table 3 above, the closer the value is to 1, the greater the correlation between the variables, and vice versa. It is natural to see a correlation of 0,8109 with the Debt-to-GDP ratio, given that debt is a component of the interaction. Assuming that the largest absolute value of multicollinearity between the variables is 0,4033 , there is no reason for concern.

Table 4. GMM results

GDP gr.	Coefficient (Robust std. errors) 1st model	Coefficient (Robust std. errors) 2nd model
L1. GDP growth	**0,4136*** ** (0,086)	**0,2698*** ** (0,071)
L2. GDP growth	-0,0584 (0,048)	**-0,2016*** ** (0,051)
Inflation	**0,2729* ** (0,121)	
Unemployment		0,1015 (0,1537)
Population growth	**-3,6437** ** (1,208)	
Interest rates	**-0,4415* ** (0,196)	**-1,0474*** ** (0,259)
Debt-to-GDP		**-0,3710*** ** (0,065)
Foreign direct investment (FDI)	0,0113 (0,006)	0,0040 (0,006)
Inflation & population	**38,7708*** ** (11,436)	
Unemployment & Debt-to-GDP		**0,8421** ** (0,314)
No. of observations	459	459
Groups/ instruments	27/23	27/23
AR (2)	0,038	0,619
Hansen statistic	0,063	0,082
Prob> chi2	0,000	0,000

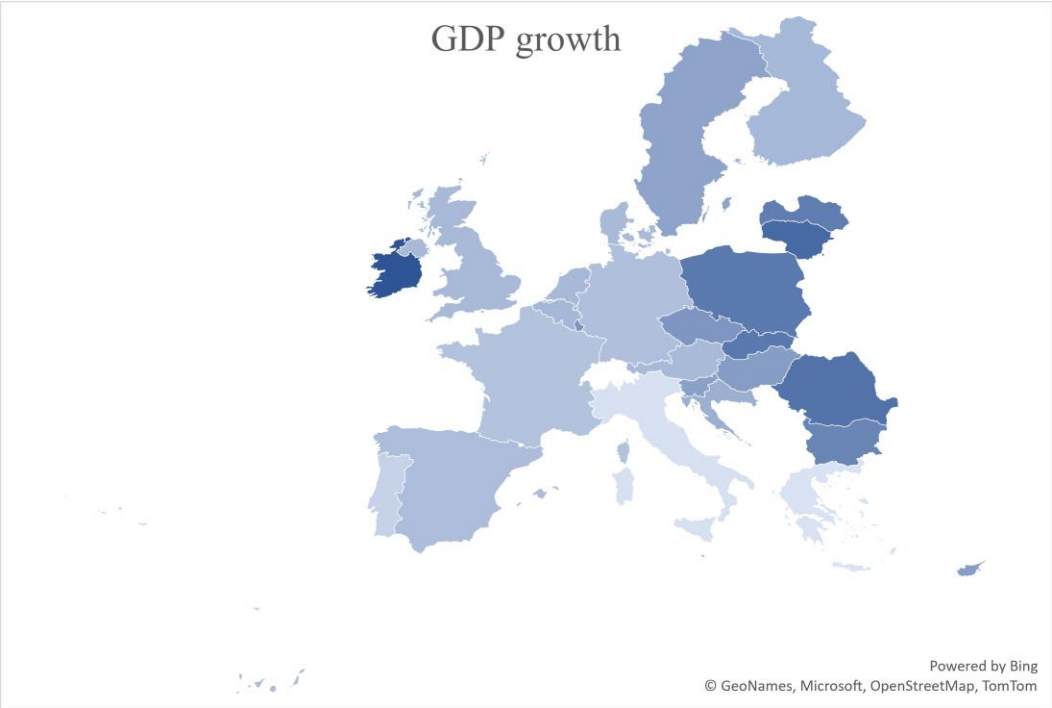
***** Statistically significant at the 1% level (p-value <= 0,001)**

***** Statistically significant at the 5% level (p-value <= 0,01)**

***** Statistically significant at the 10% level (p-value <= 0,05)**

Statistical results

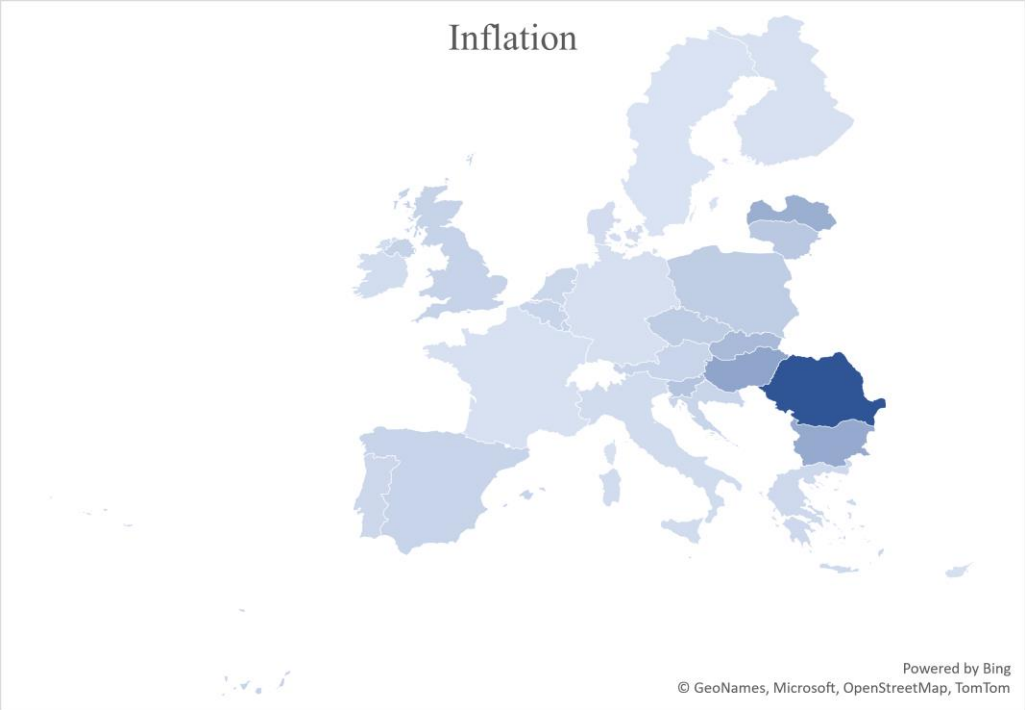
Figure 2. Average GDP growth in EU



Source: Author's compilation, powered by Bing

The above EU geographic heat map might help us better comprehend whether nations had high or low average GDP growth over the last two decades. The deeper the blue, the higher the average GDP growth rate and vice versa. The non-EU nations were left off the map. Observably, the Eastern European Union nations (Latvia, Lithuania, Slovakia, Romania, etc.) saw faster rates of economic growth than the Central and Western nations. Ireland's GDP grew by 4,81% on average, whilst Greece's economy contracted by 0,3% in the same period. This is reasonable given that Greece had two successive financial crises, the global financial crisis in 2008 and 2009 and the Greek financial crisis from 2010 to 2014.

Figure 3. Average inflation in EU



Source: Author's compilation, powered by Bing

Similar to the prior graph, the greater the effect of inflation in a certain nation, the deeper the blue. The nations with the lightest blue had the lowest inflation rates.

Here, we can discover how inflation affected the EU states on average over the study period. Romania had the highest average rate of inflation in the European Union, at 7,43 percent, while Hungary had the second-highest rate, at 3,98 percent. Romania experienced hyperinflation during the start of the 21st century of around 34 percent, it finally reached an one-digit rate of inflation in 2005, but it was still facing high levels of inflation between 5 and 10 percent until the 2011. The countries with the lowest inflation rates were Sweden, Finland, and France, with respective rates of 1,28 and 1,36.

Figure 4. Average unemployment rate in EU

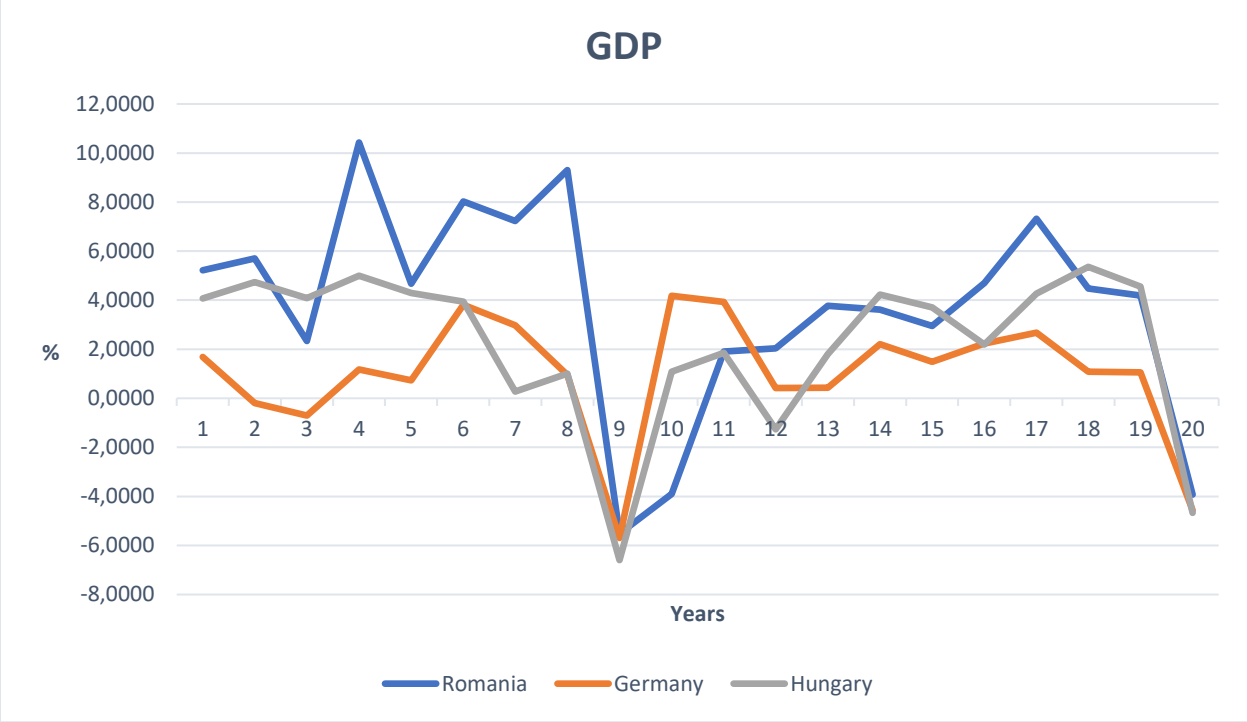
Source: Author's compilation, powered by Bing

The figure 4 above, shows which European Union countries were affected the most by unemployment the last two decades. Spain and Greece were the leaders in the rates of unemployment with an average of approximately 16 percent, while Netherlands and Luxembourg had the lowest rates in EU of 4,75 and 4,65 percent respectively. Furthermore, Croatia and Slovakia faced high rates of unemployment as well, at around 12 percent on average both.

Over the second decade of the 2000s, the unemployment rate in Greece reached its peak of 27.5% in 2013. Between 2012 and 2015, more than a quarter of the population looking for employment was jobless. Although Greece had the biggest rate of unemployment in a single year in the whole EU, Spain had higher average rate than Greece. Spain was facing two-digit unemployment rate in the whole time frame of the study, except the years of 2005, 2006 and 2007.

The data which was gathered revealed that there was a discernible shift in the GDP of the nations that make up the EU during the last 20 years. To be more specific, the majority of nations were hit with a severe economic depression in the years 2008 and 2009, as a direct result of the global financial crisis, and again in the year 2020, as a direct result of the outbreak of the Covid-19 virus. This is observed in the figure 5 below, which compares the changes of the gross domestic product in Romania, Germany, and Hungary from the year 2001 to 2020.

Figure 5. The GDP growth of particular EU countries



Source: Author's compilation

GMM results

The GMM model adjusts for endogeneity by altering the data internally and inserting lagged values for the dependent variable. The GMM model thus outperforms the OLS model in terms of estimation. The following analysis of the association between economic growth and the independent variables is then presented using the GMM approach. Because the GMM estimator provides for endogeneity, includes lagged values as explanatory variables, and applies an internal transformation procedure, endogeneity is taken into consideration.

Two different models were used in order to avoid the bias effect by including several interactions in the same model. The GDP of EU nations is significantly influenced by the majority of factors as shown in table 4. The lag variables include several interesting facts, in both models they were almost found to have significant impact on the current value of GDP. In the first model, the one-year previous value of GDP is positive related with the current value with a coefficient of 0,413 and 1% level of significance. The difference is noticed in the second lag of the dependent variable between the first and the second model. In the first model, the two-year prior GDP value does not have a significant effect on current value instead of the second model, where second lag has a great effect on GDP. However, in both cases there is a positive relationship of two-year prior GDP with the current GDP.

It should be mentioned that Hansen test is used to check the overall validity of the instruments.

Null hypothesis: instruments as a group are exogenous

According to table 4, the Hansen statistic takes p-values of 0,063 and 0,082 in the first and second model respectively. Since the Hansen p-value in both models is insignificant, I fail to reject the null hypothesis. Hence, the instruments are validly exogenous.

Inflation & Population.

Before evaluating the regression findings of the first hypothesis, it is important to note that the average inflation rate for all European Union member states is 2,27 percent within the time frame of the research. Noting this is very crucial since it was the first prerequisite for developing the second hypothesis. It was said that the European Central Bank aims for a low inflation rate of 2 percent, and it was shown in the literature that inflation may help favorably to the economy, job creation and productivity under this premise.

Regarding my first hypothesis, the data demonstrated a very substantial influence at 1 percent level of significance of inflation and population on GDP. Consequently, the first hypothesis is verified. According to the Table 4 the interactive effects of inflation and population has a beneficial impact on the economy (coefficient= 38,77 and p-value=0,001). This indicates that inflation and population together, and GDP all move in the same direction; if the first grows, so does the economy, and vice versa (if all the other variables remain constant).

Inflation that is low and stable has been shown to be beneficial to both the economy and productivity. This effect is exacerbated when combined with population growth, which also contributes to increases in both productivity and the size of the labor force. Productivity and greater labor force means economic growth. Therefore, the findings provide evidence that supports the idea that was produced about the particular hypothesis.

Unemployment & Debt-to-GDP

About the second hypothesis, that the interaction effect of unemployment rate and the debt-to-GDP ratio have a negative impact on GDP growth. The results are highly significant at the 5% level, with a p-value of 0,007. However, there is a positive coefficient of 0,8074 in the specific variable, instead of negative that I hypothesized. This may be translated that for every percent increase in unemployment and debt combined, there is an increase of 0,84% on GDP (holding other variables constant).

Several studies have shown that debt can have either a positive or a negative impact on the economy. The presence of a nonlinear link between the levels of public debt and economic

development is supported by a theory known as the threshold or nonlinear effect theory. This theory corroborates the existence of the relationship in dispute. According to this idea, rises in the amount of government debt have beneficial benefits on economic growth while the level of debt is relatively low; however, these advantages become negative once the level of national debt reaches a particular threshold level (Reinhart and Rogoff 2010).

According to this theory, while debt levels are low, increases in the debt ratio produce a positive economic boost that is consistent with classic Keynesian multipliers. As soon as the debt ratio hits elevated levels (a nonlinear threshold), additional rises in the debt level as a percentage of GDP have a negative influence on economic growth (Baum, Checherita-Westphal, and Rother 2013). This threshold is reached when the debt ratio reaches heightened levels.

As we can see in table 2, the average Debt-to-GDP ratio in all the European Union countries is 59,40 percent. Convergence criteria (or "Maastricht criteria") are economic metrics EU member states must meet to join the euro zone and continue to respect once there. They manage inflation, debt, deficit, exchange rates, and interest rates (European Central Bank). Under these criteria, the government debt must not exceed the 60% of GDP. Consequently, the average 59.40 percent of the EU may be attributed to a low level of debt. Taking into account the threshold theory and the premise that 59,40 percent is below the threshold, it is possible to infer that the positive effect of debt on GDP is reasonable. As a consequence, the unemployment & debt-to-GDP ratio combined, could be positively related with the economic growth.

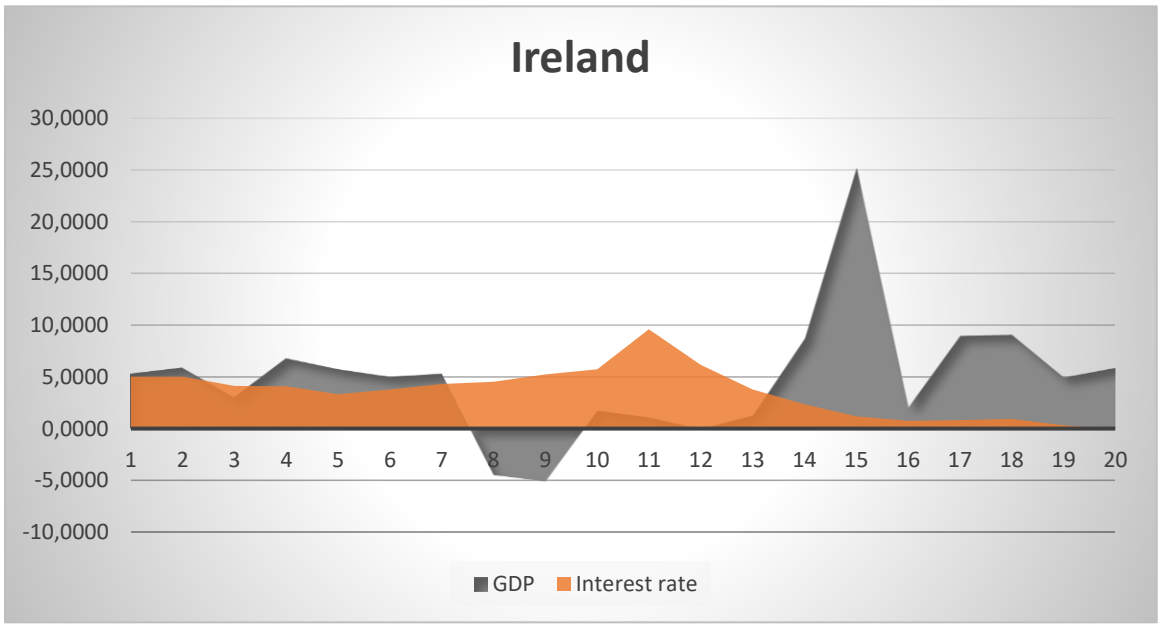
All in all, it was determined that unemployment and debt have a great influence on GDP, but their contribution is positive since the average government's debt is relatively modest.

Interest rates

According to table 4, in both models was found that interest rates have a statistically significant negative impact on the economy. In first model, the rates of interest show a negative coefficient of 0,442 and p-value of 0,025 while in second model there is a coefficient of -1,047 and p-value of 0,000.

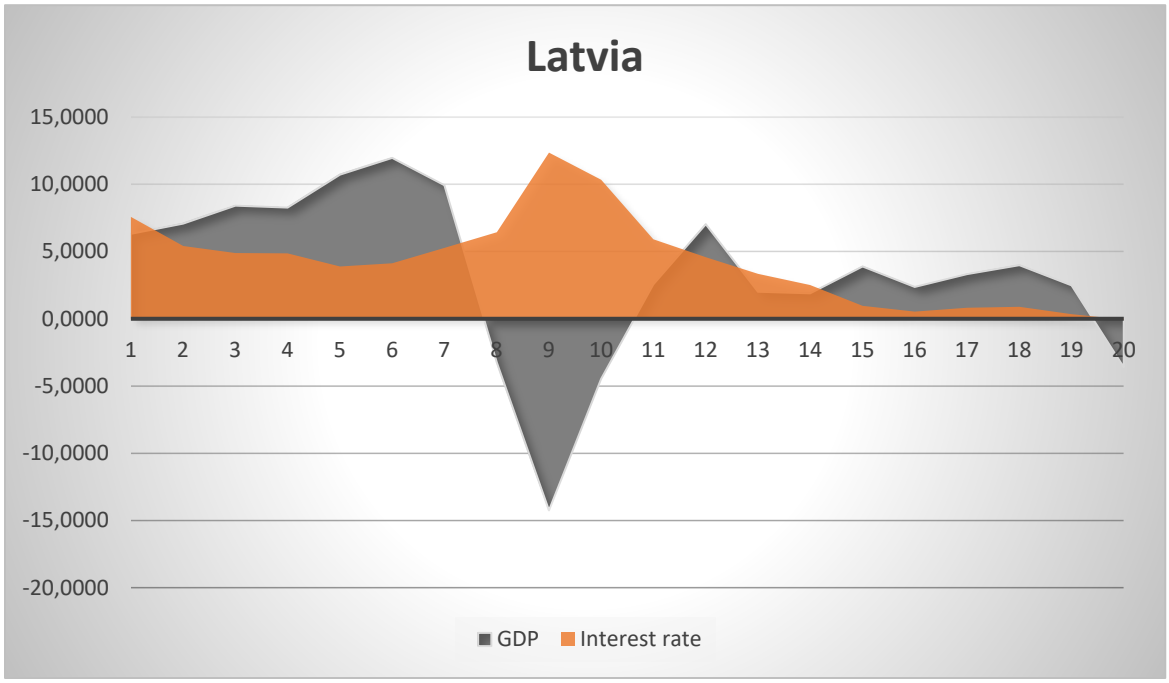
There is substantial statistical evidence that higher interest rates have been related with slower economic expansion. This supports my hypothesis and the arguments provided previously in the thesis on the significance of interest rates. It was shown that interest rates had a massive impact at 5 and 1% level of significance in the respective cases. The higher the interest rates of a nation, the lower its investment and consumption, both lead to lower economic growth, which is in accordance with what (Ujuju & Etale, 2016) and (Linnemann & Schabert, 2015) found. This indicates that the GDP and interest rates move in opposite directions. In addition to the regression results, I may study the relationship between interest rate and GDP in a few particular nations to strengthen my findings.

Figure 6. GDP and interest rates of Ireland



Source: Author's compilation

Figure 7. GDP interest rates of Latvia



Source: Author's compilation

The figures 6 and 7 support the findings of my statistical analysis. They demonstrate that interest rates and GDP are moving in different directions. For example, from 2008 until 2010, Latvia saw its highest interest rates and worst economic downturn. Similar trends may be noticed in Ireland between 2013 and 2020. Extreme levels of GDP growth occurred at the same time with the lowest interest rates in Ireland.

Robustness check

Table 6. GMM results with standard errors

GDP gr.	Coefficient (std. errors) 1st model	Coefficient (std. errors) 2nd model
L1. GDP growth	**0,4136*** ** (0,064)	**0,2698*** ** (0,057)
L2. GDP growth	-0,0584 (0,055)	**-0,2016*** ** (0,052)
Inflation	**0,2729* ** (0,127)	
Unemployment		0,1015 (0,144)
Population growth	**-3,6437*** ** (0,882)	
Interest rates	**-0,4415*** ** (0,118)	**-1,0474*** ** (0,112)
Debt-to-GDP		**-0,3710*** ** (0,030)
Foreign direct investment (FDI)	0,0113 (0,007)	0,0040 (0,006)
Inflation & population	**38,7708** ** (13,4205)	
Unemployment & Debt-to-GDP		**0,8421*** ** (0,145)
No. of observations	459	459
Groups/ instruments	27/23	27/23
AR (2)	0,061	0,686
Hansen statistic	-	-
Prob> chi2	0,000	0,000

***** Statistically significant at the 1% level (p-value <= 0,001)**

**** Statistically significant at the 5% level (p-value <= 0,01)**

*** Statistically significant at the 10% level (p-value <= 0,05)**

The study paper will apply a robustness assessment to confirm the reliability of the findings given in the previous sections. The robustness research was carried out to test the validity of the main findings, especially to determine whether the coefficient estimates of crucial variables in the main regression maintained accurate when the regression specification was altered (Lu and White, 2014).

Comparing the table 5 above with the table 4 in the previous section, it is observed that the fundamental results hold for all studied effects of factors. Each important variable remains statistically significant and the coefficients for all variables remain unchanged. Hence, it is concluded that the models are robust.

Conclusion

This research has produced evidence that macroeconomic factors have a substantial role in understanding economic development in the area as a whole, regardless of the country. An in-debt study of interacted variables and interest rate showed that significantly affect the country's economy. Most of the variables showed that have a significant impact on the economic growth. The research showed that the current value of GDP strongly depends on its previous values. Furthermore, population, interest rates and debt are mainly the factors that drive the economy of a country. Although, the inflation and the unemployment rate do not have a significant impact on it, their combination with the population and debt respectively, both showed that have a positive and strong effect on the economy.

It is nice to highlight, that low and steady inflation helps the country to quicken its GDP growth rates, with the combination of population expansion being both more helpful to boost it. As it was mentioned in the review of literature, the low inflation around 2 percent can boost the economy and create job opportunities. At the same time the population growth can help to reduce the unemployment and increase the productivity, so it is found out that both can contribute positively on the economy.

Unemployment and debt have a very significant effect on GDP, but contrary to what was predicted, this effect is positive. As previously stated in the literature review, it was also determined that the interest rate has a negative and significant effect on economic growth.

In the future, there are research that would assist to test and expand upon my results. To establish the significance of inflation, population, interest rates, and debt on economic development, further country-level research are required. Also, modifying the interactions of my factors might aid in comprehending their influence on economic growth. My findings that inflation and population combined, as well as the unemployment and debt together significantly drive the country's GDP are interesting and deserve additional investigation, considering there was no similar past paper .

Due to the large number of factors that might influence a country's economy, explaining economic development is very complex. This study indicates that certain macroeconomic factors

are more significant than others in explaining GDP growth. However, the conclusions of this research indicate that if a country want to increase its GDP growth rate rapidly, it should control appropriately the inflation and the levels of debt.

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