

Exploring the interrelation between Inflation, interest rate, exchange rate and economic growth: role of COVID-19 cases: Evidence from the UK

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ABSTRACT

Aim: The aim of this research was to understand the interrelationship between inflation, interest rate, economic growth, and exchange rate in the context of the UK. Further, it has also considered the role of inflation.

Method: In the research method a secondary quantitative research method was used, and data has been extracted from Statista and WDI website on inflation, interest rate, economic growth, and exchange rate from 2001 to 2021. For data analysis, descriptive statistics, lag order selection criteria, unit root test, VAR model, and impulse response test was used through using Eviews software.

Findings: Findings from descriptive and figures revealed that Covid-19 causes uncertainties in the exchange rate, inflation, economic growth, and especially in the interest rate of the UK. Further findings from the VAR model revealed that GDP is positive and significantly related to interest rate and inflation, whereas negative and insignificant are related to the exchange rate. Further, findings have also demonstrated that the exchange rate has a significant and positive relationship with interest rates.

Future Implications: Findings of the current study can be used by researchers and policymakers in the UK and other countries to effectively control the rate of inflation and sustainable economic growth.

Keywords: *GDP, Economic Growth, Unemployment, Inflation rate, Consumer price index, and exchange rate.*

INTRODUCTION

Economic factors like interest rate, exchange rate, inflation and economic growth have a major contribution to the trend being followed in the economic cycle. These factors are influential towards the economy because they affect the overall economy. The monetary policies set out the exchange rate and interest rate, which may impact the overall performance economy because any change in the policy goes with an increase and decrease in the rate of exchange (Sergi et al., 2021). COVID-19 has played a major role in almost all sectors. The pandemic changed the way of living, and it also had an influence towards the survival of the economies, as the major influence was towards the trends being followed in the economic sector. The pandemic caused a crisis towards the production of commodities as employees were not able to perform as before (Badmus, Bisiriyu & Alawode, 2022). The economic growth was mainly disturbed due to the influence of the trend and contribution being given to different departments, which were a reliable source of growth. The inflation rate started growing as production was critical. As a result, the prices of the products increased overall. The UK market has got the overall influence of the pandemic as the major impact was on the primary and secondary sectors. As a result, the economy was not able to do development. The gross domestic product of the country has also declined; as a result, the company have not been doing effectively.

The decline in the GDP of the country during the pandemic shows that the country was not well managing its resources. There has been around a 7% drop in the GDP of the country, which shows that the UK market is not using its resources well and effectively (Long, Zhang & Hao, 2022). The overall decline in the rate of GDP shows that the country failed to manage the trend of effective performance during the pandemic. The overall impact was on the economic factors, which also

included inflation. Other than this, factors like exchange rates and interest rates are mainly dependent on the economic certainties of the whole world, which was under crisis, and the UK failed to show the tendency to deal with these crises effectively (Kumar & Vishal, 2021). The respective journal is designed to evaluate how economic factors are affecting economic growth in the UK. It mainly analyses the inflation rate of the UK and its impact on economic growth. In addition, it also explores the impact and relationship between the inflation rate and exchange rate with the economic growth of the UK. It mainly also provides sufficient evidence to support how these economic factors are related to each other. The purpose is to explore the relationship between the economic factors of inflation, interest rate and exchange rate with the economic growth of the UK. In addition, it also explores how these factors are influential to each other.

LITERATURE REVIEW

Ufoeze et al. (2018) argue in their study that economic growth is mainly dependent on the factors of the economy. In a similar study, the author highlighted that the inflation rate and the interest rate help in increasing the economic growth of the country. Nassif, Feijó and Araújo (2020) stated in their study that interest rate and inflation rate are mainly associated with the exchange rate, which means that any change in the exchange rate will mainly bring a direct change and fluctuation in the overall economic factors of inflation and interest rate. In addition, the author also presents that economic sustainability is mainly achieved with the help of the rate of exchange and its fluctuation in it. Ghauri et al. (2022) added in their study that after COVID-19, the influence of the pandemic was directly on the factors of the economy as the primary sources of the country were disturbed, which is why the economic trend was not going effectively. The author further elaborated that the inflation rate and interest rate are major components of the economic trend which have an impact on economic sustainability. Jamal & Bhat (2022) described in their study that the outbreak of COVID-19 was directly on the economic trend. As a result, the overall economic growth of the UK was affected. The author further exaggerated that the outbreak in the economy also destructed the economic growth of the country as the prices were specifically high,

but the jobs in the market were closed. The study by Kumar & Vishal (2021) claims that the inflation rate brings a change in the prices of commodities in the country, which makes the survival of the economy tough. Furthermore, The author further elaborated that the exchange rate and interest rate bring changes to the prices of the basic product. As a result, economies get scattered, and it becomes difficult for the country to make progress.

According to Remzi & Erkan (2021), economies around the world were ease to increase the prices of goods and petrol. The author further claimed that all the markets were directly open after COVID-19. As a result, the supply and demand of the products were mainly changed. As soon as the ease in COVID-19 restrictions, the overall demand for goods and commodities increased, but the supply of the commodities failed to match the demand growth in the market. Ramayana, Oktavilia & Putri (2021) portrayed that the energy crisis after the pandemic bought high fluctuation in the prices of oil and gas, which as a result, also changed the pattern of economic factors, including the trend of the interest rate and exchange rate. The author also elaborated that the economic scale is highly affected by monetary policies and monetary factors. The study by Long, Zhang & Hao (2022) claims that the purpose the goods and commodities being sold across borders became expensive. As a result, the import and export of the products became expensive and difficult. The author further described that the higher energy prices just after COVID-19 have merely affected the economic trend of the UK.

Sergi et al. (2021) revealed in their findings that the UK market is becoming highly unstable after the pandemic as the economic factors directly bringing influence the performance of the business. The author also claimed that the inflation rate and interest rate are bringing change in the profit ratio, which is bringing change in the pattern of the economies. Sharma et al. (2021) explained that the exchange rate has a direct influence over the practice of economies throughout the world. As it has been found by the researcher that the exchange rate brings a major change towards the interest rate as well as inflation which brings change to the economic stability. Cengiz & Manga (2022) also explained that the UK markets had to deal with the low GDP due to COVID-19 as a result of the economic crisis towards the inflation rate and interest rate changes the pattern of import and export. The author further claimed that the outbreak of the pandemic was directed

towards the development and growth of production in the country. Nguyen et al. (2022) relate that economic factors have a great role when the economies are focused towards foreign exchange as any product being exchanged in the foreign market. The author further claimed that the economic growth rate goes with the growth in the exchange rate and the interest rate.

Badmus, Bisiriyu & Alawode (2022) firmly show in their study that there is a reliable connection between the inflation rate and interest rate. The author further portrayed that the exchange rate is bringing a major change in the overall economic factors. Su et al. (2022) described in their study that the UK market is very vast as it allows it to get influential in the economic trend, which is why it is highly significant that the market factors like inflation and interest rates. The author further also added that the changes in the trend of prices bring a direct change in the costing and profit maximisation. Victor et al. (2021) also revealed in their study that the inflation rate comes up with the monetary policy, which means that any change in the pricing of the commodities is due to a great change in the interest rate. The author also claimed that the change in the exchange rate is also bringing a change in the overall pattern of the economy of the UK. According to the study by Li et al. (2022), the author claims that the change in the pattern of supply and demand is bringing change in the exchange rate throughout the world. The author further also claimed that the UK market is becoming complicated as exchanging products with different economies has become a major difficulty for the development of the country. Khan, Noreen & Farooq (2022) addressed that Covid-19 has significantly influenced the exchange rate, inflation, economic growth, and especially interest rate. The pandemic break was mainly a pause towards the money-making industries, and it got a major change towards the improvement of the business cycle.

However, the following Hypothesis has been developed in the current research:

H0a: There is no interrelationship between inflation and economic growth.

H1a: There is an interrelationship between inflation and economic growth.

H0b: There is no interrelationship between interest rate and economic growth.

H1b: There is an interrelationship between interest rate and economic growth.

H0c: There is no interrelationship between exchange rate and economic growth.

H1c: There is an interrelationship between exchange rate and economic growth.

H0d: There is no interrelationship between inflation and interest rate.

H1d: There is an interrelationship between inflation and interest rate.

H0e: There is no interrelationship between inflation and exchange rate.

H1e: There is an interrelationship between inflation and exchange rate.

H0f: There is no interrelationship between interest rate and exchange rate.

H1f: There is an interrelationship between interest rate and exchange rate.

METHODOLOGY

In the current research, the secondary quantitative research method has been used, as the main emphasis of the researcher was to empirically explore the relationship between inflation, interest rate, economic growth, and exchange rate. However, for the purpose of this, data has been extracted from the WDI data bank and Statista website from 2001 to 2021. The primary reason for using the quantitative research method is as it assists the researcher in gathering up-to-date information relevant to the research topic while considering the validity of the data (Paradis et al., 2016).

Referring to the research philosophy and research approach, the philosophy of positivism has been used, as it facilitates the researcher in ensuring the reliability and authenticity of numerical data (Woiceshyn & Daellenbach, 2018). Moreover, it also helps eliminate biases from data and information collected from different sources. In the research approach, the author has relied on the deductive research approach, as it assists the researcher in determining the interrelationship between variables involved in the current research. Likely, Bougie and Sekaran (2019) in their

study indicated that the deductive research approach helps in a deeper understanding of gathered research facts.

In data analysis, descriptive statistics were used to summarise key characteristics of the variables. Additionally, a unit root test was used to test the stationary of the data. Moreover, after lag order selection criteria, the VAR model was used to determine the interrelationship between variables through Eviews software. However, the following equation has been used to test the VAR model:

$$GDP_{it} = B_0INF_{it} + B_1INT_{it} + B_2EXC_{it} + E$$

	Variable	Measurement
GDP	GDP Growth %	GDP growth (annual %)
INF	Inflation %	Consumer prices (annual %)
INT	Interest Rate	Lending interest rate (%)
EXC	Exchange Rate	Real effective exchange rate index (2010 = 100)

RESULTS

Descriptive Statistics

Descriptive statistics have been used as one of the pivotal steps to summarise the variables included in the current research. However, table 1 summarises the statistics of all variables.

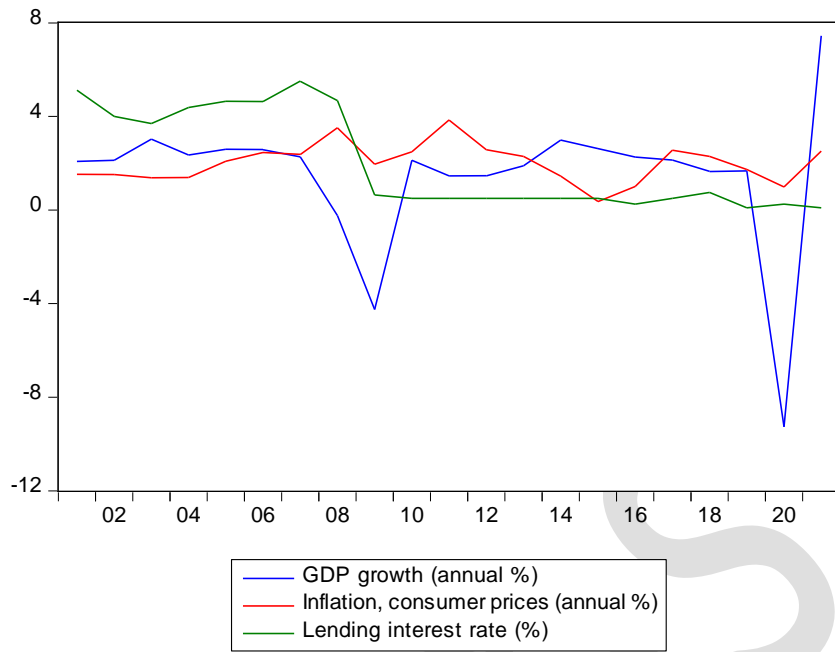
Table 1 - Descriptive Statistics

	GDP Growth %	Inflation %	Interest Rate %	Exchange Rate
Mean	1.475981	2.017712	2.012562	110.6496
Median	2.131438	2.089136	0.5	103.3988
Maximum	7.441273	3.856112	5.508708	128.2694
Minimum	-9.27041	0.368047	0.1	97.09012
Std. Dev.	3.155737	0.827292	2.100277	12.3042
Skewness	-1.96775	0.252857	0.554429	0.436564

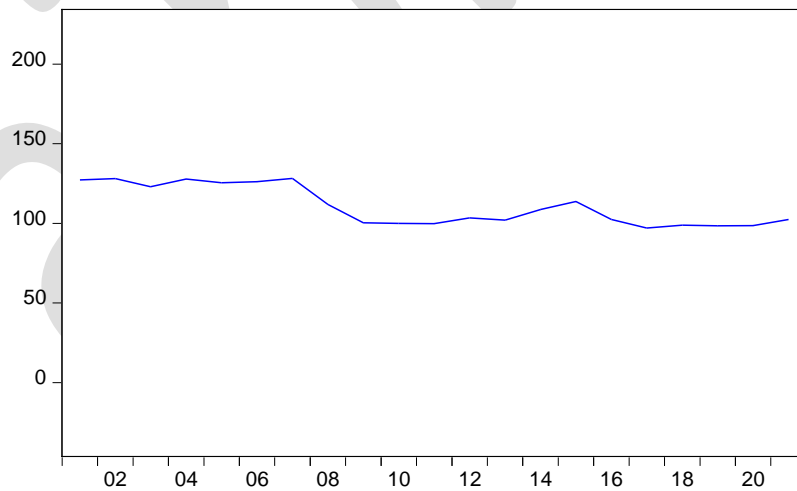
Kurtosis	8.312464	3.026918	1.437524	1.449633
Jarque-Bera	38.24666	0.224413	3.212035	2.770243
Probability	0	0.89386	0.200685	0.250293
Sum	30.99559	42.37196	42.2638	2323.641
Sum Sq. Dev.	199.1735	13.68823	88.22323	3027.868
Observations	21	21	21	21

Referring to the above table, it can be seen that the mean value of GDP growth is estimated to be 1.47, and the standard deviation value is 3.15, which implies that the average rate of GDP growth in the UK from 2001 to 2021 is found to be 1.47%, and there is higher volatility in the dataset. Additionally, the mean value of the inflation rate is found to be 2.01, which suggests that the average rate of inflation in the UK is 2.01, and it is expected to deviate towards 0.82%, as the standard deviation value is found to be 0.82. Moreover, the interest rate has also been considered in the current research. It can be observed that the average rate of interest is found to be 2.01%, and it is expected to deviate by 2.1%, which implies less volatility in the data set. Lastly, the mean value of the exchange rate is identified as 110, and its standard deviation value is found to be 12.30, which implies that higher volatility exists in the exchange rate of the UK from 2001 to 2021.

More so, the above table also indicates the skewness of the data set. It is imperative to note that except for GDP growth, all variables are found to be normally distributed, as skewness values are found to be between -0.5 and 0.5. Thus, it implies that the dataset is approximately symmetric. Further, it can also be explained with the help of figure, shown in the figures below:



Real effective exchange rate index (2010 = 100)



Unit Root Test

Before checking the interrelationship between inflation rates, interest rates, exchange rates, and economic growth check the stationarity of the variables using the Dickey and Fuller Test (1979), as shown in the table below:

Table 2 – Augmented Dicker Test at Level

Variables	t-Statistics	P-Value
GDP Growth Rate %	-5.281***	0.000
Inflation Rate %	-2.778	0.079
Interest Rate %	-1.413	0.554
Exchange Rate	-1.424	0.549

Referring to the above table 2, it can be seen that the p-value of GDP growth is found to be $0.000 < 0.01$, which suggests that the null hypothesis of unit root at 1% is rejected, and the series of GDP growth is stationary. In comparison, P values of the inflation rate, interest rate, and exchange rate are greater than 0.05, implying that we cannot reject the null hypothesis of the unit root. Thus, a series of the inflation rate, interest rate, and the exchange rate is found to be non-stationary at the level, and it needs to re-run the unit root test at the first difference, as shown in Table 3 below:

Table 3 - Augmented Dicker Test at First Difference

Variables	t-Statistics	P-Value
GDP Growth Rate %	-7.475***	0.000
Inflation Rate %	-4.611***	0.002
Interest Rate %	-3.741***	0.012
Exchange Rate	-3.539***	0.018

Concerning P value of GDP growth is found to be significant at 1%, and it suggested that the null hypothesis of unit root at 1% is rejected. Similarly, the P value of inflation, interest, and the

exchange rate is also significant at 1%, as p values are found to be 0.002, 0.012, and 0.018, respectively. Hence, all variables are stationary at the first difference I (1). However, at first, difference OLS cannot be used, and the VAR model has been used to test the interrelationship between variables involved in the research

Lag Order Selection Criteria

The next step is to examine the number of lags to determine the selection criteria for the VAR model. However, the researcher has estimated the lag order, as shown in the table below:

Table 4 - Selection Criteria for VAR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-150.731	NA	344.2138	17.19231	17.39017	17.2196
1	-122.759	40.40427*	96.59423	15.86207	16.85137	15.99848
2	-99.6066	23.15202	60.96759	15.0674	16.84815	15.31294
3	-65.5028	18.94658	25.14790*	13.05586*	15.62805*	13.41053*

Referring to the Schwartz Based Criteria (SC), it can be seen that the optimum lag order for the variables is found to be three. Moreover, several lags have also been confirmed from the Final prediction error (FPE), the Akaike information criterion (AIC), and the Hannan-Quinn information criterion (HQ).

Vector Auto regression Estimates (VAR)

The VAR model has been used to determine the interrelationship between variables in the current research. However, the following table at -3 indicates the direction and significance of the relationship between variables involved in the study.

Table 5 – VAR Model

	GDP Growth %	Inflation %	Interest Rate %	Exchange Rate
GDP Growth (-2)	1.24279	-0.46264	0.552661	4.216926

	(1.90369)	(0.42299)	(0.67561)	(5.02965)
	[0.65283]	[-1.09373]	[0.81801]	[0.83841]
GDP Growth (-3)	-0.05597	-0.11233	-0.01005	-0.52197
	(0.71455)	(0.15877)	(0.25359)	(1.88788)
	[-0.07832]	[-0.70748]	[-0.03965]	[-0.27648]
Inflation Rate (-2)	1.488809	0.202231	0.578501	2.896471
	(2.28073)	(0.50676)	(0.80942)	(6.02579)
	[0.65278]	[0.39906]	[0.71471]	[0.48068]
Inflation Rate (-3)	0.246527	-0.49716	-0.61257	-0.03548
	(2.151)	(0.47794)	(0.76338)	(5.68305)
	[0.11461]	[-1.04022]	[-0.80245]	[-0.00624]
Interest Rate (-2)	-4.15386	-0.11927	-1.12958	-7.12199
	(2.70871)	(0.60186)	(0.96131)	(7.15654)
	[-1.53352]	[-0.19817]	[-1.17505]	[-0.99517]
Interest Rate (-3)	1.647927	-0.05266	1.199343	6.131785
	(3.00005)	(0.66659)	(1.0647)	(7.92627)
	[0.54930]	[-0.07900]	[1.12646]	[0.77360]
Exchange Rate (-2)	0.119857	0.060436	0.15441	0.782636
	(0.37296)	(0.08287)	(0.13236)	(0.98539)
	[0.32136]	[0.72929]	[1.16656]	[0.79424]
Exchange Rate (-3)	0.285723	-0.00329	-0.0372	0.004605
	(0.38823)	(.08626)	(0.13778)	(1.02572)
	[0.73597]	[-0.03812]	[-0.27002]	[0.00449]
C	-45.0575	-2.26496	-12.6377	8.873315

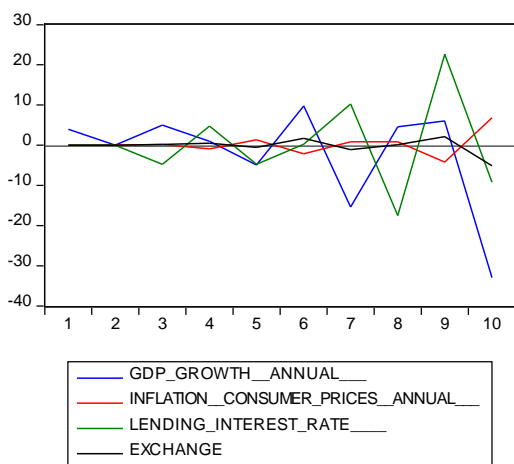
(53.1387)	(11.8071)	(18.8587)	(140.395)
[-0.84792]	[-0.19183]	[-0.67012]	[0.06320]

Significant at 90% >1.645, 95% 1.96, and 99% 2.576

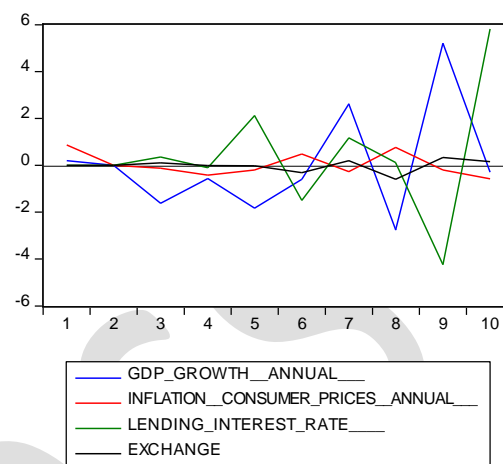
From the above table, the coefficient value has been used to ascertain the interrelationship between variables, and t-statistics has been used for the significance of the variable. Referring to the above table, it can be seen that GDP growth has a positive relationship with the inflation rate, as coefficient values are found to be 0.24, and it is significant at 95% as t statistics are found to be $2.151 > 1.96$. Similarly, GDP growth is also found to have a positive and significant relationship with an interest rate, as the coefficient value is 1.64 and the t-statistics is $3.0 > 2.57$. Moreover, GDP growth positively but insignificantly relationship with the exchange rate as t-statistics are found to be less than the threshold. The inflation rate has a negative but insignificant relationship with GDP growth, interest rate, and exchange rate. Similarly, the interest rate also negatively but insignificantly relationship with GDP growth, inflation, and exchange rate. Lastly, the exchange rate has a negative and significant relationship with GDP and inflation rate, whereas a positive and significant relationship with interest rate. Further, this interrelationship can also be visualised with the help of an impulse response test, as shown in the figure below:

Response to CholeskyOne S.D. (d.f. adjusted) Innovations

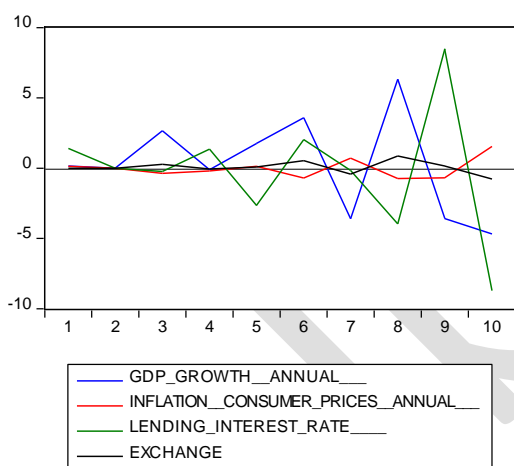
Response of GDP_GROWTH__ANNUAL__ to Innovations



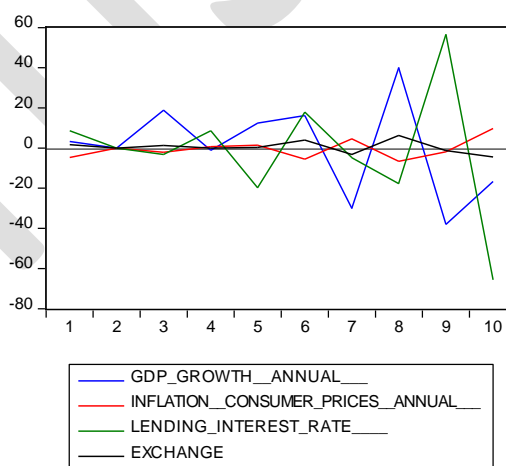
Response of INFLATION__CONSUMER_PRICES__ANNUAL__ to Innovations



Response of LENDING_INTEREST_RATE__ to Innovations



Response of EXCHANGE to Innovations



DISCUSSION

The primary intent of the researcher was to investigate the interrelationship between the inflation rate, interest rate, economic growth, and exchange rate. Concerning GDP growth, finding in the current research depicted that GDP has positive and significant interrelations with the inflation rate and interest rate. Similarly, previous studies have also revealed that an increase in the rate of inflation and interest rate causes an increase in economic growth (Ufoeze et al., 2018), as higher

inflation tends to increase the rate of interest, which ultimately increases the value of GDP. Moreover, Badmus, Bisiriyu and Alawode (2022) in their study have also claimed that there is a reliable connection between economic growth, inflation rate, and interest rate. In contrast, findings in the current research revealed that GDP is positively but insignificantly related to the exchange rate. Thus, hypotheses H1a and H1b are found to be correct, and hypothesis H1c is found to be incorrect.

Further, while referring to the interest rate and inflation rate, findings in the current study revealed that the interest rate is positively and significantly related to the inflation rate. Similarly, previous studies have also revealed that an increase in inflation tends to cause policymakers to increase the rate of interest rate (Nassif, Feijó & Araújo, 2020; Badmus, Bisiriyu & Alawode, 2022). Additionally, in their study, Cengiz and Manga (2022) revealed that changes in the trend of prices bring a direct change in the interest rate to control inflation or stagflation. Thus, Hypothesis H1d is found to be correct. Moreover, findings in the current study have also revealed that inflation and interest rate are significantly related to the exchange rate. Hence, hypotheses H1e and H1f are found to be true. Findings in the current study are also in line with previous studies, as Nassif, Feijó and Araújo (2020) stated that interest and inflation rates are mainly related to the exchange rate.

Further, findings in the current study have also revealed that Covid-19 has significantly influenced the exchange rate, inflation, economic growth, and especially interest rate. Similarly, previous studies have also revealed that the COVID-19 pandemic significantly influenced the economy's factors (Rahmayani, Oktavilia & Putri, 2021; Ghauri et al., 2022; Jamal & Bhat, 2022). However, the following table summarises the hypothesis testing based on the findings in the current research:

Table 6 - Hypothesis Testing Summary

	Hypothesis Statement	Accepted	Rejected
H0a	There is no interrelationship between inflation and economic growth.		✓
H1a	There is an interrelationship between inflation and economic growth.	✓	

H0b	There is no interrelationship between interest rates and economic growth.		✓
H1b	There is an interrelationship between interest rates and economic growth.	✓	
H0c	There is no interrelationship between exchange rate and economic growth.	✓	
H1c	There is an interrelationship between exchange rate and economic growth.		✓
H0d	There is no interrelationship between inflation and interest rate.		✓
H1d	There is an interrelationship between inflation and interest rate.	✓	
H0e	There is no interrelationship between inflation and exchange rate.		✓
H1e	There is an interrelationship between inflation and exchange rate.	✓	
H0f	There is no interrelationship between interest rate and exchange rate.		✓
H1f	There is an interrelationship between interest rate and exchange rate.	✓	

CONCLUSION AND FUTURE IMPLICATION

In the current research, the researcher's primary intent was to analyse the interrelationship between inflation, interest rate economic growth, and exchange. To address this aim, six main hypotheses were developed. However, findings revealed that GDP growth is positively and significantly related to interest rate and inflation, whereas negatively and insignificantly related to the exchange rate. Additionally, findings in the current research have also revealed that the exchange rate has a positive and significant relation with interest rates. Moreover, the inflation rate is negatively but insignificantly related to an interest rate and exchange rate. Similarly, the interest rate is also negatively but insignificantly related to inflation and exchange rate.

Hence, findings in the current research can be significantly helpful for the researcher and policymakers in the same domain to conduct further studies in the future. Further, findings in the current research have also filled the gap in previous studies, regarding the interrelationship between inflation, interest rate, economic growth, and exchange rate, in the context of the UK.

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