

Czech University of Life Sciences Prague

Faculty of Economics and Management

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Master's Thesis

**Role of Foreign Trade in Economic Growth: Case
Study of the United Kingdom**

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DIPLOMA THESIS ASSIGNMENT

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Economics and Management

Thesis title

Role of Foreign Trade on Economic Growth: Case Study of the United Kingdom

Objectives of thesis

The main objective is to understand if the role of foreign trade is significant for the economic growth of the United Kingdom. In addition to that, the author also seeks to understand if the ongoing economic recession is caused by worse conditions of trade with the EU. Undoubtedly, the question of whether Brexit is responsible for the ongoing economic recession can partially be answered with the help of a pertinent analysis of the effect that foreign trade as a whole plays in the economic growth of the United Kingdom.

Methodology

The author's main methodology is focused on conducting an empirical analysis where a linear regression will be created. Based on the linear regression and subsequent hypothesis testing, the author will come up with a conclusion about the statistical significance of selected parameters on the GDP growth of the UK. Also, the author incorporates other analyses, such as the terms of trade analysis. For data, the author heavily relies on data provided by one of the world's largest open databases for economic data – the World Bank, which is also one of the institutions created as a consequence of the Bretton-Woods conference (Woods, 2008). The time-series of the data analyzed ranges from 2000 to 2021 which covers 22 years.

The proposed extent of the thesis

60 – 80 pages

Keywords

United Kingdom, foreign trade, Brexit, economic growth, gross domestic product, liberalization, protectionism, exchange rate

Recommended information sources

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Declaration

I declare that I have worked on my bachelor thesis titled "Role of Foreign Trade in Economic Growth: Case Study of the United Kingdom " by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break any copyrights.

In Prague on 31.03.2024

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Role of Foreign Trade in Economic Growth: Case Study of the United Kingdom

Abstract

The main objective is to understand if the role of foreign trade is significant for the economic growth of the United Kingdom. In addition to that, the author also seeks to understand if the ongoing economic recession is caused by worse conditions of trade with the EU.

The author's main methodology is focused on conducting an empirical analysis where a linear regression will be created. Based on the linear regression and subsequent hypothesis testing, the author will come up with a conclusion about the statistical significance of selected parameters on the GDP of the country. Also, the author incorporates other analyses, such as the terms of trade analysis. For data, the author heavily relies on data provided by one of the world's largest open databases for economic data – the World Bank.

According to the results of the empirical part, the author comes up to the conclusion that trade does have its effect on the economy of the UK, but the effect of other macroeconomic variables related primarily to the domestic environment is much more important.

Keywords: United Kingdom, foreign trade, Brexit, economic growth, gross domestic product, liberalization, protectionism, exchange rate

Role zahraničního obchodu v ekonomickém růstu: případová studie Spojeného království

Abstrakt

Hlavním cílem je pochopit, zda je role zahraničního obchodu významná pro hospodářský růst Spojeného království. Kromě toho se autor také snaží pochopit, zda je pokračující ekonomická recese způsobena horšími podmínkami obchodu s EU.

Hlavní metodika autora je zaměřena na provedení empirické analýzy, kde bude vytvořena lineární regrese. Na základě lineární regrese a následného testování hypotéz autor přijde se závěrem o statistické významnosti vybraných parametrů na HDP země. Autor také zahrnuje další analýzy, například podmínky obchodní analýzy. Pokud jde o data, autor se silně spoléhá na data poskytovaná jednou z největších otevřených databází ekonomických dat na světě – Světovou bankou.

Na základě výsledků empirické části autor dospěje k závěru, že obchod má svůj vliv na ekonomiku Spojeného království, ale mnohem důležitější je vliv dalších makroekonomických proměnných souvisejících především s domácím prostředím.

Klíčová slova: Spojené království, zahraniční obchod, Brexit, hospodářský růst, hrubý domácí produkt, liberalizace, protekcionismus, směnný kurz

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1 Introduction

Undeniably, the United Kingdom served as a role model for many different countries, regimes, and economies over the course of the last 3 or even more centuries. Fairly enough, it could have been downright hard to fight the temptation to try to follow in the footsteps of one of the world's most powerful colonial empires in the history of mankind. However, over the course of the last years, the country is constantly being criticized and the conservative government of the country is under pressure for the political decision whose roots started to take place in 2016 and which eventually happened in 2020. Evidently, the author refers to Brexit, which was finally sealed in 2020. At the same time, even despite the presence of an agreement with the EU, many parties and independent researchers suggest that the result of Brexit is far from being anywhere close to what had been assumed by people actively engaging in anti-EU rhetoric and the country is believed to be in a serious economic recession, also according to Oxford Analytica (2022).

The author of the thesis is surely enough neither a citizen of the UK nor the EU, but his home country – Zambia, has been a part of the British Colonial Empire for centuries until eventually gaining independence in 1964 under the reign of Elizabeth the Second (Gewald, 2008). Due to the influence that the UK politics and the colonial heritage both had on his home country, the author was always genuinely interested in observing the development of the United Kingdom, especially from the economic perspective, largely because of the author's utter passion for economics. In light of recent circumstances and countless messages in the media that the reign of the United Kingdom has ended with the country's withdrawal from the EU, the author is interested to see the role that foreign trade as a whole plays for the country.

By examining the role of trade, it would be possible to understand if the country should focus on finding new trade partners overseas, or if the country should focus instead on further improving its domestic production and processes, such as factor productivity. The author believes that in the age of great political turmoil, examining the role that foreign trade plays in still one of the world's most important and powerful countries play would be a great idea as it would potentially contribute to the debate of whether countries in the twenty-first century should focus on policies actively promoting trade liberalization or they should instead aim for trade protectionism. Undeniably, the findings of this diploma thesis can be used for the author's further research and potential dissertation writing.

2 Objectives and Methodology

2.1 Objectives

The main objective is to understand if the role of foreign trade is significant for the economic growth of the United Kingdom. In addition to that, the author also seeks to understand if the ongoing economic recession is caused by worse conditions of trade with the EU. Undoubtedly, the question of whether Brexit is responsible for the ongoing economic recession can partially be answered with the help of a pertinent analysis of the effect that foreign trade as a whole plays in the economic growth of the United Kingdom.

Apart from the main objective of the diploma thesis related to the identification of the degree of the effect of foreign trade, the author seeks to answer the following series of research questions:

- 1) Which factors significantly contribute to the country's real GDP?
- 2) How was the country's exchange rate evolving over time and does it have any direct implication for the GDP?
- 3) What are the possible solutions that can be implemented from the trade domain to improve the situation with the long-term economic growth of the United Kingdom?

2.2 Methodology

The author's main methodology is focused on conducting an empirical analysis where a linear regression will be created. Based on the linear regression and subsequent hypothesis testing, the author will come up with a conclusion about the statistical significance of selected parameters on the GDP of the country. Also, the author incorporates other analyses, such as the terms of trade analysis. For data, the author heavily relies on data provided by one of the world's largest open databases for economic data – the World Bank, which is also one of the institutions created as a consequence of the Bretton-Woods conference (Woods, 2008).

To be more specific and concrete, the methodology of the work strongly relies on the utilization of techniques of econometric estimation, which is largely based on the Gauss-Markov theorem, which has the following criterion at the core of the estimation:

$$\min \sum u_i^2 = \sum (y - \hat{y})^2 \quad (1)$$

Effectively, it is essential to mention that the implementation of the Gauss-Markov theorem suggests that the estimator that which be created will be BLUE, standing for the best linear unbiased estimator. The compliance of the model with the series of fundamental assumptions will be examined. For the purpose of estimating relevant parameters and finding them, the author employs the Gretl application. Gretl uses techniques of linear algebra and therefore, it computes parameters of the assumed model in accordance with the following formula:

$$OLS = (X^T X)^{-1} X^T Y \quad (2)$$

After properly estimating linear parameters, it is crucial to perform three consecutive verification processes – economic verification, econometric and statistical. For all verifications where the process of hypothesis testing is performed, the author uses a significance level equal to 5%. Statistical verification is largely based on the computation of t-ratios, which are found based on the formula:

$$t \text{ ratio} = \frac{\beta_i}{St.error_i} \quad (3)$$

Additionally, for the purpose of identifying if there is a presence of multicollinearity (the author selects the boundary of 0.8 in absolute terms as a market for the presence of the multicollinearity problem) in the model or not, as well as for potential additional analyses, the author utilizes Pearson correlation coefficient, which is computed as follows:

$$r = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}} \quad (4)$$

Additionally, the author also relies on the computation of elasticities for the purpose of defining which variable out of the selected list of predictors has the highest effect on the dependent variable. Elasticities, which show the percentual change in the response variable

following a one percent change in the independent variable are calculated according to the following formula:

$$Elasticity = \beta_i * \frac{X_i}{Y} \quad (5)$$

At last, the author uses methods of descriptive statistics to describe the dataset. Also, the author implements various kinds of charts and time series analysis, which will help to explain the development of selected variables in time. The results of this analysis are expected to be used in tandem with the current economic theory and relevant economic publications.

3 Literature Review

3.1 United Kingdom

3.1.1 Structure of the Economy

Before proceeding to the specification of the structure of the British economy, it is first vital to specify what are individual sectors of any economy and how they are computed in general. Economies are traditionally split into individual sectors, which summarize specific categories of goods that are produced within the country. Those goods traditionally have similar traits, characteristics, and technology implemented and, what is even more important, those goods share more or less similar levels of value added. When talking about economic sectors, it is vital to understand that in absolute terms, a particular country can be producing significantly less than another country, but in total the country with the smaller scale of production will be making as much as the second one or even higher. The main reason for the aforementioned disparity is the value-added and specification of economies in the production of something (Kenessey, 1987).

Thus, it is vital to mention that there are traditionally three sectors that are identified within economies:

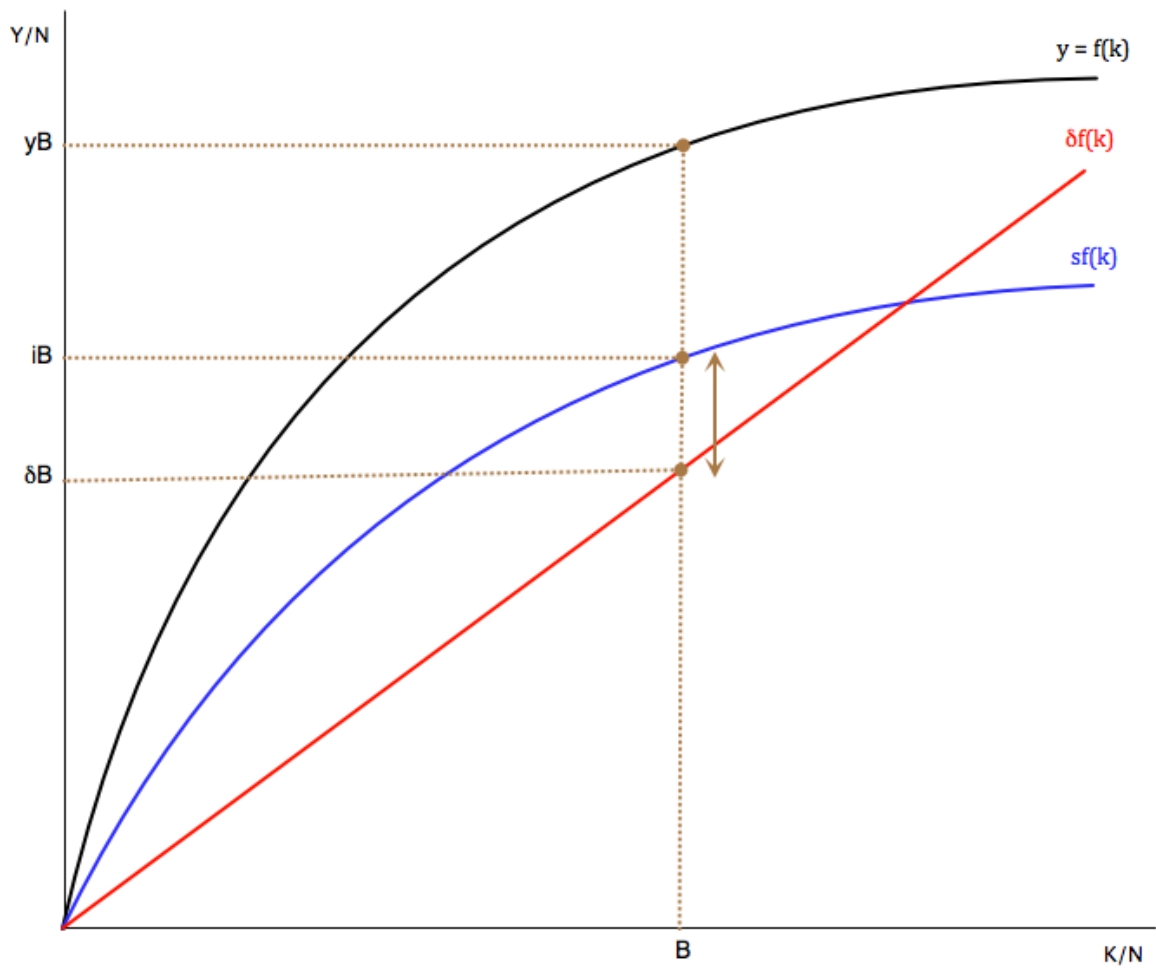
- 1) **Agrarian sector or primary sector** – the sector is largely represented by fisheries and agriculture. The sector traditionally has the lowest value-added and employs the lowest level of technology. Countries specializing in the sector are classified as agrarian countries and those countries are traditionally regarded as countries of the third world and poor ones (Frolova, 2020).
- 2) **Industrial sector or secondary sector** – the sector which is largely represented by manufacturing and production of goods related to national resources. Industrial countries are traditionally largely export-oriented countries, which are heavily represented by developing countries (Arent, 2015).
- 3) **Service sector or tertiary sector** – the sector, which is largely concentrated around services. The sector traditionally has the highest value-added and the sector is especially strong in countries of the developed world (Eswaran, 2002).

In addition to the original three sectors, scholars started to regard the sector specializing in research and development and science as an equally important component of the earlier-mentioned structure. Yet, it is essential to continue to the case of the United Kingdom whilst taking into consideration the traditional approach viewing three sectors as a basis for any economy (Kenessey, 1987).

The United Kingdom, according to the classification by numerous international organizations and institutions is a developed country and not just one out of many, but one of the world's leading economic powers with the financial center of Europe located in London. The United Kingdom is surely enough not a country that can be classified as a natural resource-abundant one, which could effectively be easily noticed during the energy crisis that happened as a result of the outbreak of the war in Ukraine, where the prices for almost everything soared after the decision not to continue the cooperation with the Russian Federation. At the same time, despite the country lacking natural resources, the country is abundant in capital and the country has a good stock of qualified and educated labor that makes up for the country's human capital. Undoubtedly, thanks to the presence of this educated labor and human capital, the country does not have to rely on the spillover of innovation from other countries such as the United States of America and instead, the United Kingdom is home to many different research centers that help to drive the economy even further (Kontovas, 2022).

According to Solow's view of economic growth, a country's ability to properly employ technology and have the potential to innovate is something that can help already developed countries to move from the steady state, which is the intersection of the depreciation and investment curves in Figure 1 (Prescott, 1988).

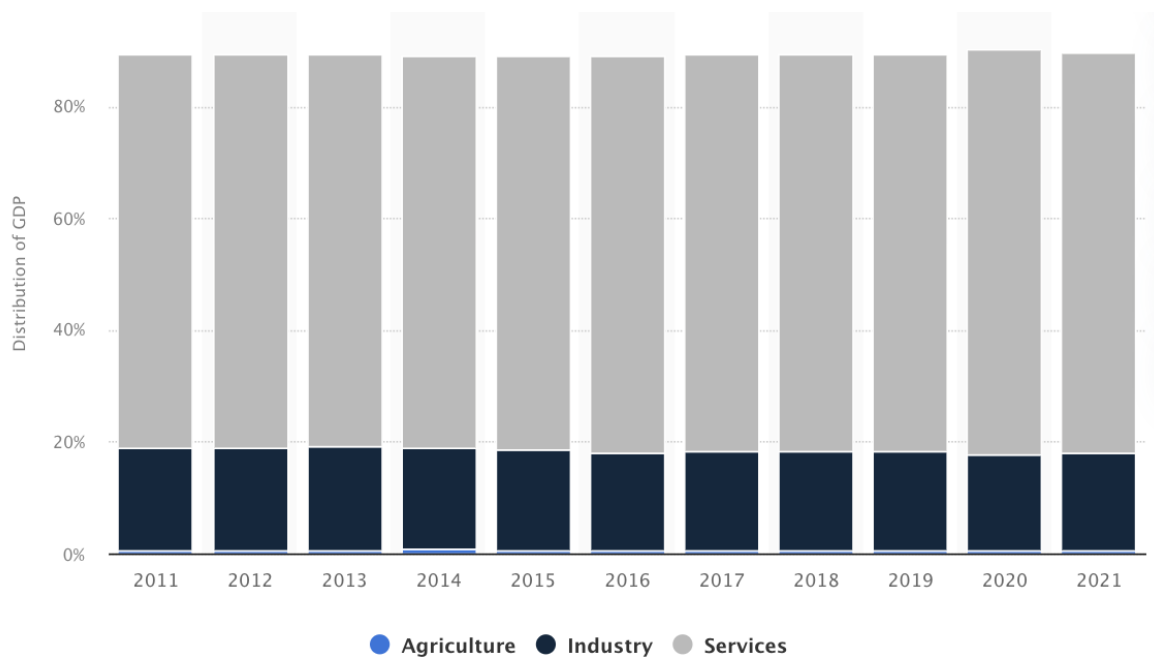
Figure 1, Solow's model of exogenous growth



Source: Dekkers, 2015

As can be observed from Figure 2, the country perfectly fits within the description of a developed country with a share of services significantly exceeding 50%. At the same time, as many scholars point out, strong reliance on services with an insignificant share of agriculture is exactly something that makes economists perceive the country's recent withdrawal from the EU as concerning. Undeniably, with such a low share of agriculture and generally strong reliance on imported agricultural goods from overseas, the fact that the UK does not participate in the EU's common agrarian policy is something that might worsen the ongoing recession even more (Christophers, 2019).

Figure 2, The structure of the UK's GDP



Source: O'Neill, 2023

Yet, at the same time, it is essential to mention that one of the main specializations of the UK economy and UK society is finance with London being the home to the world's biggest banks, funds, and investors, which largely happened thanks to the policy of open doors of the beginning of the 1900s, according to some scholars. Effectively, by opening its doors to foreign investors and wealthy beings, the United Kingdom is believed to have offered a huge chance for wealthy individuals all over the world to legalize their funds in exchange for a fair amount of their income, which would be paid to the authorities in the form of taxes. Indeed, this aspect of the country's specialization has been mentioned a couple of times recently and The Economist journal is not an exception in that regard. Yet, despite this, the journal went even further by labeling the capital of the UK as "Londongrad" (Morgan, 2023).

Figure 3, The Economist's depiction of London



Source: The Economist, 2022

Nevertheless, all scholars and scientists coincide in the fact that the United Kingdom is a country that specializes in services and the goods that the country is producing are of high value-added. Yet, there is a major problem with agriculture as the country's huge population quite evidently needs a constant supply of food, which might not at all be possible to achieve under the circumstances of little domestic production and high reliance on imports. Of course, not just the import of end-products, but also the import of necessary intermediate goods and inputs that are required to maintain at least some level of production. The next chapter observes the cooperation that exists in the political and economic domains between the United Kingdom and other international entities (Pallett, 2022).

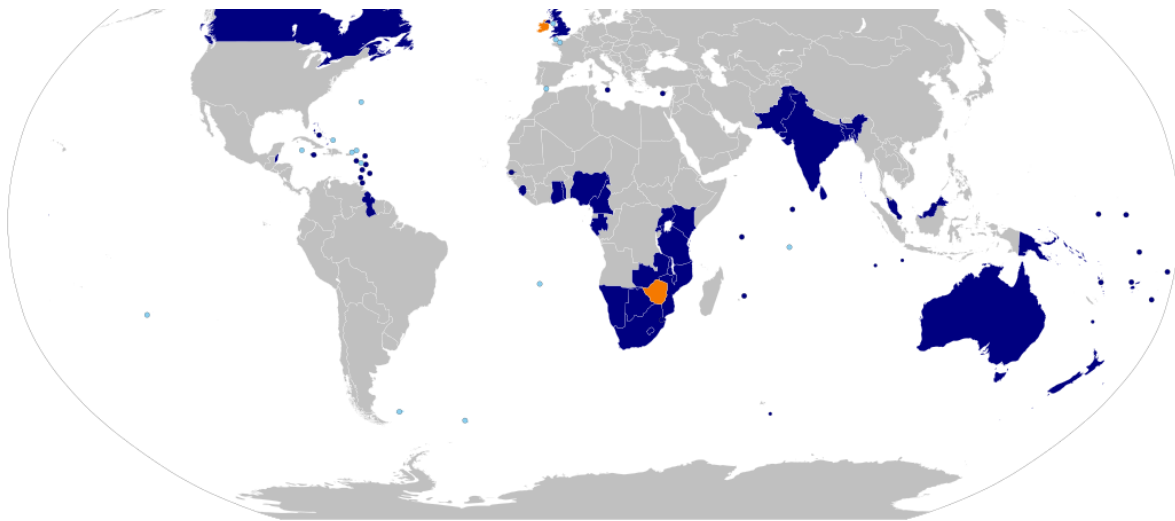
3.1.2 UK and International Cooperation

Of course, when analyzing the role of foreign trade on any country's economy, it is wise to take a look at the most important partners that cooperate with the country. Fairly speaking, as in the case with almost any post-colonial metropole, it is essential to understand that one of the most important parties cooperating with the UK are former colonies of the latter, which today form part of the so-called Commonwealth of Nations, hosting 56 countries scattered

around the globe. Undeniably, according to the relevant scientific framework, it is fair to assume that the core of the UK international trade relationship is in fact represented by the cooperation with its former colonies (Murray-Evans, 2016). Of course, there is a series of reasons for that, such as:

- 1) Cultural and language proximity. Thanks to the education system, which was inherited from colonial times, as well as the judicial one, former British Colonies all share a strong culture of using English as either the first language or lingua franca. According to relevant theory, countries tend to engage in trade with one another not just based on the principle of comparative advantage described by David Ricardo, or not because of the relevant distance and size of economies (gravity model) but because culture plays a huge role and can significantly change the way how matters stand (Melitz, 2008).
- 2) Size of economies. According to the gravity theory of foreign trade, countries are expected to engage in trade based on two characteristics – the distance between them and the size of their economies. Undoubtedly, this theory might be often criticized, especially in 2023, but this to the largest extent holds true, which is fully logical: as the distance increases, the transportation cost increases, and the trade might not be so beneficial; the larger volume of domestic economies suggests that the pool of goods that might be traded is higher. When looking at the countries of the Commonwealth, the majority of them are indeed lower-middle- and low-income countries, but 5 particular ones stand out: South Africa, Canada, India, Australia, and Nigeria. In fact, those countries (with the exception of Canada and Australia – they are already highly developed economies) all have an incredibly high pace at which their economies growth (Van Bergejik, 2010).
- 3) Specialization of economies. Indeed, as was already described, the United Kingdom itself is a country that specializes in services and highly innovative manufacturing. At the same time, for this manufacturing, it is essential to ensure that there will be enough inputs from which those goods can be produced. Given the fact that the overwhelming majority of countries from the Commonwealth are developed ones, the cooperation with the UK offers them a good chance to participate in the international value chain in the form of backward participation, where they will be exporting inputs to the UK that will be processed and exported back (Lopez-Villavicencio, 2021).

Figure 4, The map of the Commonwealth of Nations



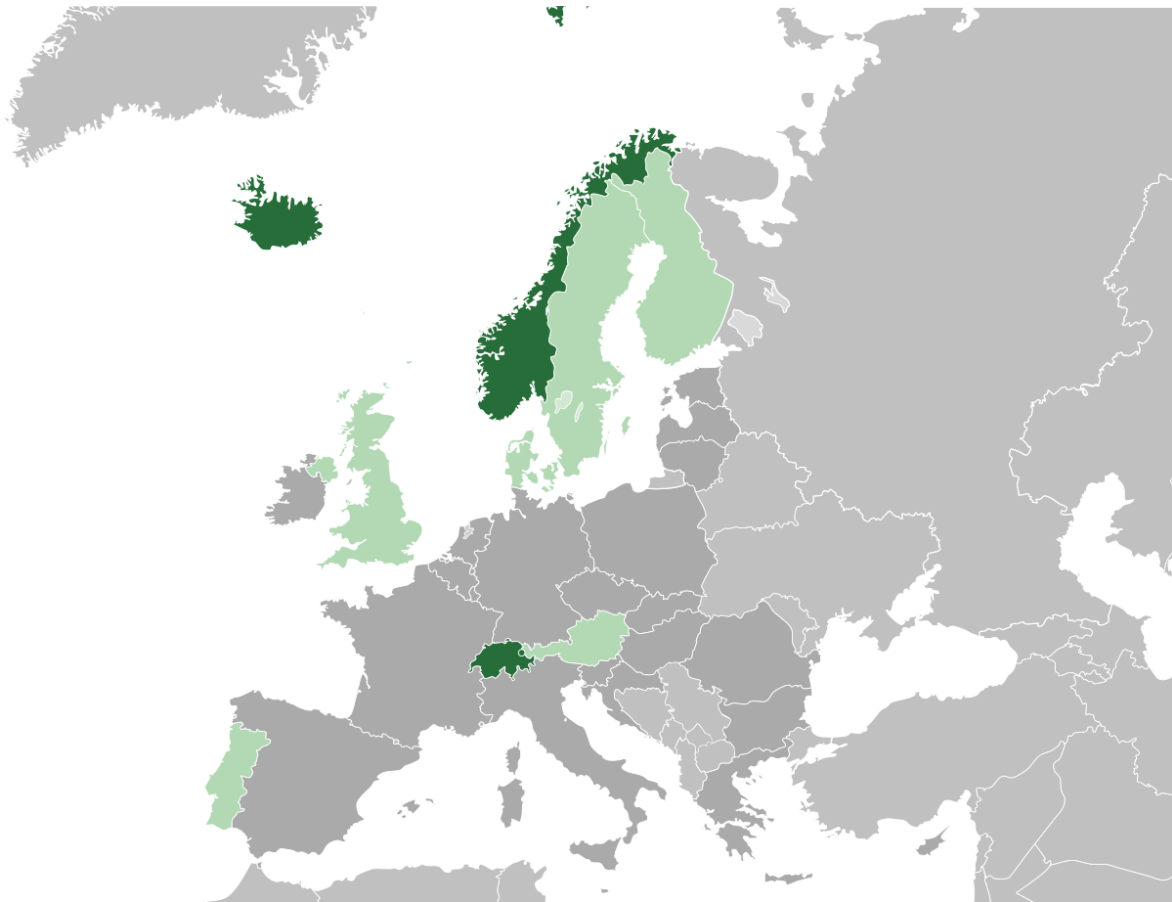
Source: Commonwealth, 2023

On the other hand, it is vital to mention that one of the biggest partners of the United Kingdom around the globe is the United States of America with which the country actively trades at rather beneficial terms for both parties. At the same time, it is essential to mention that the UK has a huge interest in Turkey, which was especially visible during the times when Turkey officially submitted its application to join the EU and was heavily supported by the UK (Hakura, 2011).

However, upon mentioning the EU in this chapter, it is essential to continue the relationship between the EU and the UK as according to the gravity theory and also the idea

that countries with similar cultures are expected to trade, the United Kingdom and the EU might seem to have been created for each other since on paper this pair seems a perfect match.

Figure 5, EFTA member-states



Source: PopulationData, 2019

At the same time, what might seem rather attractive and interesting in theory is far from being so in reality. The relationship between the UK and the EU was quite often driven by the desire to cooperate in order to gain the maximum possible benefit for each other. After the EEC (European Economic Community) has been established in 1957 with the signing of the Treaty of Rome, there was an obvious need for the creation of a specific free trade area between the European Communities and other countries thus preparing them for a potential accession in the future. Based on this logic, the EFTA was created, and the UK was among the first countries who joined the area. Yet, as the country's situation was not improving and, on the other hand, the EEC was prospering, the United Kingdom became genuinely interested in joining the Union but was vetoed two times by Charles De Gaulle, who was the president of France back at the

time. Nevertheless, as the president of France stepped down, the UK was finally able to join the union in 1973 becoming one of the first countries to join the union alongside Ireland and Denmark (Turner, 2013).

The first years of cooperation were rather fruitful but as time progressed and the UK's situation was not improving so fast, but money kept being spent on European projects and CAP, there came a series of concerns of whether the mechanism does really treat the UK fairly or not. As a consequence of this, as well as of the presence of the "Iron Lady", i.e., Margaret Thatcher the head of the UK government, the UK was able to cut the financing, which was one of the first blows in the relationship between the two. In fact, after years of fruitful cooperation, the two decided to part ways with the UK triggering the exit clause that had been introduced in the Treaty of Lisbon in 2009 and the UK was a part of the EU no more. In the next chapter, the author will focus on the breakdown of the current economic situation of the UK and will briefly reflect upon the events of Brexit (Keedus, 2018).

Figure 6, Marger Thatcher during the British Debate



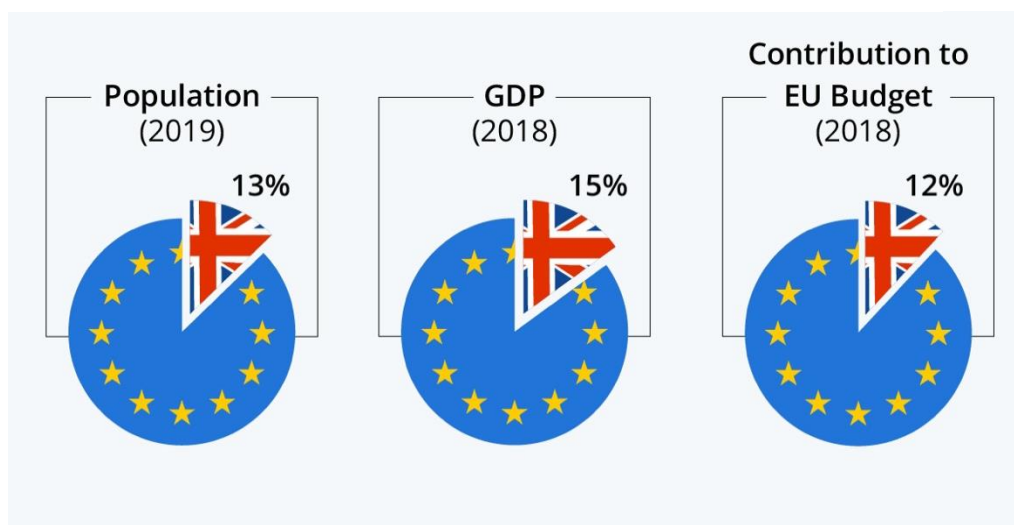
Source: Elsom, 2021



3.1.3 Current Economic Situation

According to many different independent reports and assessments of the British economy in the new decade, it is fair to suggest that its state is much worse than it had been during earlier years of the 21st century. Scholars blame three main events that are expected to have significantly worsened the state of the British economy. The first and the most obvious event that took a toll on the British economy is Brexit, which was initiated by the conservative government in 2016 and eventually finished in 2020. The whole process was indeed highly painful not just for the British political environment but also for the business sector, which had to come to grips with the loss of preferential access to the EU market. On the other hand, another problem associated with Brexit for the business sector was uncertainty – since there was literally no idea nor projection of what is expected to come from the "new deal" negotiations with the EU, scholars suggest that firms were hesitating to make large capital investments, which might have resulted in the lost opportunity for the British economy to continue its expansion. All in all, in the context of Brexit and its effect on the economy of the UK, it is vital to mention that the biggest negative effect had the change in the trade since by leaving the EU, the UK started to face a series of trade barriers. Undoubtedly, this had the worst implication for UK agriculture, since agrarian goods are traditionally one of the ones having the highest tariffs when entering the EU since agriculture is considered to be a sector of high national interest. All in all, Brexit necessarily led to three specific phenomena: high uncertainty among businesses, which leads to lower investment; loss of preferential access to the EU and the emergence of barriers to the free flow of merchandise and services (Vandenbussche, 2022).

Figure 7, Loss of the EU from the Brexit



Source: Armstrong, 2020

However, blaming Brexit for everything that is currently happening in the UK, including the economic recession and astonishingly high inflation would not be sensible, since there was another event that might have damaged the British economy in a far worse way than Brexit. Clearly, the author refers to the pandemic of COVID-19 that broke out in 2020 and lasted until approximately the middle of the summer of 2022. Based on statistics and assessment of the effect that the pandemic had on the world, it is surely enough impossible to say that there is no state on Earth that had not been touched by this pandemic. On the other hand, in the context of the United Kingdom, it is possible to suggest that the UK was among the world's most badly hit economies by the pandemic largely because of the country's inability to properly control the spread of the virus and also because of the massive disruption of the supply chains around the globe, which was especially crucial for the UK. Unquestionably, the EU remained the biggest trading partner for the UK even during the process of the Brexit negotiations, but as was already mentioned earlier, the UK also heavily relies on cooperation with the members of the Commonwealth of Nations and because of the pandemic, the full-scale cooperation with them was impossible because of disrupted supply chains resulting in delays or even inability to deliver goods at all. Quite apparently, when summarizing two paragraphs of this very chapter together, it becomes apparent that the situation of the UK was affected not just by one negative phenomenon, but by two happening at more or less the same time. Yet, unfortunately for the

country, there is also a third driving force that put the country in an even bigger recession (Delardas, 2022).

The third event that equally took its toll on the British economy alongside the pandemic and Brexit is the breakout of the war in Ukraine with the Russian Federation invading the country on the 24th of February. Without any hint of a doubt, the relative distance between the place of the conflict and the UK is huge but as it usually happens with similar conflicts, they inevitably influence even countries lying thousands of kilometers away from the zone of the direct conflict. When summarizing the effect that the war had on the world economy, it is essential to mention that as a result of the conflict, there was a situation of almost a shortage of wheat since Ukraine was one of the world's biggest exporters of wheat, thus leading to the situation when the prices for the commodity soared influencing the UK. On the other hand, another issue is the increase in the price of raw materials used in agriculture, such as fertilizers. The problem of fertilizers becomes in fact more and more seeming when taking into consideration the fact that the Russian Federation and Belarus (two countries actively cooperating with each other in the war against Ukraine) are the world's biggest exporters of fertilizers. Another issue that arose for the UK and other European countries is the need to search for an alternative supplier of energy-related commodities, notably gas since neither Russia nor the European continent wanted to continue the cooperation in the domain of energy. Consequently, the prices for almost everything rose in the UK leading to the two-digit inflation making the lives of ordinary consumers extremely expensive (Mbah, 2022).

Figure 8, UK inflation over time



Source: Race, 2022

3.2 Benefits of Foreign Trade

After finishing part of the narrative dedicated specifically to the United Kingdom, it is vital to continue to the breakdown of potential benefits that might arise from foreign trade. However, before proceeding to the specification of advantages and benefits, it is essential to first mention the presence of two different paradigms associated with foreign trade – trade liberalization and trade protectionism. The first paradigm is believed to yield the best results in terms of economic prosperity for a country due to the absence of barriers resulting in zero welfare loss and more opportunities for cooperation between business entities. Protectionism, on the other hand, is centered around the idea of protecting domestic producers and by doing so, ensuring prosperity through the increasing role of domestic firms in the international arena. Undeniably, both paradigms might in fact have their own advantages but based on numerous research and articles published recently, it became pretty apparent for economists that the route toward the autarky, i.e., a self-sufficient closed economy is the road towards nowhere, so the author will focus mainly on mentioning the benefits of liberal foreign trade (Nölke, 2022).

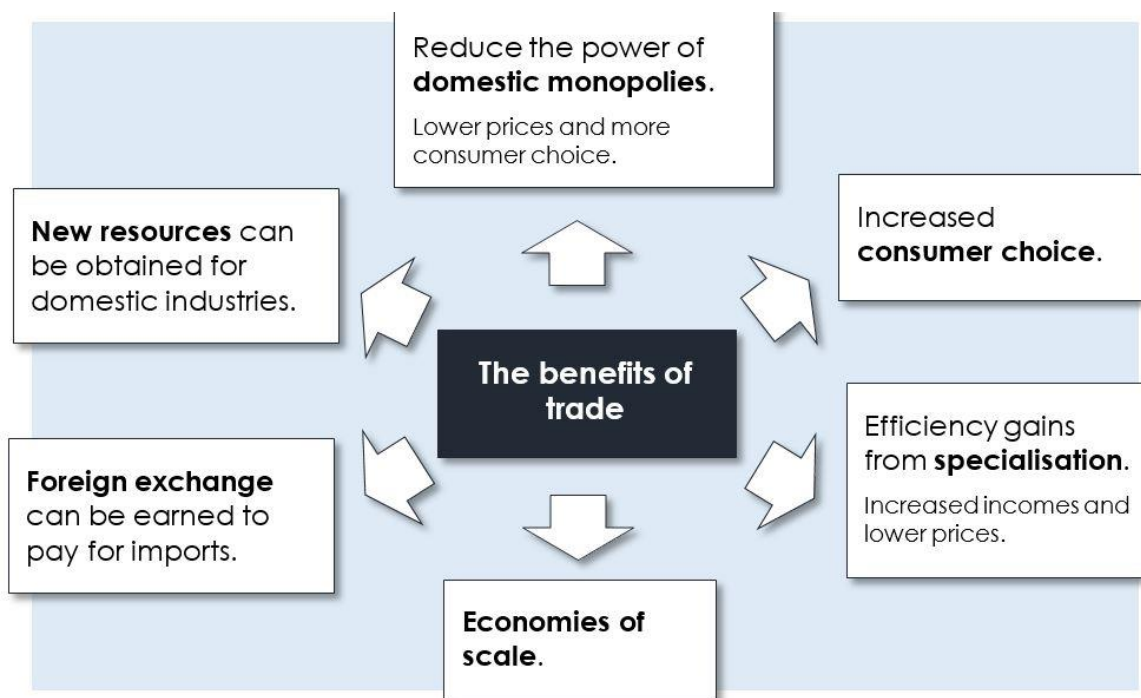
One of the most obvious advantages of foreign trade is the effect that it has on consumers. Given a higher number of firms competing in a particular market, the quality of goods

constantly evolves since firms have to be competitive and they have to conquer consumers with their marketing mix. By ensuring the market of competition, it is highly anticipated that there will be an environment of innovation created since companies would inevitably have to be attractive and more beneficial than other options available on the market (Zhu, 2008).

Another benefit of foreign trade is an opportunity for domestic firms to participate in the foreign market, as well as in the international one. Evidently, domestic markets are always limited to the existing demand, which is explained by the market size. Additionally, every market is made of people sharing more or less similar preferences for goods, and firms surely enough cannot anyhow evolve and experiment with their products by focusing solely on domestic markets. Additionally, participating in international markets helps companies to achieve the so-called economies of scale. Economies of scale are referred to the situation when companies are able to achieve higher levels of revenue with the constantly decreasing level of average costs, which is a highly beneficial situation for companies (Harley, 1994).

Undeniably, another advantage of foreign trade is that engaging in trade relations with other countries and actors of the world economy can help countries to specialize in something in which they are good. Clearly, this is the principle of comparative advantage suggesting that countries should export goods where they have a comparative advantage, i.e., lower opportunity cost, and import goods that have an incredibly high opportunity cost. Another economic paradigm underpinning the benefit mentioned in the paragraph is the Heckscher-Ohlin theorem, which explains that countries will be exporting goods and services that employ the factor of production in which the country has a relative endowment resulting in a cheaper price for exports since a factor in the abundance (Leamer, 1995). All in all, the author summarizes all benefits of foreign trade in Figure 9.

Figure 9, Benefits of foreign trade



Source: IB Economics, 2023

3.3 Measuring Economic Growth

Economic growth refers to the increase in the volume of production in a given country. The term is often mistakenly taken for another one, which is economic development. Economic development, contrary to economic growth is an improvement in the socio-economic dimension of a specific country, which is traditionally associated with the improvement of the living standards. Nevertheless, despite the fact that the first term is pretty self-explanatory and clear, there are infinitely many different approaches to measuring economic growth, which is concentrated around a few indicators traditionally used for various analyses (Lewis, 2013).

The first and the most widely used indicator of economic growth is GDP, standing for the gross domestic product. Gross domestic product is the total volume of goods and services at their monetary price produced within the borders of a specific country over the course of one year. When it comes to the GDP itself, there are three approaches for measuring the indicator, which are:

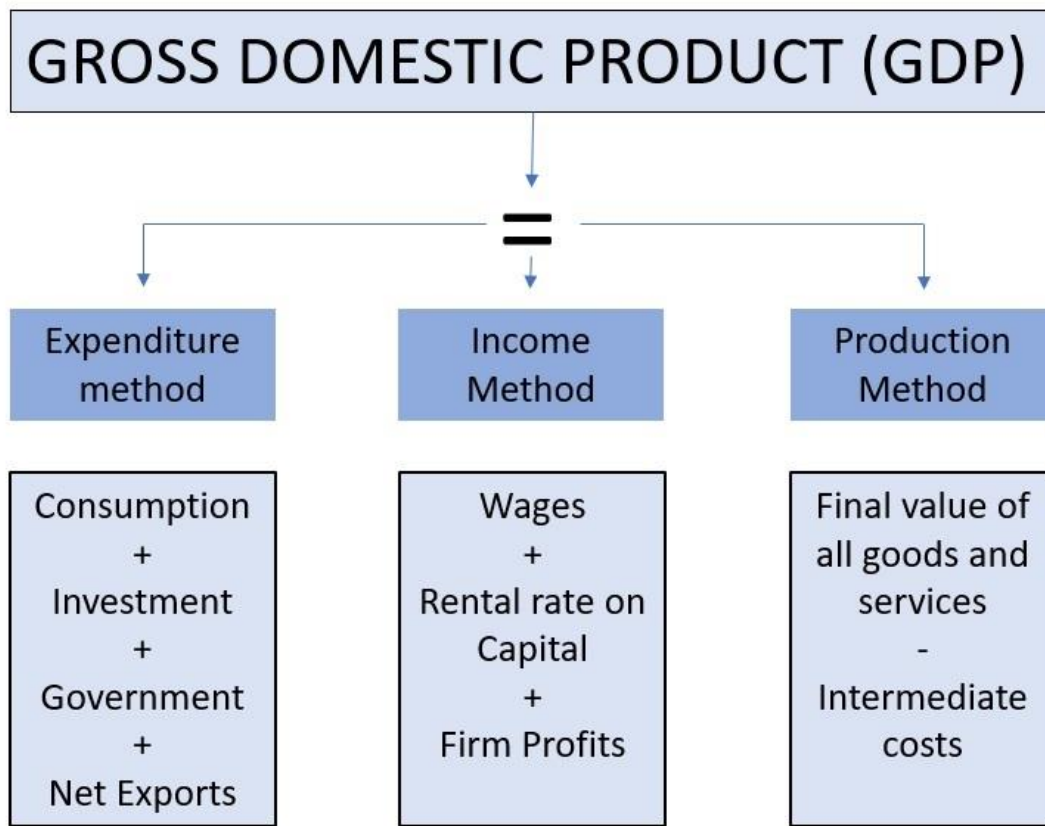
- 1) Production approach. According to the production approach, the GDP is calculated as the sum of all gross value added by different industries of a specific country, while also subtracting the monetary value of all intermediary goods used for the production.
- 2) Expenditure approach. The expenditure approach is traditionally one of the most widely used ones, as it covers fairly a lot of domains of national economies and offers a somewhat comprehensive and sophisticated algorithm for calculating the GDP. The following formula sums up the expenditure approach to the GDP calculation:

$$GDP = C + I + G + NX \quad (6)$$

Surely enough, this approach regards the GDP as the sum of all private consumption expenditures, government final consumption expenditure, gross capital formation and the difference between the exports and imports denoted as NX.

- 3) Income approach. This approach focuses on the calculation of the GDP by summing up compensation that one gets on a particular factor of production (land, labor, capital, and entrepreneurship). Thus, according to the income approach, the GDP is calculated as the sum of the following elements: income from labor, profit of the private sector and rent income from the ownership of land, and also interest earned on capital (Grishin, 2019).

Table 1, Approaches to the GDP calculation



Source: Econhelp, 2019

Nevertheless, one of the most obvious problems of utilizing the GDP as the main indicator for describing economic growth is the fact that the gross value of the indicator does not take into consideration depreciation, so for the purpose of providing a more sophisticated and comprehensive approach to the GDP, economists often subtract the figures for amortization in order to get the net volume of the GDP. Another problem with the GDP is the fact that it concerns mainly the monetary value, and it shows the figures in nominal terms thus not taking inflation into consideration. For this purpose, the price deflator is used to express the level of the GDP in terms adjusted to inflation, being thus the level of the real GDP (Kohli, 2004).

Apart from the GDP as an indicator of economic growth, international institutions and notably the UN tend to use a slightly modified indicator of the GDP by also considering remittances from the country and into the country. This is the indicator of the gross national income or GNI. Additionally, there is an indicator focused mainly not on the borders within which a particular production takes place but rather focusing on those who produce the good.

The indicator that considers the production of nationals of a specific country regardless of borders is the indicator of the GNP or the gross national product (Capelli, 2016).

In fact, when talking about economic development which is also a crucial element on the agenda of almost any state on Earth, for the purpose of measuring that phenomenon, traditional indicators of economic growth are modified by computing their figures per capita (by dividing the figures for the figures of the population) (Baster, 1972).

3.4 Factors Influencing Foreign Trade

There are traditionally many different factors that inevitably influence foreign trade, as well as a particular country's competitiveness. Undeniably, the overwhelming majority of those factors come from the economic domain and the most important ones are:

- 1) Exchange rate. The exchange rate has traditionally been one of the key determinants behind a given country's competitiveness. At the same time, it is essential to understand that it is traditionally not the exchange rate that matters much, but the real exchange rate, which is calculated based on the principle of the law of one price and in situations when the real exchange rate is below one, it suggests that a given country is not so attractive. On the other hand, in situations when the real exchange rate is above one, it can be suggested that other countries and companies will consider the idea of buying goods from the country due to the fact that goods are under-priced there. In situations when the real exchange rate is equal to one, parity exists (Arize, 2000).
- 2) Inflation. In addition to the exchange rate, inflation is something that might inevitably prompt the exchange rate to either appreciate or depreciate rapidly, if one refers to the theory of the relative purchasing power parity. Effectively, inflation is a factor that might influence trade in a slightly different indirect manner – with high levels of inflation, the real GDP of an economy is likely to suffer, so it will lead to a lower volume of products available for export (Galal, 2017).
- 3) Interest rate. The role of the interest rate is somewhat similar to inflation – with high levels of interest, the firms are expected to have lower volumes of production

thus leading to lower engagement in the foreign trade of individual countries (Lardy, 1995).

- 4) GDP. The volume of available production inevitably influences a given country's ability to engage in international operations, as well as the total number of private firms (Popkova, 2017).
- 5) Political environment. As has already been mentioned before, the political agenda of a specific country is something that might either restrict foreign trade (protectionism) or it can equally help foreign trade to prosper by creating an environment of little or no barriers at all for foreign companies (Ricardo, 2017).

4 Practical Part

4.1 Model

4.1.1 Data and Economic Model

To begin the practical part and the econometric estimation, it is first vital to proceed to the dataset that will be used for the estimation. In Table 2, the author presents the complete dataset collected with the help of data obtained from the World Bank covering 22 years – from 2000 to 2021.

Table 2, The dataset for the estimation

Year	GDP, trillion of 2015 constant USD	Exchange rate, pound/dollar	Inflation %	Current account balance, billion USD	FDI, billion USD	Interest rate %	Unemployment %
2000	2.31	0.66	1.18	-30.77	164.13	5.33	5.56
2001	2.36	0.69	1.53	-29.77	56.09	4.93	4.70
2002	2.40	0.67	1.52	-36.37	89.76	4.89	5.04
2003	2.47	0.61	1.38	-38.75	36.01	4.53	4.81
2004	2.53	0.55	1.39	-57.23	87.06	4.88	4.59
2005	2.60	0.55	2.09	-51.77	252.65	4.41	4.75
2006	2.66	0.54	2.46	-85.76	203.64	4.50	5.35
2007	2.72	0.50	2.39	-117.10	209.51	5.01	5.26
2008	2.72	0.54	3.52	-116.91	253.45	4.59	5.62
2009	2.60	0.64	1.96	-75.39	14.55	3.65	7.54
2010	2.66	0.65	2.49	-72.12	66.73	3.62	7.79
2011	2.69	0.62	3.86	-48.10	27.01	3.14	8.04
2012	2.73	0.63	2.57	-89.05	46.75	1.92	7.88
2013	2.78	0.64	2.29	-133.26	54.47	2.39	7.52
2014	2.87	0.61	1.45	-157.49	58.89	2.57	6.11
2015	2.93	0.65	0.37	-148.71	45.33	1.90	5.30
2016	3.00	0.74	1.01	-149.57	324.81	1.31	4.81
2017	3.07	0.78	2.56	-96.88	125.36	1.24	4.33
2018	3.12	0.75	2.29	-116.99	-25.06	1.46	4.00
2019	3.17	0.78	1.74	-80.78	19.79	0.94	3.74
2020	2.82	0.78	0.99	-87.81	132.48	0.37	4.47
2021	3.04	0.73	2.52	-47.05	5.92	0.79	4.83

Source: The World Bank, 2023

Effectively, the econometric estimation is traditionally done through a series of fundamental steps, where the first one is the economic theory. In this case, it is possible to say that this stage is already passed as the literature review served this function pretty well. Henceforth, it is vital to continue to the formulation of an economic model, where the author will specify what is being predicted and what are individual regressors for that case. Below, the author presents the economic model based on which, an econometric one will be elaborated.

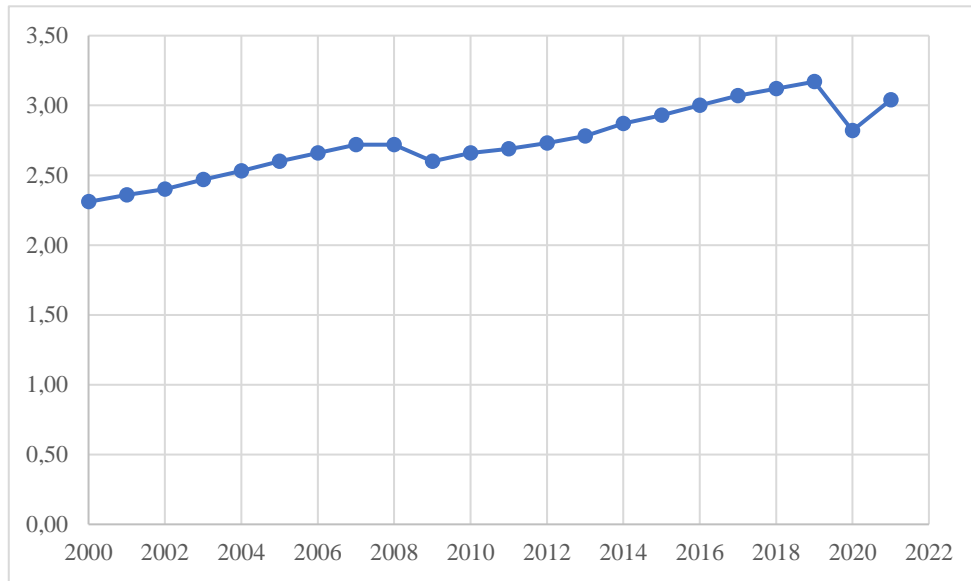
$$y (\text{Real GDP}) = f(x_1, x_2, x_3, x_4, x_5, x_6)$$

Clearly, the annual volume of the real GDP in the United Kingdom expressed in 2015 constant trillions of US dollars is taken as the dependent variable, while other variables are expected to have a significant influence on the real GDP. After the specification of the economic model, it is essential to continue to the description of each variable's development in time thus conducting a time series analysis.

4.1.2 Time Series Analysis

Of course, given that the data used for the estimation is of the time series kind, it is possible to observe the development of each individual variable with the help of scatterplots. This procedure is useful to understand the context of the British economy and address it during the process of formulating pertinent recommendations for the British government in the results and discussion chapter of this diploma thesis. First, the author starts with the real GDP variable, which will be further denoted as y . Figure 10 presents the development of the variable over the course of the 22 years taken into consideration.

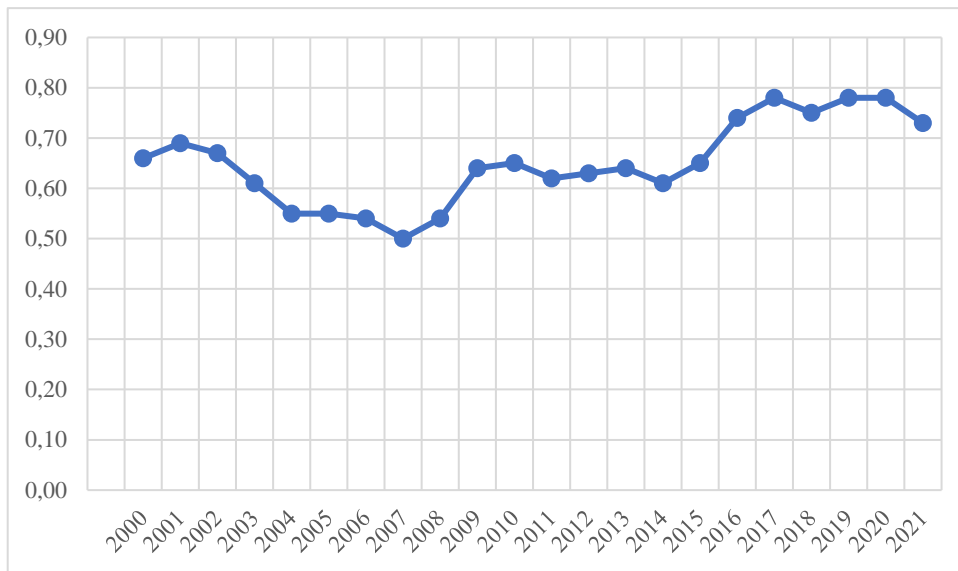
Figure 10, Development of the real GDP in time, trillion of 2015 constant USD



Source: Author's computation based on The World Bank data, 2023

Clearly, it is possible to suggest that the British economy in fact went through 2 decades of gradual economic expansion with the real GDP increasing by almost half of a trillion over the course of 22 years. On one hand, this result suggests that the economy is a well-functioning one and economic policies of the UK's government are working, but on the other hand, especially when considering that the UK is traditionally labeled as one of the world's leading economies, this increase in the volume of the economy is not so high, especially when taking into consideration that former UK's colonies are quickly catching up, especially India. Then, the author proceeds to the breakdown of the exchange rate variable in Figure 11.

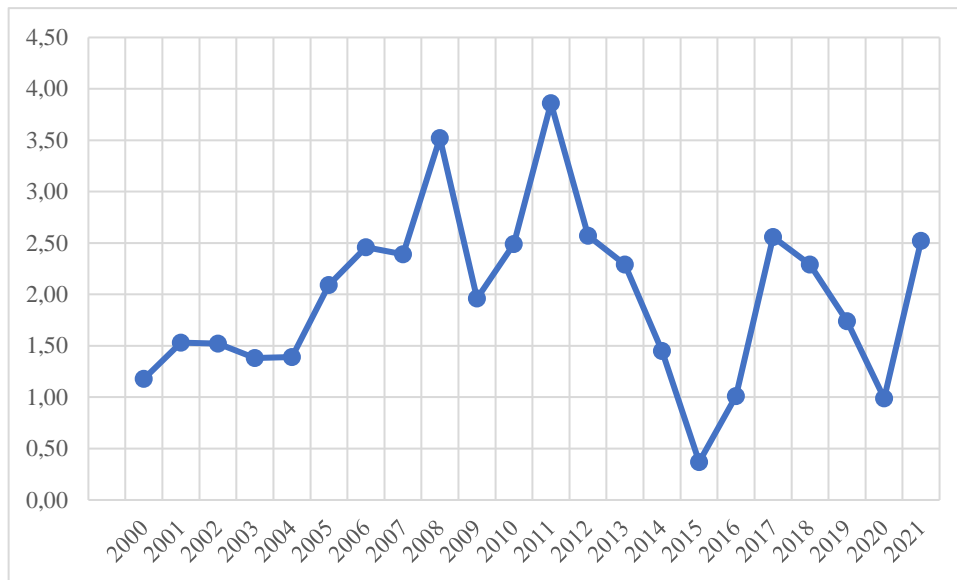
Figure 11, Development of the exchange rate in time (pound/dollar)



Source: Author's computation based on The World Bank data, 2023

Based on the development of one of the most crucial variables associated with the subject of foreign trade, it is possible to say that the domestic currency of the United Kingdom, the British pound, is relatively stable when comparing the currency against the developing world. Yet, at the same time, when taking into consideration other international reserve currencies such as the United States dollar and euro, it becomes pretty apparent that the performance of the British pound was not so smooth over the course of the previous two decades as the currency has frequently been going through moments of depreciation and appreciation. Additionally, it is wise to say that one of the biggest depreciation of the currency happened during Brexit, which is not at all surprising given the overall level of uncertainty, which always reflects on the market prices. Then, the author takes an insight into the third variable – inflation, the breakdown of which is available in Figure 12.

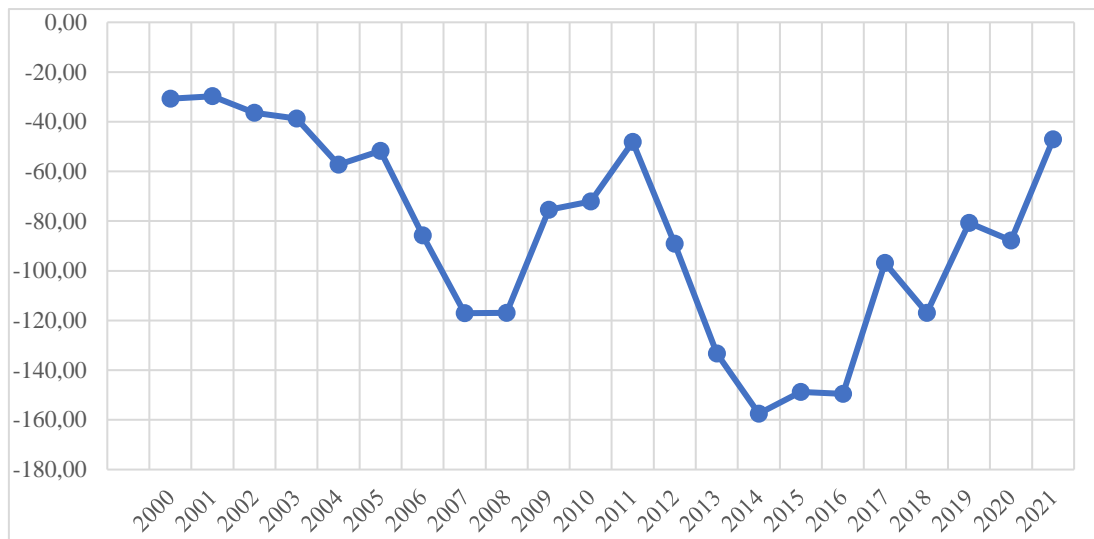
Figure 12, Development of inflation in time, %



Source: Author's computation based on The World Bank data, 2023

Yet, when talking about stability and smooth development of a particular variable, it is surely enough possible to say that the development of the inflation in the UK cannot anyhow be classified as predictable as the country's inflation rate was subject to active fluctuations, especially right after the Great Recession that broke out in 2007-2008. At the same time, it is possible to say that the overall level of inflation for the UK was lower than 10 percent, which is something that can suggest a positive result for the inflation-targeting policy of the Bank of England. The next variable on the list is the current account balance, whose development in time is shown in Figure 13.

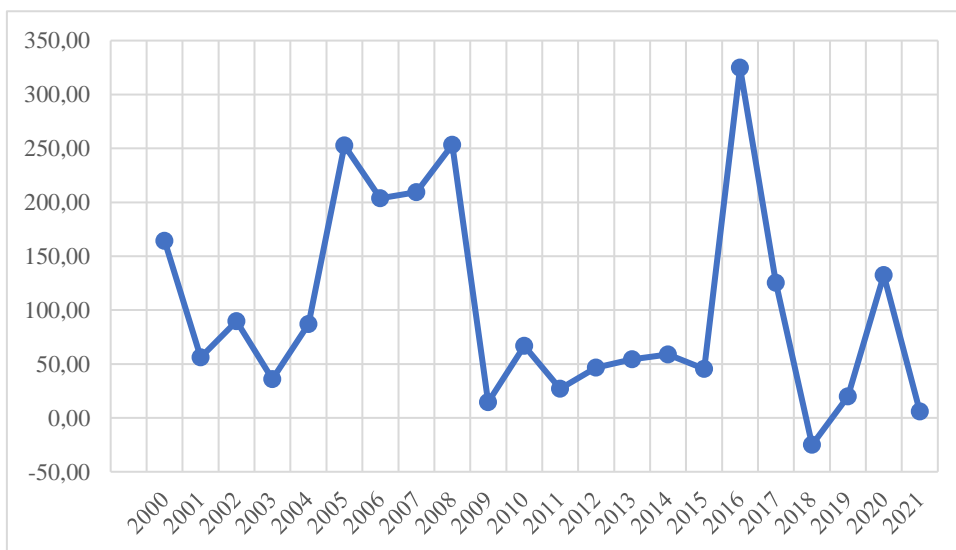
Figure 13, Development of the current account balance in time, billion USD



Source: Author's computation based on The World Bank data, 2023

The development of the second variable directly associated with the trade domain suggests a change in the paradigm of the United Kingdom. Until approximately 2014-2015, the country was actively increasing its deficit of trade, while the situation started to change drastically after 2015 when the country was able to significantly close the gap and approach the level of the perfect equilibrium with the figure of 0 for the balance. The next variable is the one dedicated to the net inflow of FDI, whose development in time is presented in Figure 14.

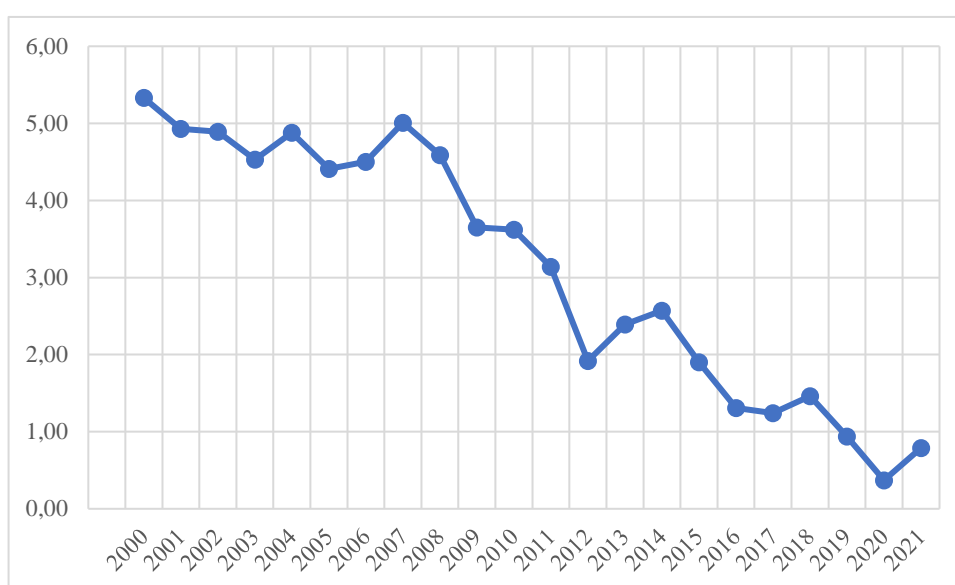
Figure 14, Development of FDI in time, billion USD



Source: Author's computation based on The World Bank data, 2023

When it comes to foreign direct investment, the level of the FDI was constantly fluctuating in the UK but the figures were rather high, which underpins the presence of a positive dynamic and a relatively good environment for potential investment. At the same time, it is quite visible that the variable's volume suffered a serious shock as the Brexit process was initiated resulting in the all-time low figures for 2018 and 2021. The next variable to be analyzed is the interest rate, which will be examined based on the graph from Figure 15.

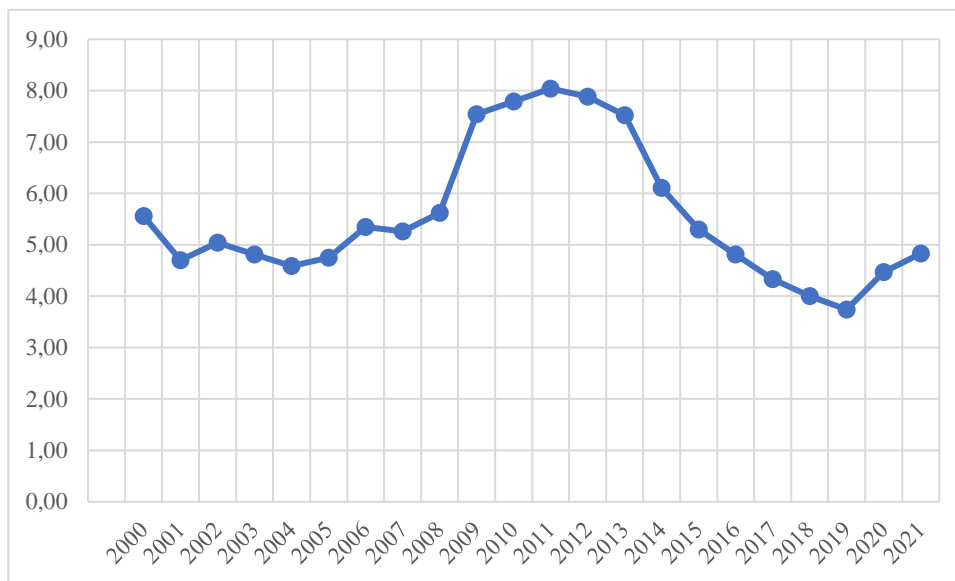
Figure 15, Development of interest rate in time, %



Source: Author's computation based on The World Bank data, 2023

The very first aspect of the development of the interest rate that comes to one's mind is the fact that the central bank of the United Kingdom was pursuing the strategy of lowering the interest rate, which was expected to increase the amount of money circulating in the economy consequently increasing the level of economic activity. Presumably, this is directly related to the goal of the Central Bank to attain economic growth with the help of liberal mechanisms. In fact, the utilization of monetary instruments is quite common for the United Kingdom, especially when considering the fact that Milton Friedman was an economic adviser to the Iron Lady during the times of her rule over the British Isles. Nevertheless, it is essential to proceed to the very last variable from the dataset – unemployment. The development of the variable is shown in Figure 16.

Figure 16, Development of unemployment in time, %



Source: Author's computation based on The World Bank data, 2023

Contrary to the development of another variable forming part of the Phillips curve – inflation, the development of unemployment is somewhat smooth, and apparently, the government was not able to anyhow break the frontier of approximately 4% as the level of unemployment almost never dropped under the figure, apart from 2019. At the same time, it is fair to say that the worst times in terms of British unemployment happened right after the outbreak of the Great Recession and notably in 2009-2013, which also coincided with the European debt crisis. Nevertheless, after explaining each variable's development in time, it is time to proceed to the descriptive statistics of the dataset's variables before finally creating an econometric model.

4.1.3 Descriptive Statistics

For the descriptive analysis, the author employs measures from two statistical domains – measures of central tendency and also measures of dispersion. The outcome of the analysis is indicated in Table 3, where the overview of computed measures is available for each variable from the list.

Table 3, Descriptive statistics

	Real GDP	Exchange Rate	Inflation	Current Account Balance	FDI	Interest Rate	Unemployment
Minimum	2.31	0.50	0.37	-157.49	-25.06	0.37	3.74
Maximum	3.17	0.78	3.86	-29.77	324.81	5.33	8.04
Median	2.72	0.64	2.03	-83.27	62.81	3.38	5.15
Mean	2.74	0.65	1.98	-84.89	102.24	3.11	5.55
St.deviation	0.25	0.08	0.83	-40.53	94.21	1.65	1.34
Coef. of var	9%	13%	42%	48%	92%	53%	24%

Source; Author's computation based on The World Bank data, 2023

Effectively, it is possible to say that the most volatile indicator according to the value of the coefficient of variation is foreign direct investment, whose volatility has already been commented on by the author in the earlier chapter. Effectively, the volatility of domestic currency equal to 13% is not good news for the country whose currency is treated as one of the world's reserve currencies. If the country will not be able to take the development of the exchange rate under its control, there is a prospect of the pound losing its international power. In addition to that, when commenting on figures for individual variables in terms of average values, it becomes pretty apparent that the average figures for almost all indicators suggest that the overall situation of the British economy was somewhat favorable as the average inflation for the period is equal to 1.98% being the target level for the overwhelming majority of countries; interest rate and unemployment both are somewhat acceptable. Therefore, the author suggests that on the surface, the situation for the UK's economy as of 2021 did not look too concerning but it became quite clear that Brexit would have its toll on investment and the value of the British pound. Finally, the author continues with the econometric estimation with the formulation of an econometric model in the first place.

4.2 Econometric Estimation

4.2.1 Econometric Model

Now, after taking a deep insight into the economic theory, creating an economic model, and providing a relevant description of each variable, it is time to create an econometric model. Below, the author presents the structure of the assumed model and then provides a breakdown of each variable.

$$y_t = \beta_0 + \beta_1 x_{1t} + \beta_2 x_{2t} + \beta_3 x_{3t} + \beta_4 x_{4t} + \beta_5 x_{5t} + \beta_6 x_{6t} + U_e, \text{ where:}$$

Y_t	Real GDP in trillions of constant 2015 USD.
X_{1t}	Exchange rate in pounds per USD.
X_{2t}	Inflation rate in percentage points.
X_{3t}	Current account balance in billion USD.
X_{4t}	FDI net inflow in billion USD.
X_{5t}	Interest rate in percentage points.
X_{6t}	Unemployment in percentage points.
β₀	Intercept term.
β_{1...6}	Parameters of independent variables.
U_e	Error term.

In addition to the creation of an econometric model, the author would also like to list down a series of assumptions that are expected from the model:

- 1) The model is correctly specified, i.e., no specification bias.
- 2) The constant variance of residuals, i.e., no heteroscedasticity.
- 3) Residuals are normally distributed, i.e., normality of residuals.
- 4) No serial correlation of residuals, i.e., no autocorrelation.
- 5) No perfect collinearity nor high collinearity, i.e., no multicollinearity.
- 6) Linear parameters.

For the purpose of estimation, the author uses Gretl, which is one of the most comprehensive tools for linear estimation. After the primary estimation of the parameters of the variables, the author will continue the verification process to understand if the model created by him is suitable for making generalized conclusions related to the role that foreign trade plays in the United Kingdom. Depending on the outcome of the verification and in case a particular assumption will be violated for the model, the author will take a decision based on the relevant econometric theory of whether it is still possible to use the model for making predictions or the model has to be reformulated by either adding additional variables or omitting particular ones, which might be quite sensible in useful in case of the violation of the second assumption related to the absence of heteroscedasticity of residuals

4.2.2 Estimation

Before effectively initiating the process of the estimation, it is downright essential to first check if there is any high and almost perfect collinearity between a particular pair of independent regressors. Yet, before doing so, the author will explain why he decided to include this assumption in his model since it does not always form part of the series of assumptions for the LRM. In fact, in cases of perfect collinearity, there can be no estimation done at all due to the fact that the values of parameters will not be estimated due to their nature being close to infinity. On the other hand, the problem with multicollinearity is the fact that with the presence of the phenomenon, the effect of individual regressors is not isolated, i.e., parameters are distorted as a consequence of the distortion of standard errors. In addition to that, there can be an issue with the individual significance of variables, where there will be fewer significant variables even given a high level of the coefficient of determination. Yet, on the other hand, this might in fact be discarded when the main goal of the estimation lies in making a prognosis rather than identifying the effect of individual regressors. However, this is not the case for this very estimation, so the author regards multicollinearity as a serious issue. The author uses a correlation matrix for the identification of the presence of multicollinearity. The result of the correlation matrix from Gretl is available in Table 4.

Table 4, Correlation matrix

Correlation Coefficients, using the observations 2000 - 2021
5% critical value (two-tailed) = 0.4227 for n = 22

Exchangeratepo~	Inflation	Currentaccount~	FDIbillionUSD	Exchangeratepo~
1.0000	-0.2680	-0.0128	-0.3246	
	1.0000	0.1048	-0.0172	Inflation
		1.0000	-0.2004	Currentaccount~
			1.0000	FDIbillionUSD
Interestrate	Unemployment	Exchangeratepo~	Inflation	Currentaccount~
-0.7473	-0.3261	0.4293	-0.0536	FDIbillionUSD
0.0803	0.4293	0.4456	-0.2026	Interestrate
0.4456	-0.0536	0.2710	0.1268	Unemployment
0.2710	-0.2026	1.0000		
1.0000	0.1268			
	1.0000			

Source: Author's computation based on The World Bank data, 2023

Based on the result of the correlation matrix computation in Gretl, it is pretty apparent that there is no situation of high correlation (when considering 0.8 as a boundary) in the dataset, which is a good sign suggesting that the author can move along and proceed to the estimation with the help of the OLS method. However, the author would like to stop here and explain his choice of estimation technique. Effectively, there is more than just one technique used for the estimation, e.g., GMM, ML, etc. However, in the case of fixed regressors, which are fixed in this case, ML and OLS both can be implemented as they yield the same results in terms of the value of parameters. Yet, the ML method requires a more detailed and complicated mathematical calculation, so the author decided to focus on the most common approach to linear estimation – the ordinary least squares method, which is largely based on the formula mentioned in the methodology of the diploma thesis. In Figure 17, the author presents the result of the application of the OLS method on the dataset used in this diploma thesis.

Figure 17, Estimated parameters of the model

	coefficient	std. error	t-ratio	p-value	
const	3.25104	0.367156	8.855	2.41e-07	***
Exchangeratepoun~	-0.246268	0.379831	-0.6484	0.5266	
Inflation	0.0969319	0.0228294	4.246	0.0007	***
Currentaccountba~	-0.00235577	0.000578515	-4.072	0.0010	***
FDIbillionUSD	-0.000299233	0.000201176	-1.487	0.1576	
Interestrates	-0.104438	0.0209308	-4.990	0.0002	***
Unemployment	-0.0700651	0.0145831	-4.805	0.0002	***

Mean dependent var	2.738789	S.D. dependent var	0.247124
Sum squared resid	0.078905	S.E. of regression	0.072528
R-squared	0.938474	Adjusted R-squared	0.913864
F(6, 15)	38.13353	P-value(F)	2.99e-08
Log-likelihood	30.71941	Akaike criterion	-47.43882
Schwarz criterion	-39.80152	Hannan-Quinn	-45.63970
rho	-0.223437	Durbin-Watson	2.418717

Excluding the constant, p-value was highest for variable 2 (Exchangeratepounddollar)

Source: Author's computation based on The World Bank data, 2023

According to the outcome of the estimation, the author can proceed to the process of creating the model. The complete model serving as a core of the diploma thesis is presented on the next page of the thesis.

$$y_t = 3.25 - 0.24x_{1t} + 0.09x_{2t} - 0.02x_{3t} - 0.0002x_{4t} - 0.1x_{5t} - 0.07x_{6t} + U_e$$

Consequently, it is possible to attain the following interpretation of individual parameters beta for each variable respectively to the selected dependent variable representing the volume of the real GDP in the UK expressed in trillions of constant 2015 dollars:

- If the level of all selected regressors is equal to 0, then the value of the real GDP in the UK will be equal to 3.25 trillion 2015 constant US dollars.
- Whenever the exchange rate depreciates by 1 pound/USD, the value of the real GDP in the UK falls by 0.24 trillion 2015 constant US dollars *ceteris paribus*.
- Whenever inflation in the UK increases by 1 percentage point, the value of the real GDP in the UK increases by 0.24 trillion constant 2015 US dollars *ceteris paribus*.
- Whenever the current account balance increases by 1 billion USD, the value of the real GDP in the UK decreases by 0.02 trillion 2015 US dollars.
- Whenever the FDI in the UK increases by 1 billion USD, the value of the real GDP in the UK decreases by 0.0002 trillion 2015 US dollars.
- Whenever the interest rate in the UK increases by 1 percentage point, the value of the real GDP in the UK decreases by 0.1 trillion 2015 US dollars.
- Whenever unemployment in the UK increases by 1 percentage point, the value of the real GDP in the UK decreases by 0.07 trillion 2015 dollars.

The author will proceed to the economic verification of the created model in the next chapter, where the econometric and statistical verifications will also take place. Econometric verification will consist of the interpretation of the signs of individual regressors and checking if those signs correspond to the existing economic theory. At the same time, other verifications are essential to ensure that the assumptions which had been mentioned earlier before the estimation process was initiated are not anyhow violated by the created model, otherwise, it will inevitably result in no compliance with the theory of Gauss-Markov and irrelevant results of the research since the Gauss-Markov theorem assumes that the model follows an acronym BLUE, standing for the best linear unbiased estimator and whose presence is ensured by the compliance with the assumptions that were mentioned slightly earlier in the narrative.

4.2.3 Verification

Of course, the first kind of verification, as has already been mentioned in the end of the previous chapter, will be the economic verification, which largely consists of the verification of the signs of individual regressors. To begin with, when it comes to the interpretation of the intercept term, it is wise to suggest that the figure seems to be quite close to reality as the overwhelming majority of variables, once attained huge values, will result in a serious diminishment of the total volume of the UK's GDP, which is pretty apparent by also looking at the signs of those variables, where all of them (with the exception of inflation) have negative signs. Therefore, the author suggests that the figure of the intercept term perfectly makes sense, and it complies with the economic theory.

The sign of the second variable, which is the variable of the exchange rate, does also seem pretty logical from the economic theory's perspective to the author. Depreciation of the domestic currency in some cases might yield positive results for the GDP of highly export-oriented countries and countries not fully dependent on imported input and intermediate goods. Yet, in the case of the UK, under the scenario of the depreciation of the domestic currency, there might in fact be a positive effect on the exports of the country, but the cost of import will significantly be higher which is crucial for an economy strongly relying on import in many industries. Therefore, the author believes that the negative sign of the exchange rate is perfectly justified, and it makes sense from an economic perspective.

Yet, the situation with the sign of inflation seems rather controversial as it is positive, while the overwhelming majority of research conducted on the effect of inflation on the GDP suggests that the sign should on the contrary be a negative one. However, the author believes that the situation is not so simple as a complete absence of inflation or situations of deflation are even more harmful than the presence of low inflation. Therefore, the author suggests that the sign is correct, but the relationship will not be positive all along and after reaching a particular level, it will prove itself to be harmful to the economy. Yet, this specific aspect cannot be modeled due to the limitations of the OLS and the nature of the estimation.

The author believes that in the case of a positive current account balance, for the UK the situation will not be so optimistic, so the sign is also correct. However, at the same time, the sign of the FDI is negative, while it is traditionally positive it arises from the fact that the FDI

is not a significant variable, so it can easily be omitted, and this is not such a big issue. The author will also group the last two variables under the same paragraph – the sign of interest rate fully complies with the monetary theory as it must be negative when discussing its effect on the GDP of the country; unemployment is one of the crucial aspects influencing the GDP, so the sign of this variable is also correctly estimated. Overall, the author believes that under existing circumstances, he can continue to try verification as the model does make sense from the economic point of view. The next step would be a statistical verification of the model.

The very first step of the statistical verification would be the verification of the coefficient of determination, which is denoted as R square in Figure 17. R square for the case of the estimated model is roughly equal to 0.93 meaning that 93% of the variation in the real GDP is explained by the variation in the selected set of regressors, which is an incredible result in terms of the precision. Additionally, the figure of the adjusted R square equal to 91% underpins the earlier findings and suggests that the model is extremely good in terms of its accuracy.

Continuing to the next step of the verification of the model from the statistical point of view, the author will proceed to the series of statistical tests, where the first one on the agenda will be F test. the F test inspects if the joint effect of the selected series of predictors has a significant effect on the selected dependent variable. For the case of the estimated model for the British real GDP, the P-value associated with the F value is equal to a number under 0.01, which leads to the situation, when the null hypothesis about the absence of a significant effect on the dependent variable will be rejected. Therefore, the model is significant and now the author can decide on individual predictors. For this purpose, the author will conduct a series of t-tests, which will each be described in a separate paragraph dedicated to each variable.

- The intercept is significant at $0.01 < 0.05$. The exchange rate is not significant since the null hypothesis about the absence of significance of the parameter was not rejected at $0.52 > 0.05$.
- Inflation is significant at $0.0007 < 0.05$
- Current account balance is significant at $0.0010 < 0.05$.
- FDI is not significant at $0.15 > 0.05$.
- The interest rate is significant at $0.0002 < 0.05$.
- Unemployment is significant at $0.0002 < 0.05$.

Consequently, it is possible to say that in terms of the individual significance of selected regressors, the model yielded relatively good results since just 2 out of 6 predictors were classified as non-significant – exchange rate and FDI. Effectively, the outcome of the hypothesis testing associated with the exchange rate is crucial for the main objective of the diploma thesis, since the variable of the exchange rate is probably one of the most important representants of the domain of foreign trade.

The next stage of the verification would be the verification of the econometric properties of the model, which will be done with the help of three separate tests: White's test for the identification of heteroscedasticity, Jarque-Bera test for the identification of the presence of normality of residuals and Breusch-Godfrey test for the identification of the presence of the autocorrelation. All aforementioned testing procedures will be done with the help of the output from Figure 18.

Figure 18, Econometric verification

```
White's test for heteroskedasticity -  
Null hypothesis: heteroskedasticity not present  
Test statistic: LM = 12.8309  
with p-value = P(Chi-square(12) > 12.8309) = 0.381447  
  
LM test for autocorrelation up to order 1 -  
Null hypothesis: no autocorrelation  
Test statistic: LMF = 1.05667  
with p-value = P(F(1, 14) > 1.05667) = 0.32141  
  
Test for normality of residual -  
Null hypothesis: error is normally distributed  
Test statistic: Chi-square(2) = 1.79406  
with p-value = 0.407779
```

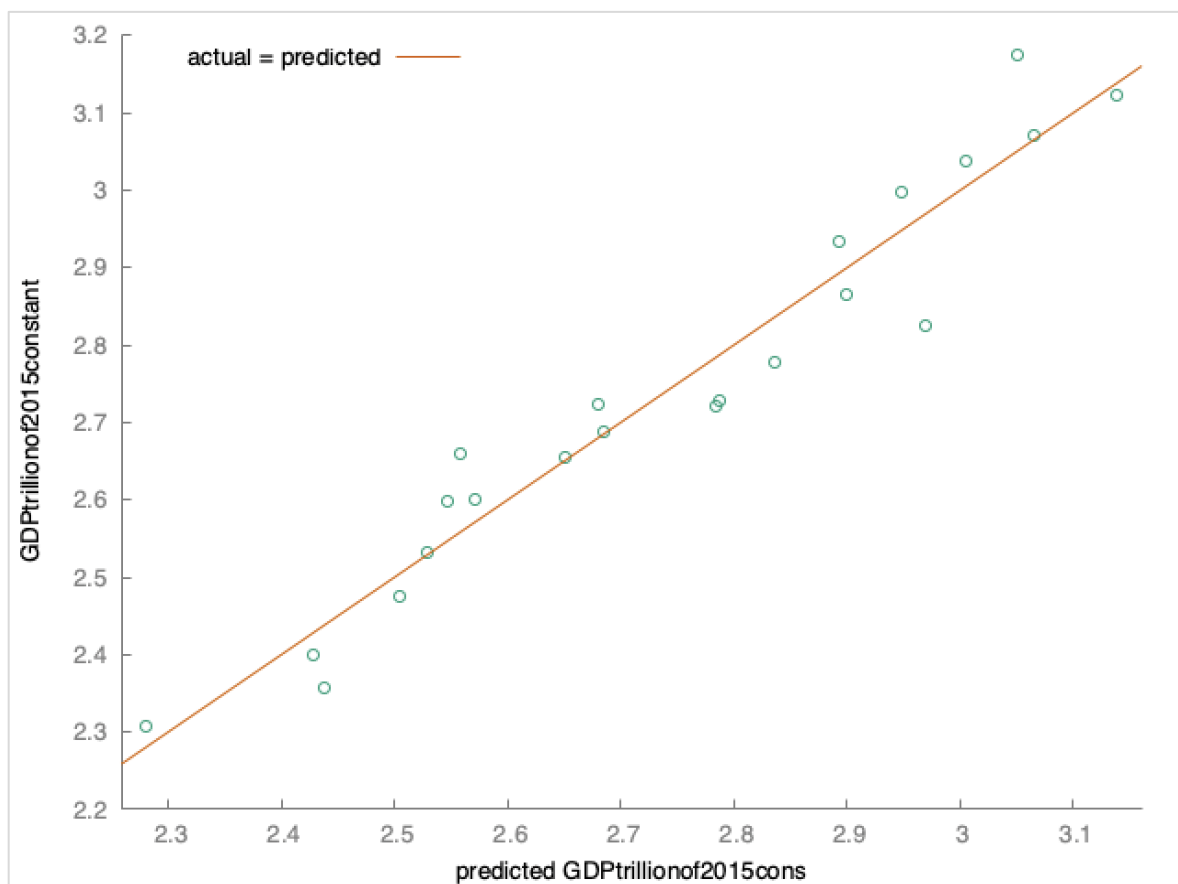
Source: Author's computation based on The World Bank data, 2023

- There is no heteroscedasticity in the model: $0.38 > 0.05$. Therefore, there is constant variance for residuals in the model.
- There is no autocorrelation of the first order: $0.32 > 0.05$.

- Residuals are normally distributed: $0.4 > 0.05$. Therefore, the F-test and t-tests performed earlier are valid since they require the presence of normality as one of the most fundamental assumptions due to their parametric nature.

After all, the author has enough evidence to suggest that the model created by him is highly likely to have BLUE properties inherent to the LRM estimation and the Gauss-Markov theorem. Additionally, the author will present a series of scatterplots to visualize the quality of the estimated model. The first one would be the scatterplot with the comparison of fitted and actual values presented in Figure 19.

Figure 19, Fitted vs. Actual GDP, USD Trillin of 2015 constant

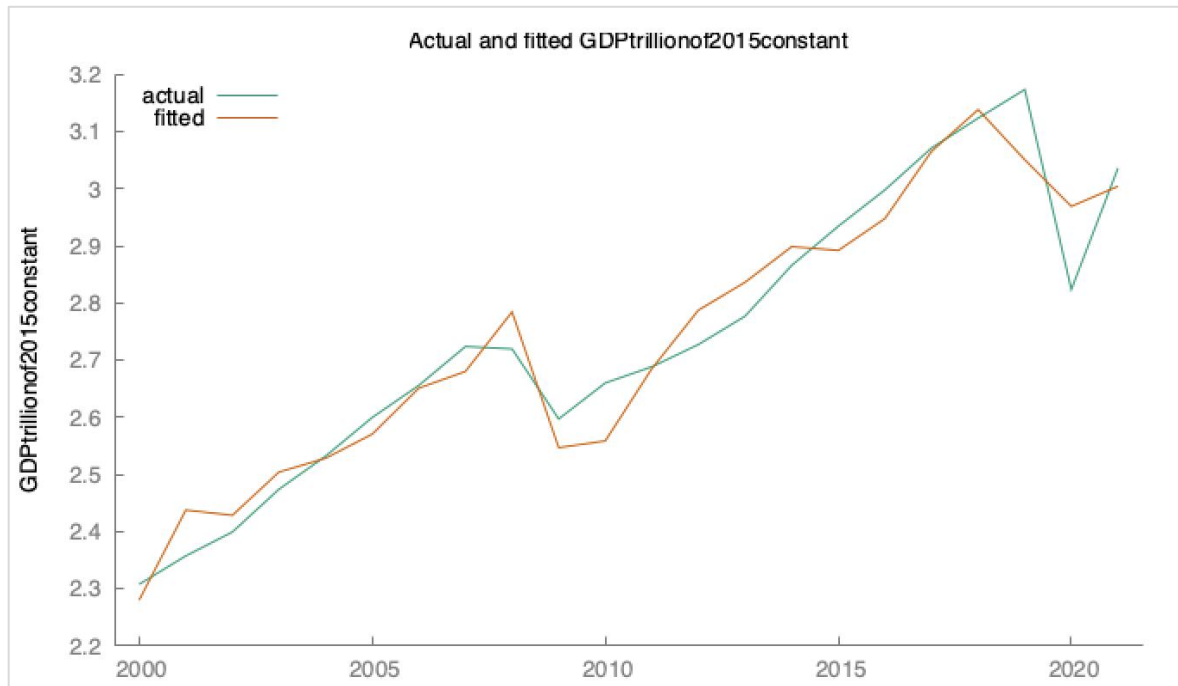


Source: Author's computation based on The World Bank data, 2023

In fact, it is pretty apparent by looking at the scatterplot that the predicted values are somewhat close to the actual ones, which had already been mentioned before, and more

specifically, it arises from the high coefficient of determination for the model. Additionally, the author will present the comparison of fitted and actual values for the real GDP of the UK expressed in constant 2015 trillion USD in Figure 20.

Figure 20, Actual vs. Fitted against time, USD Trillin of 2015 constant



Source: Author’s computation based on The World Bank data, 2023

Clearly, the additional comparison of fitted and actual values underpins the author’s findings that the model created by him yields incredible results from an accuracy point of view. In the next chapter, the author continues with the application of the model and the calculation of elasticities.

4.3 Simulation and Elasticities

This chapter serves as a foundation for the potential simulation of the model based on the British macroeconomic reality from 2022-2023 and also for the computation of elasticities in order to identify which predictor has the highest effect on the value of the real GDP in the United Kingdom. First, the author presents the results of the computation of elasticities, which is available in Table 5.

Table 5, Elasticities for 2021

2021, elasticities in %					
Exchange rate, pound/dollar	Inflation, %	Current account balance, billion USD	FDI, billion USD	Interest rate, %	Unemployment, %
-0.06	0.08	0.04	0.001	-0.03	-0.11

Source: Author's computation based on The World Bank data, 2023

The year 2021 is taken as the basis for the calculation of elasticities since it is the last year from the dataset. Effectively, after looking at elasticities for individual regressors, it becomes pretty apparent that the variable that had the highest effect on the real GDP in the United Kingdom was in fact the unemployment rate. According to the computed elasticity, a 1% increase in unemployment in 2021 led to a 0.11% decrease in the level of the real GDP in the United Kingdom, which is a huge number especially when considering that the real GDP of the United Kingdom is expressed in trillions of US dollars. Nevertheless, after estimating elasticities and finishing the part with the estimation of the model, the author, at last, would like to apply the model for the current situation in the United Kingdom under the projected figure for 2023 for the series of variables. Those projected figures are:

- 0.78 pounds per USD for the exchange rate variable.
- 11.1 percentage points for the inflation rate.
- -50.5 billion USD for the current account balance.
- 14 billion USD for FDI.
- 4.5 percentage points for the interest rate.
- 3.8 percentage points for the unemployment rate.

Consequently, the value of the real GDP expressed in constant 2015 US dollars for the United Kingdom under the aforementioned figures would be equal to 3.5 trillion 2015 constant USD, which seems to be a pretty reasonable and logical figure for the GDP. According to the model created by the author and input figures based on the projected figures for 2023, the United Kingdom is believed to have slightly increased its economic performance from 2021 and recovered from the shock of the pandemic and Brexit.

5 Results and Discussion

5.1 Role of Foreign Trade

To begin with, it is first essential to answer the first question that was put down in the objectives of the diploma thesis – *which factors significantly contribute to the economic growth of the country expressed in the real GDP?* Of course, before answering this question, it is essential to understand that due to the very nature of the econometric estimation and the presence of the error term representing all variables for whatever reason not included in the model, there can be other significant predictors of the real GDP, but they were omitted from the model, and they are shown in the error term. Hence, out of the list of six selected regressors of the real GDP, the author can with a 95% degree of confidence suggest that the following list of variables have a significant effect on the real GDP: inflation, current account balance, interest rate, and unemployment. Henceforth, when answering the question about the role that foreign trade plays in the economy of the United Kingdom, when considering the fact that one of the most important variables from the trade domain – exchange rate was considered to be insignificant, it is possible to say that the foreign trade does not play one of the most crucial roles for influencing the economy of the UK as other macroeconomic indicators related mostly to internal actors do – notably, the interest rate, inflation, and unemployment. On the other hand, the author believes that answering the question in such a simple manner would not at all be correct, especially when considering the nature of the economy, where one phenomenon is likely to influence another one without even being directly related. Despite the fact that the exchange rate is directly insignificant to the real GDP, the author believes that it might still indirectly influence the GDP by triggering higher levels of inflation and other processes in the economy. In addition to that, the second variable associated with foreign trade is considered to be significant – current account balance, so the author closes the question by saying that the effect of foreign trade on the economy of the UK is not the most crucial one, but it is surely there. Similar findings are made by Kordos (2019). However, the results of the author's analytical part do not coincide with Dhingra et al. (2016), where the publication of the latter group of scholars suggested that the UK is likely to go through a series of devastating consequences due to the potential drop in the volume of the FDI, whilst the results of the estimated model by the author suggest that the FDI is not a significant factor influencing the real GDP of the United Kingdom.

When it comes to the second question asked in the objectives of the work – *what is the recent development of the UK's exchange rate and what is its effect on the real GDP?* For this question, the author is able to suggest that the currency has been fluctuating rather too much, especially when considering that the British pound is one of the world's most important currencies forming the circle of international reserve currencies. The author identified that the variation of the UK's currency over the course of the last 22 years is equal to 13%, which is rather slightly above the accepted level of fluctuation for major currencies thus increasing the level of uncertainty circling around the figure of the United Kingdom. In addition to that, it is essential to say that Brexit and all related events that happened after 2016 led to one of the biggest depreciations in the history of the British pound, and the currency seems not to have properly recovered from the blow. On to the second part of the question, the t-test for the exchange rate variable suggested that there is no direct effect of the exchange rate on the real GDP thus suggesting that the role of foreign trade is not so high, or at least it is significantly lower than the role of other macroeconomic variables related to the domestic environment of the country. The author's findings about the depreciation of the British pound are underpinned by the publication of Breinlich et al. (2019), who suggested that one of the first negative responses of Brexit will constantly be observed in the increase of the overall price level due to the potential depreciation of the British pound, what has indeed happened in the subsequent years.

5.2 Recommendations

The final research question from the objectives was: *what are the possible solutions that can be implemented from the trade domain to improve the situation with the long-term economic growth of the United Kingdom?* Of course, there is no universal way of answering the question in an easy and realistic way. However, based on the analysis conducted by the author, if there had been a remedy that could instantly solve all of the UK's economic problems, it would have been the return to the EU, but the author is afraid that the door for the UK has been closed once and for all, so the country has to focus on finding alternative ways of solving the ongoing crisis without any assistance from their former colleagues from the Union. According to the results of the empirical analysis, it became pretty apparent to the author that easing taxation and opening the country's doors to foreign direct investments might not be a good idea as investors are likely to be avoiding any major capital investments in the British economy in the nearest future and also, the variable of the foreign direct investment has little

effect on the real GDP as it is classified as insignificant. Therefore, the author believes that the government has to focus on assisting local producers and supporting domestic companies that are expected to have entailed a serious series of losses arising from Brexit, disrupted supply chains due to the pandemic, and energy crisis resulting from the war broke out in Europe for the first time in almost 30 years (when considering the war in Yugoslavia). Nevertheless, the author believes that increasing government expenditures would be a sensible step as it would lower the level of unemployment in the country and lead to a higher volume of production. In addition to that, for further stimulation of the business environment, the author suggests that the government has to consider the idea of lowering the interest rate as soon as the occasion arises. Clearly, doing so during times of two-digit inflation might prove itself to be a suicidal course or just an attempt to imitate the unorthodox policy of the Turkish leader, who, instead of raising interest rates during hyperinflation decided to lower them instead by forcing the domestic currency of Turkey to start its free fall. Nevertheless, the author believes that to the largest extent, the United Kingdom was trapped in the circle of misfortune starting in 2016, when the country became the victim of circumstances that could not anyhow be controlled by the country's officials. At the same time, the author believes that the situation could have been much better in terms of the response to both crises – the energy crisis and the pandemic if the country had not decided to leave the EU beforehand and had been having the deal negotiations as a priority on the agenda instead on focusing on the improvement of the domestic situation. However, the author believes that once the occasion arises and once the country will shift to more expansionary tools of economic policies, the country will turn the page and continue its economic expansion.

6 Conclusion

To conclude the diploma thesis, the author would like to once more answer the research questions that were asked at the beginning of the thesis. With the first question being related to variables that can be considered to be significant predictors of the country's real GDP, the author is able to say that out of 6 predictors selected for the analysis, the following ones are significant: current account balance, inflation, interest rate, and unemployment. At the same time, exchange rate and FDI are not related directly to the real GDP but without any hint of doubt, the author believes that even those variables are indirectly related to the GDP, which could be modeled with the help of the estimation of simultaneous equations.

For the second question about the nature of the British's exchange rate development, the author suggests that the situation with this indicator is rather not typical for a country whose currency forms part of the circle of international reserve currencies, as the annual volatility of this currency over the course of 22 years was equal to 13%, which is fairly a lot. At the same time, the currency started to actively depreciate right after the Brexit procedure was initiated in 2016. Ultimately, the variable is not a significant predictor of the real GDP but once more, the author believes that it might indirectly be related to the real GDP by inevitably directly influencing inflation and all other macroeconomic variables.

Last, for the recommendations for improving the current situation, the author suggests that blaming the UK for a series of unfortunate circumstances of which the country had no control, e.g., the war in Ukraine and the pandemic of COVID-19 is not sensible at all. On the other hand, the author believes that the situation might have been far better if the UK had decided not to part ways with the EU. At the same time, the author believes that the government should as soon as the occasion would arise go for expansionary economic policies that would help the country to gain conciseness once more and continue its economic expansion.

For future research during potential doctoral studies, the author recommends expanding the created model by creating a system of linear equations rather than by focusing on just one equation. After all, economics is the science where everything is based on something else, and relying on just one equation when making general conclusions about the fate of the whole country might not at all be justifiable.

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8.3 List of abbreviations

UK	United Kingdom
GDP	Gross Domestic Product
BLUE	Best Linear Unbiased Estimator
EU	European Union
EFTA	European Free Trade Association
EEC	European Economic Community
CAP	Common Agriculture Policy
UN	United Nations
GNI	Gross National Income
GNP	Gross National Product
USD	United States Dollar
LRM	Linear Regression Model
OLS	Ordinary Least Squared
ML	Maximum Likelihood
GMM	Generalized Method of Moments