



Statistic Report Matthew Gitu

Abstract

This study investigates the economic similarities between UK and France. And the relationship between Investment and GDP

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Report 1

Introduction

The UK and France are similar in development, and economy. Since 2019, both economies were impacted by the pandemic. Statistical methods will be used to explore the relationship between the countries monthly's inflation rate from January 2010 to December 2022. Revealing the countries have a low relativity in inflation rates.

Analysis & Graphical methods:

Analysis 1: External factors

Country	Observations	Mean	Median	Min	Max	Std.Dev	Skewness
United Kingdom (%)	156.00	2.47	2.25	0.20	9.60	1.90	2.05
France (%)	156.00	1.42	1.17	-0.38	6.20	1.35	1.88

Table 1-Descriptive Statistics for Monthly Inflation rates 2010-2022

In October 2022 the domestic energy supply changed in the UK due to the war between Ukraine and Russia, which caused a pressure on oil prices and caused energy prices to increase. This caused a 10% increase in the consumer prices in the UK as heating and oil is an inelastic good. Meaning that it would be highly demanded non-relative to the price. As well as a supply chain disruption from the effects of covid, which caused a 12% increase in consumer prices in October 2022 for France.

Analysis 2: Covid 19

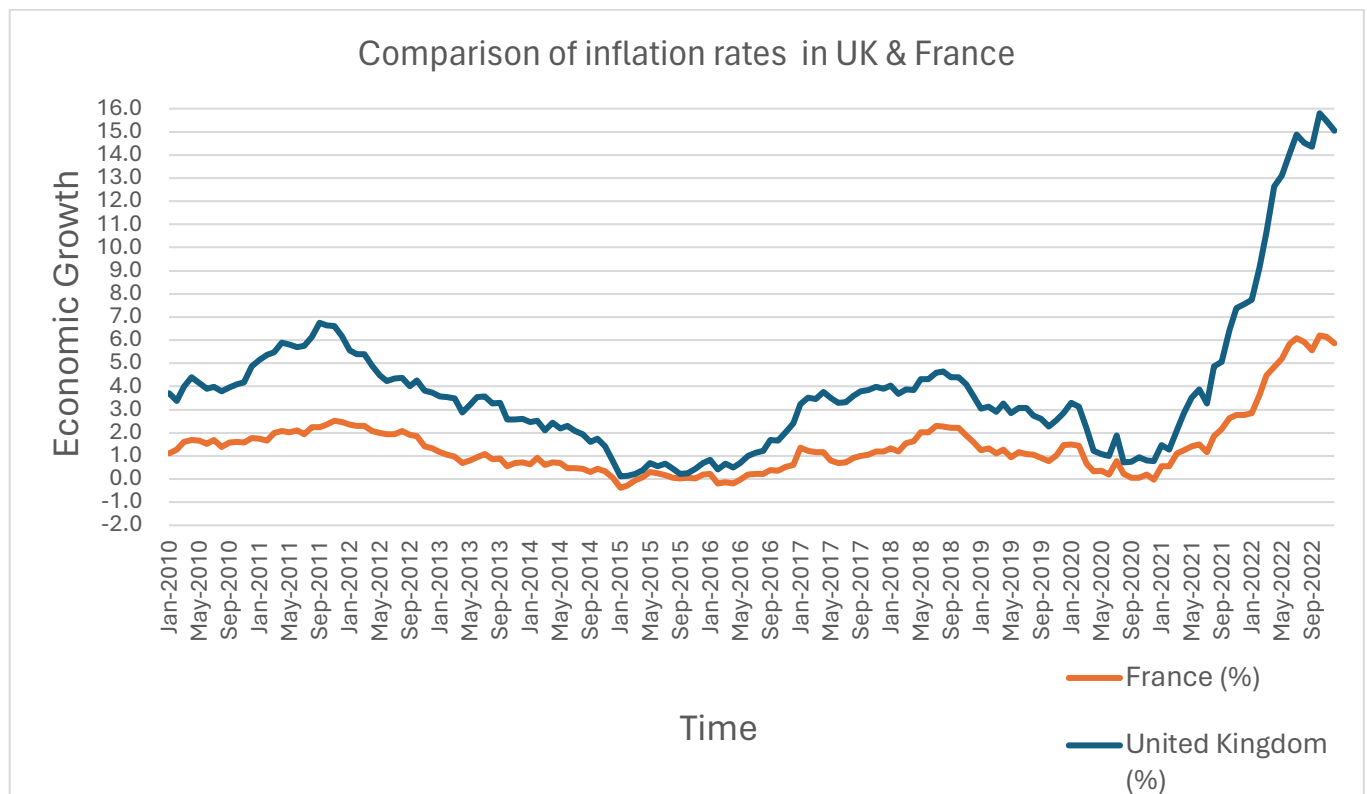


Figure- 2-Comparison of Inflation rates

In January 2020 the uk had an economic development of 1.8% (consumer prices) and France of (1.5%) Both countries suffered a Supply and demand shock Causing a contraction in the economy due to covid. Aggregate supply (Capital enterprise land and labour) of both countries fell due a fall. Where in the uk 1,152,000 became unemployed and hence the country's economic output decreased. In France the country suffered a contraction in the countries demand and experienced a 10% contraction in its GDP growth.

Analysis 3: Economic understanding of change in inflation rates

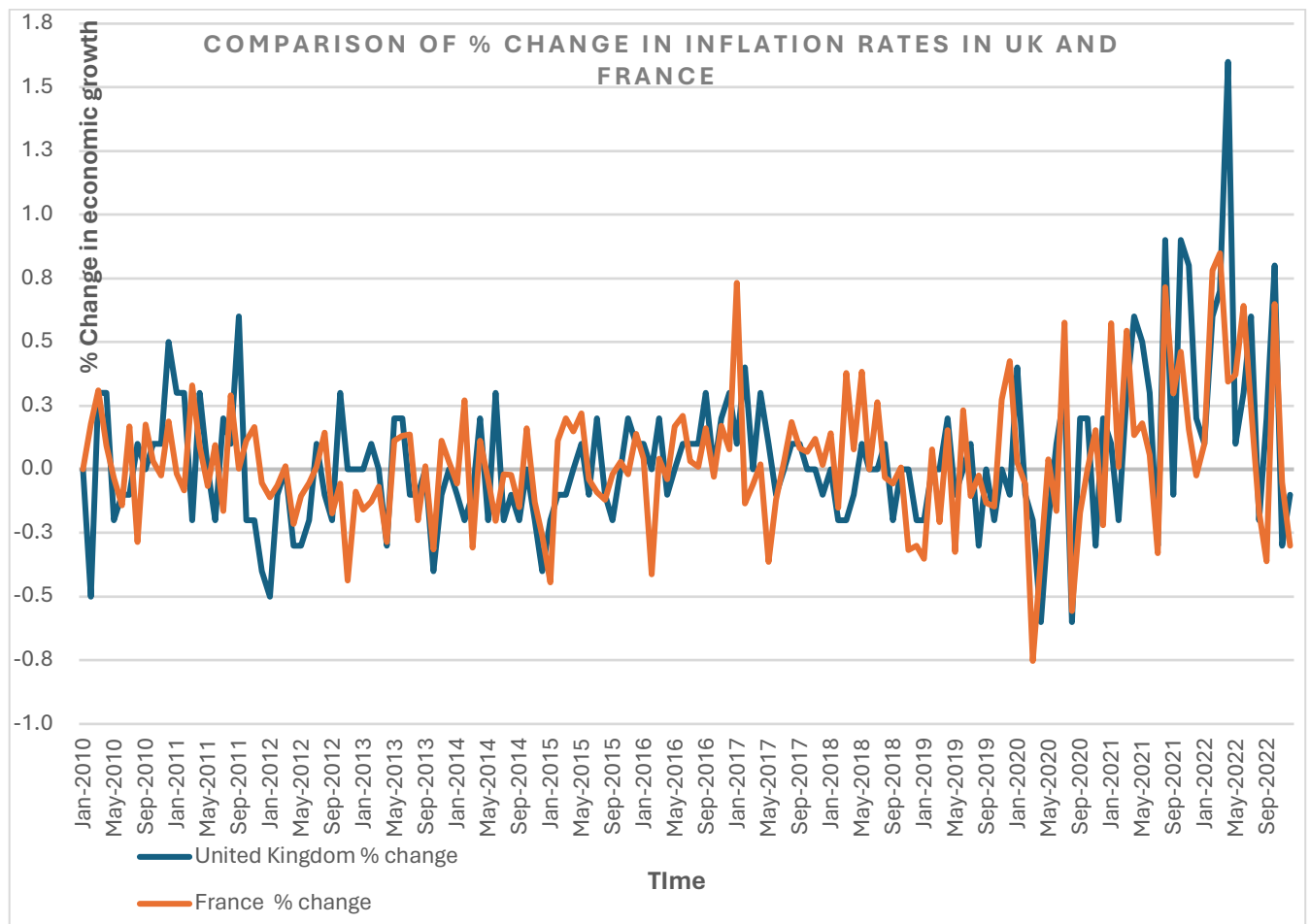


Figure- 3- Percentage change in inflation in UK and France

Figure 3 shows that in the year **2010** the percentage change for the UK was at **0**. As towards the end of 2010 the British economy had recovered from the financial crisis of 2008. However, for France the recovery from the financial crisis is seen earlier in 2010 compared to the UK. As the government implemented fiscal and monetary policies for example: Growing consumer confidence to increase spending and liquidity to increase the availability of money. However there are many accurate different statistical methods that are able to show the relationship between two variables.

Analysis 4: Economic growth

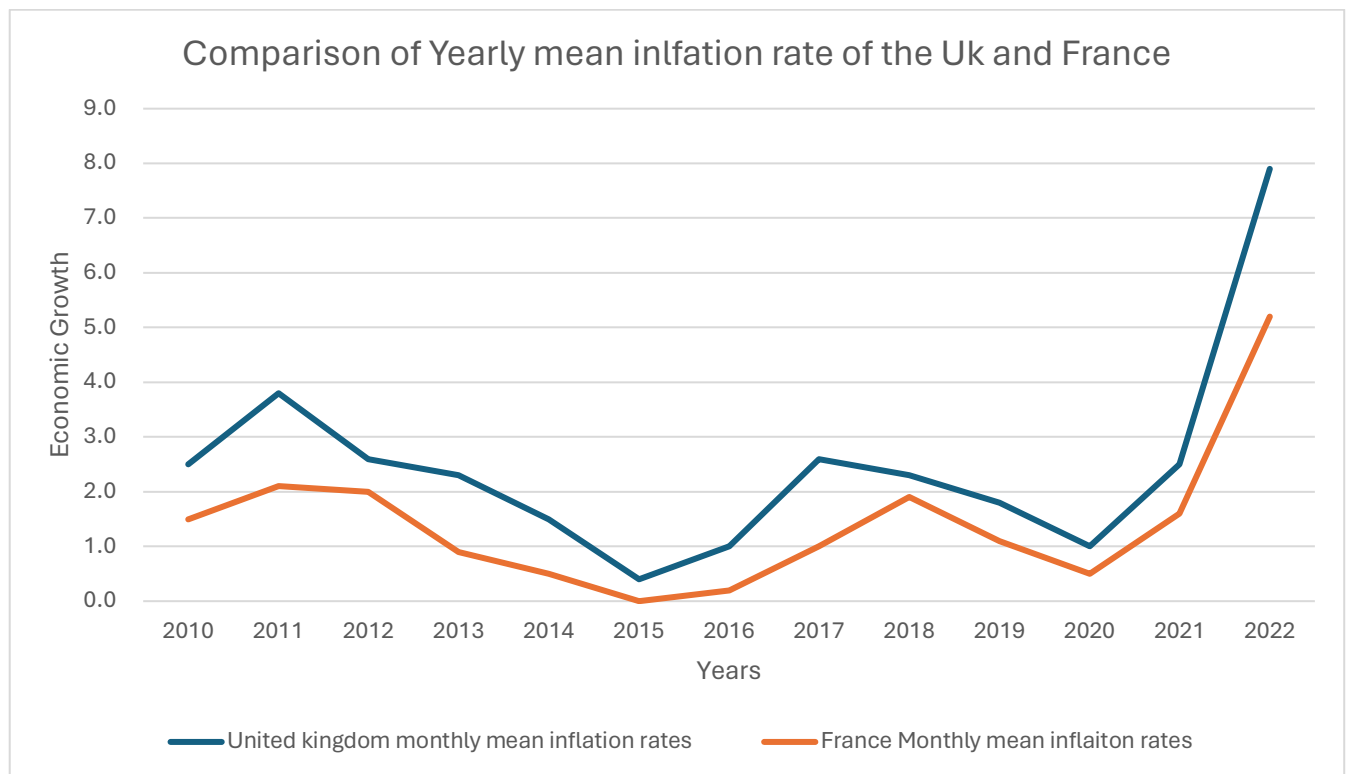


Figure- 4-Comparison of yearly average inflation rate

After the years of covid the years of covid the UK and France have both experienced a growth in the economy. Whereas off December 2022 the UK experienced a 9.2% increase in growth while France experienced a 5.9% in growth. This is widely due to both governments attempt to increase the consumption of the country due the stagnation of the pandemic. However, in the UK the nation has faced a larger economic growth due to governmental policies and had caused high inflation to 10.5%. However, when using an average amount. An outlier could change the range of data.

Analysis 5: statistical overview of the Uk inflation rate

$$H_0: \mu = 2\%$$

$$H_1: \mu \neq 2\%$$

Sample size	156.00
Mean	2.47
Standard deviation	1.90
Hypothesised value	2.00

Standard error	0.15
T-statistics	3.09

Degrees of Freedom	155.00
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P-value (lower tail)	0.56
P-value (upper tail)	0.44
P-value t tail	0.88

Table 5-One sample hypothesis test for the average UK inflation rate at a 5% significance rate

The Null hypothesis claims that the uk's average inflation rate is like the targeted rate of 2% at a 5% significance rate. The results (P-Value=0.88) show the Null hypothesis can be rejected, as there is insufficient evidence to show that the average UK inflation rate is not like the target rate. This can be explained through the cost-of-living crisis that begin in late 2021, this is where prices increased, one factor that entangled into this was Brexit where many foreign workers had to leave the country which caused a lack of labour in the country. Thus, the country thus the country experienced and increase in price.

$$H_0: \mu_1 - \mu_2 = 0$$

$$H_1: \mu_1 - \mu_2 \neq 0$$

	Variable 1	Variable 2
Mean	2.47	1.42
Variance	3.61	1.83
Observations	156.00	156.00
df	155.00	155.00
F	1.97	
P(F<=f) one-tail	0.00	
F Critical one-tail	1.37	

Table 6-F test sample for variances

Analysis 6: statistical overview

Due to the F stat being larger than the F critical value (1.97>1.37). The H_0 was rejected. As the variances are not equal. Thus, why the two-sample test assumes unequal variances for the comparison of means tests.

	Variable 1	Variable 2
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Mean	2.47	1.42
Variance	3.61	1.83
Observations	156.00	156.00
Hypothesized Mean Difference	0.00	
df	280.00	
t Stat	5.58	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.65	
P(T<=t) two-tail	0.00	
t Critical two-tail	1.97	

Table 7-T-Test: Two-Sample Assuming Unequal Variances

Analysis 7:: statistical overview

The null Hypothesis theorises the average inflation rate of both the Uk and France are the same. However, with the T stat (5.58) being larger than the critical value (1.97). We can reject the null hypothesis as there is insufficient evidence to claim the average inflation rate is not the same in both countries. This could be due to the different economic environments of the country and governing body.

Conclusion:

This report has found that the development of the Uk and France are not the same. This report recommends policies like an increase in domestic production to mitigate the disruptions of external trading partners and could also allow grow each country's economy.

References:

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Appendix:

Table 8-Consumer prices

	Country	Country
Time	United Kingdom (%)	France (%)
Jan-2010	2.6	1.1
Feb-2010		
	2.1	1.3
Mar-2010		
	2.4	1.6
Apr-2010	2.7	1.7
May-2010	2.5	1.6
Jun-2010	2.4	1.5
Jul-2010	2.3	1.7
Aug-2010	2.4	1.4
Sep-2010	2.4	1.6
Oct-2010	2.5	1.6

Nov-2010	2.6	1.6
Dec-2010	3.1	1.8
Jan-2011	3.4	1.7
Feb-2011	3.7	1.7
Mar-2011	3.5	2.0
Apr-2011	3.8	2.1
May-2011	3.8	2.0
Jun-2011	3.6	2.1
Jul-2011	3.8	1.9
Aug-2011	3.9	2.2
Sep-2011	4.5	2.2
Oct-2011	4.3	2.3
Nov-2011	4.1	2.5
Dec-11	3.7	2.5
Jan-2012	3.2	2.4
Feb-2012	3.1	2.3
Mar-2012	3.1	2.3
Apr-2012	2.8	2.1
May-2012	2.5	2.0
Jun-2012	2.3	1.9
Jul-2012	2.4	1.9
Aug-2012	2.3	2.1
Sep-2012	2.1	1.9
Oct-2012	2.4	1.9
Nov-2012	2.4	1.4
Dec-2012	2.4	1.3
Jan-2013	2.4	1.2
Feb-2013	2.5	1.0
Mar-2013	2.5	1.0
Apr-2013	2.2	0.7
May-2013	2.4	0.8
Jun-2013	2.6	0.9
Jul-2013	2.5	1.1
Aug-2013	2.4	0.9
Sep-2013	2.4	0.9
Oct-2013	2.0	0.6
Nov-2013	1.9	0.7
Dec-2013	1.9	0.7
Jan-2014	1.8	0.6
Feb-2014	1.6	0.9
Mar-2014	1.5	0.6
Apr-2014	1.7	0.7
May-2014	1.5	0.7
Jun-2014	1.8	0.5
Jul-2014	1.6	0.5
Aug-2014	1.5	0.4
Sep-2014	1.3	0.3
Oct-2014	1.3	0.5
Nov-2014	1.1	0.3
Dec-2014	0.7	0.1
Jan-2015	0.5	-0.4

Feb-2015	0.4	-0.3
Mar-2015	0.3	-0.1
Apr-2015	0.3	0.1
May-2015	0.4	0.3
Jun-2015	0.3	0.3
Jul-2015	0.5	0.2
Aug-2015	0.4	0.0
Sep-2015	0.2	0.0
Oct-2015	0.2	0.1
Nov-2015	0.4	0.0
Dec-2015	0.5	0.2
Jan-2016	0.6	0.2
Feb-2016	0.6	-0.2
Mar-2016	0.8	-0.1
Apr-2016	0.7	-0.2
May-2016	0.7	-0.0
Jun-2016	0.8	0.2
Jul-2016	0.9	0.2
Aug-2016	1.0	0.2
Sep-2016	1.3	0.4
Oct-2016	1.3	0.4
Nov-2016	1.5	0.5
Dec-2016	1.8	0.6
Jan-2017	1.9	1.3
Feb-2017	2.3	1.2
Mar-2017	2.3	1.1
Apr-2017	2.6	1.2
May-2017	2.7	0.8
Jun-2017	2.6	0.7
Jul-2017	2.6	0.7
Aug-2017	2.7	0.9
Sep-2017	2.8	1.0
Oct-2017	2.8	1.1
Nov-2017	2.8	1.2
Dec-2017	2.7	1.2
Jan-2018	2.7	1.3
Feb-2018	2.5	1.2
Mar-2018	2.3	1.6
Apr-2018	2.2	1.6
May-2018	2.3	2.0
Jun-2018	2.3	2.0
Jul-2018	2.3	2.3
Aug-2018	2.4	2.3
Sep-2018	2.2	2.2
Oct-2018	2.2	2.2
Nov-2018	2.2	1.9
Dec-2018	2.0	1.6
Jan-2019	1.8	1.2
Feb-2019	1.8	1.3
Mar-2019	1.8	1.1
Apr-2019	2.0	1.3

May-2019	1.9	0.9
Jun-2019	1.9	1.2
Jul-2019	2.0	1.1
Aug-2019	1.7	1.0
Sep-2019	1.7	0.9
Oct-2019	1.5	0.8
Nov-2019	1.5	1.0
Dec-2019	1.4	1.5
Jan-2020	1.8	1.5
Feb-2020	1.7	1.4
Mar-2020	1.5	0.7
Apr-2020	0.9	0.3
May-2020	0.7	0.4
Jun-2020	0.8	0.2
Jul-2020	1.1	0.8
Aug-2020	0.5	0.2
Sep-2020	0.7	0.0
Oct-2020	0.9	0.0
Nov-2020	0.6	0.2
Dec-2020	0.8	-0.0
Jan-2021	0.9	0.6
Feb-2021	0.7	0.6
Mar-2021	1.0	1.1
Apr-2021	1.6	1.2
May-2021	2.1	1.4
Jun-2021	2.4	1.5
Jul-2021	2.1	1.2
Aug-2021	3.0	1.9
Sep-2021	2.9	2.2
Oct-2021	3.8	2.6
Nov-2021	4.6	2.8
Dec-2021	4.8	2.8
Jan-2022	4.9	2.9
Feb-2022	5.5	3.6
Mar-2022	6.2	4.5
Apr-2022	7.8	4.8
May-2022	7.9	5.2
Jun-2022	8.2	5.8
Jul-2022	8.8	6.1
Aug-2022	8.6	5.9
Sep-2022	8.8	5.6
Oct-2022	9.6	6.2
Nov-2022	9.3	6.2
Dec-2022	9.2	5.9

Table 9-Changes in inflation rates from Period January 2010-December 2022

Time	Country		Country	
	United Kingdom (%)	United Kingdom % change	France (%)	France % change
Jan-2010	2.6	0.0	1.1	0
Feb-2010				
	2.1	-0.5	1.3	0.2
Mar-2010				
	2.4	0.3	1.6	0.3
Apr-2010	2.7	0.3	1.7	0.1
May-2010	2.5	-0.2	1.6	0.0
Jun-2010	2.4	-0.1	1.5	-0.1
Jul-2010	2.3	-0.1	1.7	0.2
Aug-2010	2.4	0.1	1.4	-0.3
Sep-2010	2.4	0.0	1.6	0.2
Oct-2010	2.5	0.1	1.6	0.0
Nov-2010	2.6	0.1	1.6	0.0
Dec-2010	3.1	0.5	1.8	0.2
Jan-2011	3.4	0.3	1.7	0.0
Feb-2011	3.7	0.3	1.7	-0.1
Mar-2011	3.5	-0.2	2.0	0.3
Apr-2011	3.8	0.3	2.1	0.1
May-2011	3.8	0.0	2.0	-0.1
Jun-2011	3.6	-0.2	2.1	0.1
Jul-2011	3.8	0.2	1.9	-0.2
Aug-2011	3.9	0.1	2.2	0.3
Sep-2011	4.5	0.6	2.2	0.0
Oct-2011	4.3	-0.2	2.3	0.1
Nov-2011	4.1	-0.2	2.5	0.2
Dec-2011	3.7	-0.4	2.5	-0.1
Jan-2012	3.2	-0.5	2.4	-0.1
Feb-2012	3.1	-0.1	2.3	-0.1
Mar-2012	3.1	0.0	2.3	0.0
Apr-2012	2.8	-0.3	2.1	-0.2
May-2012	2.5	-0.3	2.0	-0.1
Jun-2012	2.3	-0.2	1.9	-0.1
Jul-2012	2.4	0.1	1.9	0.0
Aug-2012	2.3	-0.1	2.1	0.1
Sep-2012	2.1	-0.2	1.9	-0.2
Oct-2012	2.4	0.3	1.9	-0.1
Nov-2012	2.4	0.0	1.4	-0.4
Dec-2012	2.4	0.0	1.3	-0.1
Jan-2013	2.4	0.0	1.2	-0.2
Feb-2013	2.5	0.1	1.0	-0.1
Mar-2013	2.5	0.0	1.0	-0.1

Apr-2013	2.2	-0.3	0.7	-0.3
May-2013	2.4	0.2	0.8	0.1
Jun-2013	2.6	0.2	0.9	0.1
Jul-2013	2.5	-0.1	1.1	0.1
Aug-2013	2.4	-0.1	0.9	-0.2
Sep-2013	2.4	0.0	0.9	0.0
Oct-2013	2.0	-0.4	0.6	-0.3
Nov-2013	1.9	-0.1	0.7	0.1
Dec-2013	1.9	0.0	0.7	0.0
Jan-2014	1.8	-0.1	0.6	-0.1
Feb-2014	1.6	-0.2	0.9	0.3
Mar-2014	1.5	-0.1	0.6	-0.3
Apr-2014	1.7	0.2	0.7	0.1
May-2014	1.5	-0.2	0.7	0.0
Jun-2014	1.8	0.3	0.5	-0.2
Jul-2014	1.6	-0.2	0.5	0.0
Aug-2014	1.5	-0.1	0.4	0.0
Sep-2014	1.3	-0.2	0.3	-0.1
Oct-2014	1.3	0.0	0.5	0.2
Nov-2014	1.1	-0.2	0.3	-0.1
Dec-2014	0.7	-0.4	0.1	-0.3
Jan-2015	0.5	-0.2	-0.4	-0.4
Feb-2015	0.4	-0.1	-0.3	0.1
Mar-2015	0.3	-0.1	-0.1	0.2
Apr-2015	0.3	0.0	0.1	0.1
May-2015	0.4	0.1	0.3	0.2
Jun-2015	0.3	-0.1	0.3	0.0
Jul-2015	0.5	0.2	0.2	-0.1
Aug-2015	0.4	-0.1	0.0	-0.1
Sep-2015	0.2	-0.2	0.0	0.0
Oct-2015	0.2	0.0	0.1	0.0
Nov-2015	0.4	0.2	0.0	0.0
Dec-2015	0.5	0.1	0.2	0.1
Jan-2016	0.6	0.1	0.2	0.0
Feb-2016	0.6	0.0	-0.2	-0.4
Mar-2016	0.8	0.2	-0.1	0.0
Apr-2016	0.7	-0.1	-0.2	0.0
May-2016	0.7	0.0	-0.0	0.2
Jun-2016	0.8	0.1	0.2	0.2
Jul-2016	0.9	0.1	0.2	0.0
Aug-2016	1.0	0.1	0.2	0.0
Sep-2016	1.3	0.3	0.4	0.2
Oct-2016	1.3	0.0	0.4	0.0
Nov-2016	1.5	0.2	0.5	0.2
Dec-2016	1.8	0.3	0.6	0.1
Jan-2017	1.9	0.1	1.3	0.7
Feb-2017	2.3	0.4	1.2	-0.1
Mar-2017	2.3	0.0	1.1	-0.1
Apr-2017	2.6	0.3	1.2	0.0
May-2017	2.7	0.1	0.8	-0.4
Jun-2017	2.6	-0.1	0.7	-0.1

Jul-2017	2.6	0.0	0.7	0.0
Aug-2017	2.7	0.1	0.9	0.2
Sep-2017	2.8	0.1	1.0	0.1
Oct-2017	2.8	0.0	1.1	0.1
Nov-2017	2.8	0.0	1.2	0.1
Dec-2017	2.7	-0.1	1.2	0.0
Jan-2018	2.7	0.0	1.3	0.1
Feb-2018	2.5	-0.2	1.2	-0.2
Mar-2018	2.3	-0.2	1.6	0.4
Apr-2018	2.2	-0.1	1.6	0.1
May-2018	2.3	0.1	2.0	0.4
Jun-2018	2.3	0.0	2.0	0.0
Jul-2018	2.3	0.0	2.3	0.3
Aug-2018	2.4	0.1	2.3	0.0
Sep-2018	2.2	-0.2	2.2	-0.1
Oct-2018	2.2	0.0	2.2	0.0
Nov-2018	2.2	0.0	1.9	-0.3
Dec-2018	2.0	-0.2	1.6	-0.3
Jan-2019	1.8	-0.2	1.2	-0.4
Feb-2019	1.8	0.0	1.3	0.1
Mar-2019	1.8	0.0	1.1	-0.2
Apr-2019	2.0	0.2	1.3	0.2
May-2019	1.9	-0.1	0.9	-0.3
Jun-2019	1.9	0.0	1.2	0.2
Jul-2019	2.0	0.1	1.1	-0.1
Aug-2019	1.7	-0.3	1.0	0.0
Sep-2019	1.7	0.0	0.9	-0.1
Oct-2019	1.5	-0.2	0.8	-0.1
Nov-2019	1.5	0.0	1.0	0.3
Dec-2019	1.4	-0.1	1.5	0.4
Jan-2020	1.8	0.4	1.5	0.0
Feb-2020	1.7	-0.1	1.4	-0.1
Mar-2020	1.5	-0.2	0.7	-0.8
Apr-2020	0.9	-0.6	0.3	-0.3
May-2020	0.7	-0.2	0.4	0.0
Jun-2020	0.8	0.1	0.2	-0.2
Jul-2020	1.1	0.3	0.8	0.6
Aug-2020	0.5	-0.6	0.2	-0.6
Sep-2020	0.7	0.2	0.0	-0.2
Oct-2020	0.9	0.2	0.0	0.0
Nov-2020	0.6	-0.3	0.2	0.2
Dec-2020	0.8	0.2	-0.0	-0.2
Jan-2021	0.9	0.1	0.6	0.6
Feb-2021	0.7	-0.2	0.6	0.0
Mar-2021	1.0	0.3	1.1	0.5
Apr-2021	1.6	0.6	1.2	0.1
May-2021	2.1	0.5	1.4	0.2
Jun-2021	2.4	0.3	1.5	0.1
Jul-2021	2.1	-0.3	1.2	-0.3
Aug-2021	3.0	0.9	1.9	0.7
Sep-2021	2.9	-0.1	2.2	0.3

Oct-2021	3.8	0.9	2.6	0.5
Nov-2021	4.6	0.8	2.8	0.2
Dec-2021	4.8	0.2	2.8	0.0
Jan-2022	4.9	0.1	2.9	0.1
Feb-2022	5.5	0.6	3.6	0.8
Mar-2022	6.2	0.7	4.5	0.8
Apr-2022	7.8	1.6	4.8	0.3
May-2022	7.9	0.1	5.2	0.4
Jun-2022	8.2	0.3	5.8	0.6
Jul-2022	8.8	0.6	6.1	0.2
Aug-2022	8.6	-0.2	5.9	-0.2
Sep-2022	8.8	0.2	5.6	-0.4
Oct-2022	9.6	0.8	6.2	0.6
Nov-2022	9.3	-0.3	6.2	-0.1
Dec-2022	9.2	-0.1	5.9	-0.3

Formulas:

Table 10-Formulas

Observations	=COUNT(H19:H174)
Mean	=AVERAGE(H19:H174)
Median	=MEDIAN(H19:H174)
Minimum	=MIN(H19:H174)
Maximum	=MAX(H19:H174)
Standard deviation	=STDEV.S(H19:H174)
Skewness	=SKEW(H19:H174)

Table 1-Descriptive Statistics for Monthly Inflation rates 2010-2022

Country	Observations	Mean	Median	Min	Max	Std.Dev	Skewness
United Kingdom (%)	156.00	2.47	2.25	0.20	9.60	1.90	2.05
France (%)	156.00	1.42	1.17	-0.38	6.20	1.35	1.88

Figure- 2-Comparison of Inflation rates

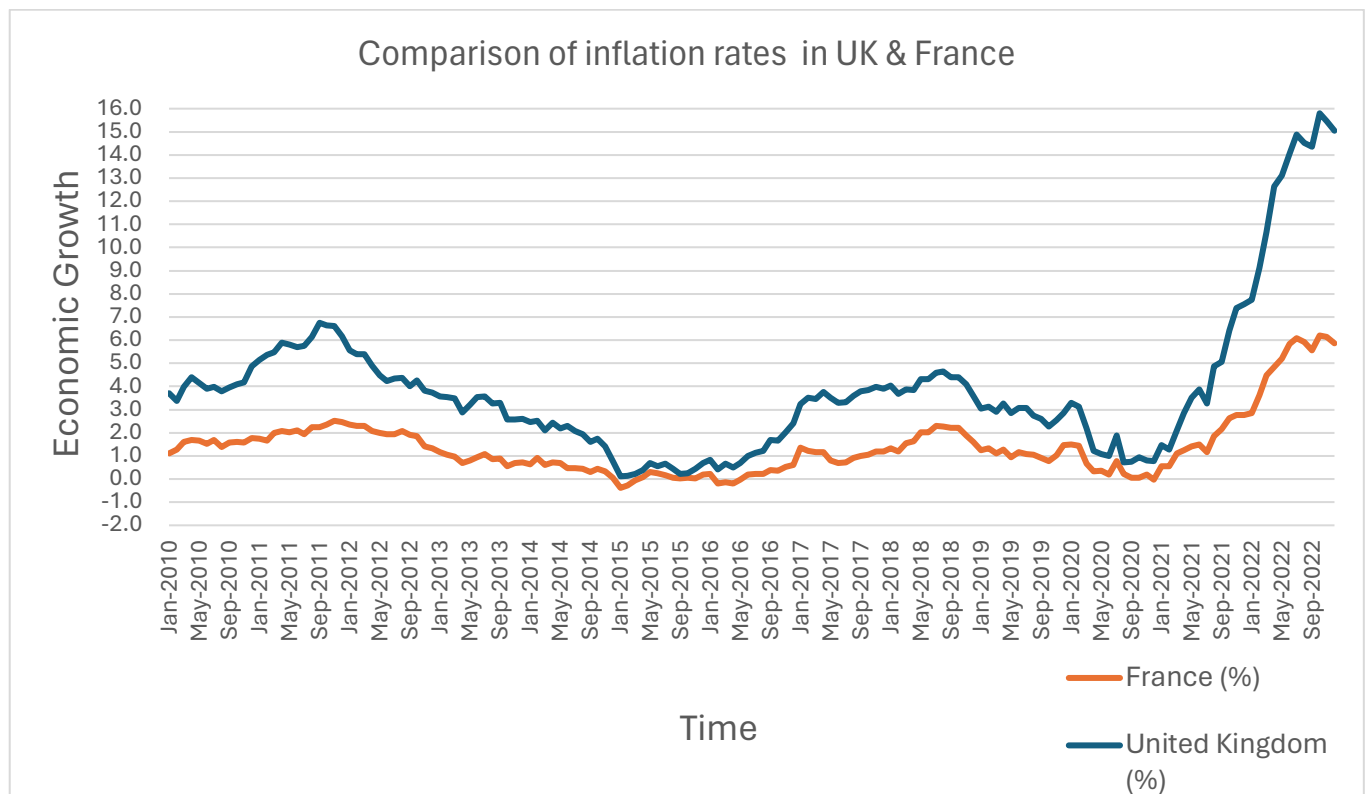


Figure- 3- Percentage change in inflation in UK and France

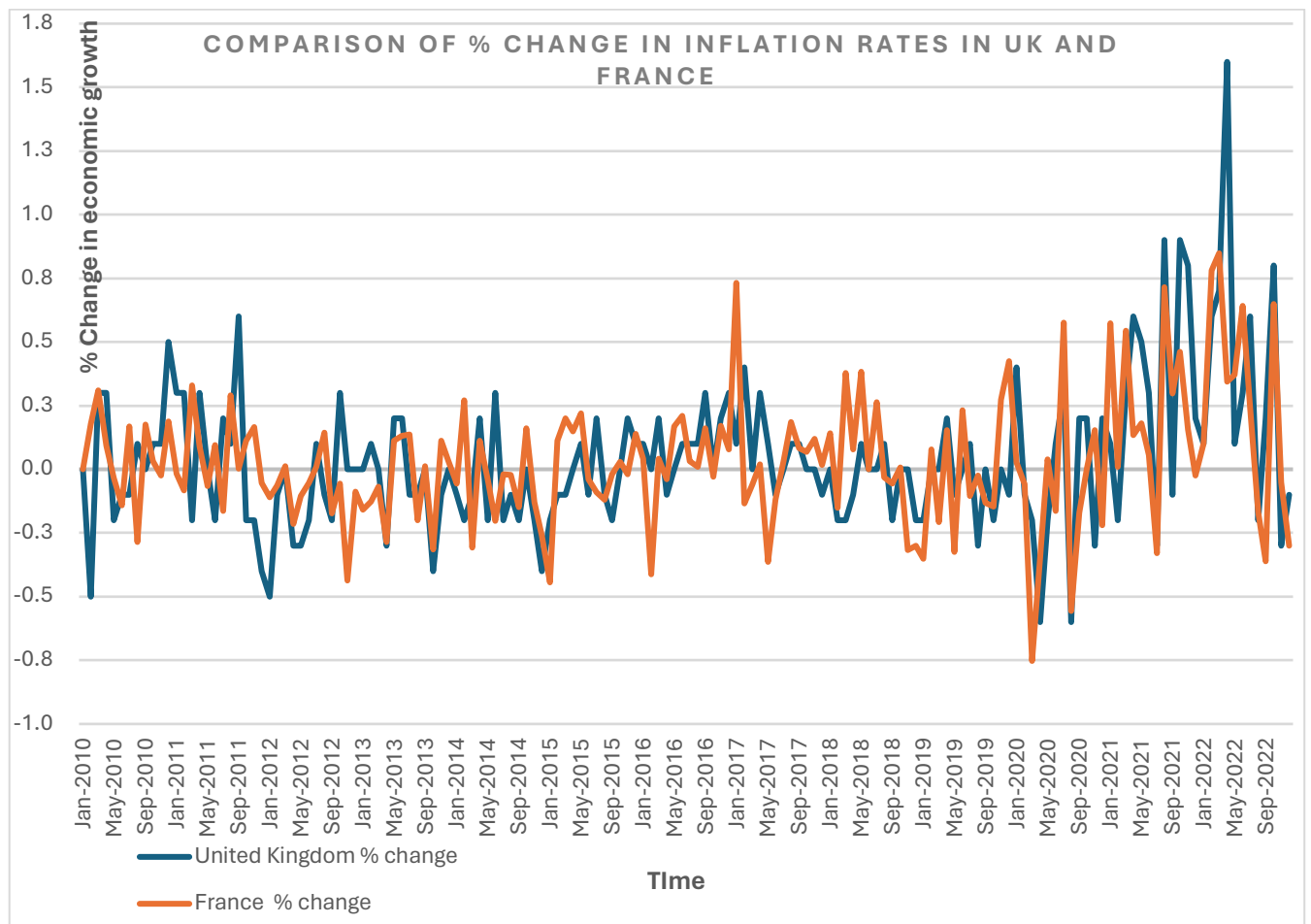
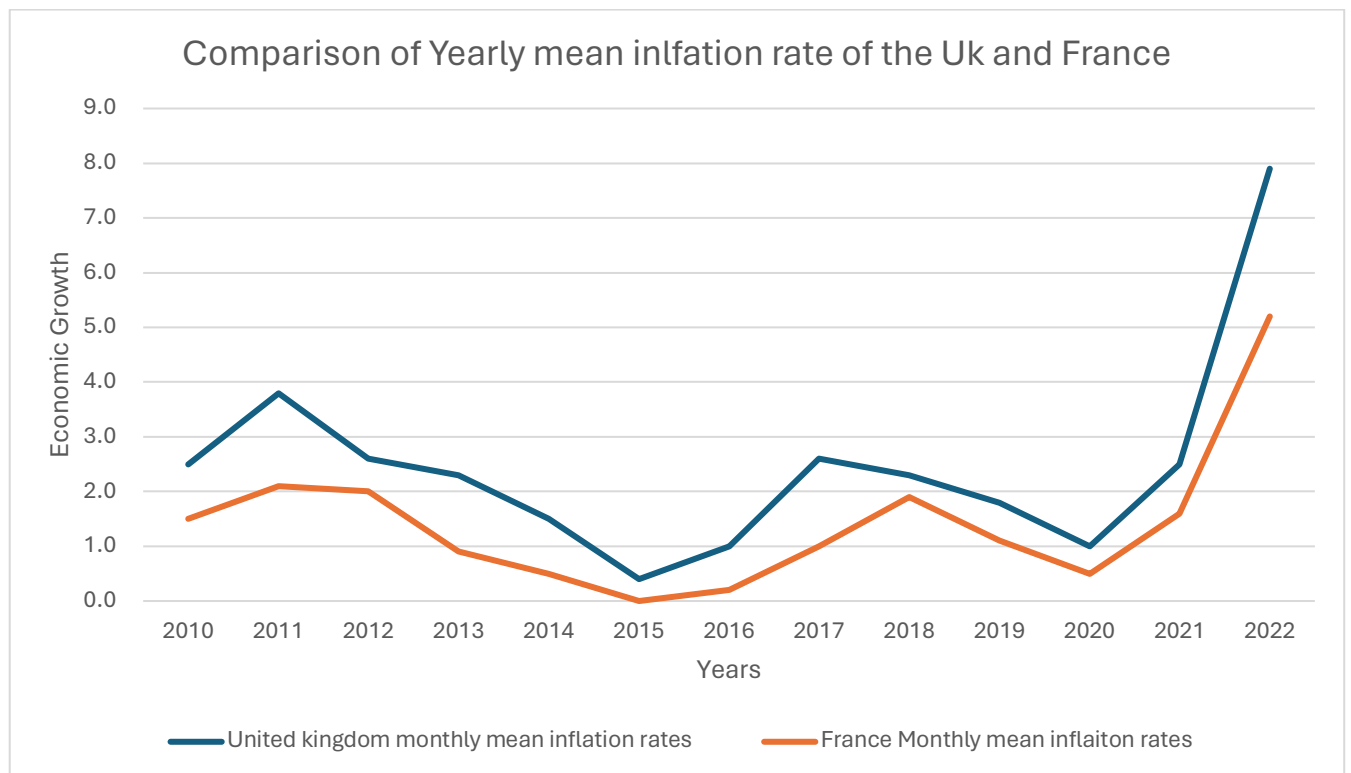


Figure- 4-Comparison of yearly average inflation rate



$$H_0: \mu = 2\%$$

$$H_1: \mu \neq 2\%$$

Sample size	156.00
Mean	2.47
Standard deviation	1.90
Hypothesised value	2.00
Standard error	0.15
T-statistics	3.09
Degrees of Freedom	155.00
P-value (lower tail)	0.56
P-value (upper tail)	0.44
P-value t tail	0.88

Table 5-One sample hypothesis test for the average UK inflation rate at a 5% significance rate

$$H_0: \mu_1 - \mu_2 = 0$$

$$H_1: \mu_1 - \mu_2 \neq 0$$

	Variable 1	Variable 2
Mean	2.47	1.42
Variance	3.61	1.83
Observations	156.00	156.00
df	155.00	155.00
F	1.97	
P(F<=f) one-tail	0.00	
F Critical one-tail	1.37	

Table 6-F test sample for variances

	Variable 1	Variable 2
Mean	2.47	1.42
Variance	3.61	1.83
Observations	156.00	156.00
Hypothesized Mean Difference	0.00	
df	280.00	
t Stat	5.58	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.65	
P(T<=t) two-tail	0.00	

t Critical two-tail

1.97

Table 7-T-Test: Two-Sample Assuming Unequal Variances

Time	Country	
	United Kingdom monthly mean inflation	France Monthly mean inflation rates

2017	1.0	0.2
2018	2.6	1
2019	2.3	1.9
2020	1.8	1.1
2021	1.0	0.5
2022	2.5	1.6
	7.9	5.2

Table 11--Raw data for comparison of inflation rates

Report 2:

Introduction:

This report will explore the phenomenon between correlation and causation and their relationship specifically with Growth and investment. This will be attempted through statistical descriptions as well as Graphical visualisations like scatter plots. This analysis will aim to show there is a positive relationship with Investment and GDP.

Analysis and graphical methods:

Table 1-Graphical method

Variables	Observations	Mean	Median	Min	Max	Std.Dev	Skewness
inv2015	161	24.23	23.60	-3.95	79.401	9.160939	1.646021
gGdp2015	161	2.99	3.02	-20.60	25.18	3.900968	-0.69302

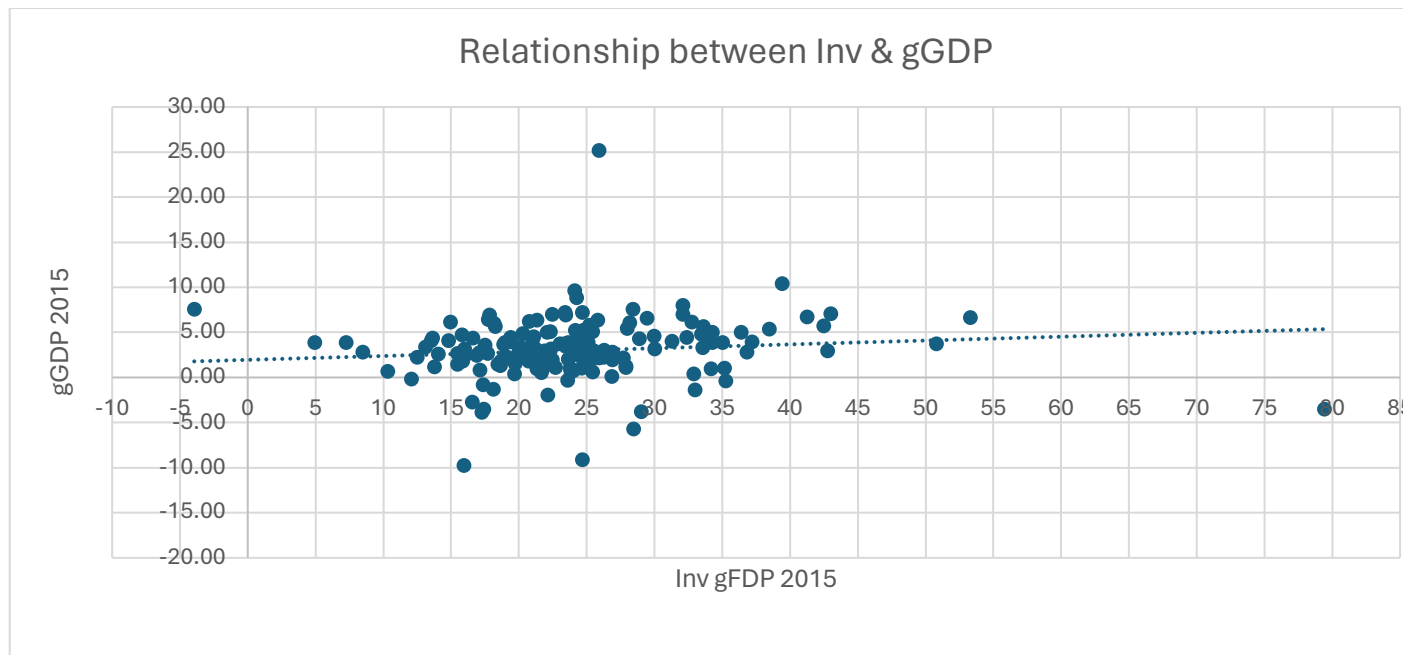
Analysis 1: External factors

The highest number in the inv2015 variable was the republic of Congo's 79.4% of GDP however the country they experienced a -3.55 shock in GDP. Who in the same year faced a physical attack from armed government forces. Which caused a large humanitarian shock due to widespread propagation. On this hand the correlation between the high investment of the country and low GDP was hindered by an external matter. And hence the investment caused a contraction in GDP.

The Minimum level of investment was by Djibouti an east African a country widely known for its service activities on the red see. The country invested -3.95 into the country and had a high GDP. The country managed this through a balance of trades with countries and investors wanting to use their channel line. Which allowed them to experience economic growth. This explores the different factors external from investment that affect GDP.

Analysis 2: Correlation

Figure 2- Relationship between investment and GDP



In this scatter graph there is a strong positive correlation with investment and GDP. Which may insinuate that the higher a country invests the higher the GDP. For example, in Ireland investment was 25% of its GDP and consequently the country had a High GDP of 25%. However, with the scatter graph it does not present a numerical value on the strength on the relationship of the GDP and investment.

Analysis 3: Statistical methods

Table 3- Correlation coefficient between Investment and GDP

H_0 States GDP is dependent on Investment at a 5% significant level

H_1 States GDP is not dependent on Investment at a 5% significance level

Correlation Coefficient	0.10
T Statistic	1.27
T Test	0.00

We cannot reject the NULL hypothesis value as the t critical value (0) is lower than the t statistic (1.27). The correlation coefficient of **0.1** highlights a weak positive correlation between GDP and investment. In different countries there could be different variables that affect the relationship between investment and GDP. One being the macro environment of a country, for example Iran who invested 32.99% of GDP still experienced a contraction of -1.42 in GDP. And this is due to the country having high interest rates of **16.3%** which caused a decrease consumer spending thus the country experienced a slowdown in its economy and a contraction in its GDP.

Analysis 4: Statistical methods

H_0 States GDP is dependent on Investment at a 5% significant level

H_1 States GDP is not dependent on Investment at a 5% significance level

Count of InvGroup	Column Labels		Grand Total
	High Inv	Low Inv	
Contraction gGDP	6	10	16
High gGDP	25	12	37
Moderate gGDP	43	65	108
Grand Total	74	87	161

Table 4-Chi squared
test showing the
relationship between
InvGroup and gGDP
group

Expected	Column Labels	Column	
		1	Column2
Row Labels	High Inv	Low Inv	Grand Total
Contraction gGDP	7.35	8.65	16.00
High gGDP	17.01	19.99	37.00
Moderate gGDP	49.64	58.36	108.00
Grand Total	74.00	87.00	161.00

Table 5- expected values

Chi squared statistic
0.01

Table 6-Chi squared statistic.

The results show that the null hypothesis cannot be rejected as the chi squared value of **0.01** is and smaller than the 5% significance level. Thus, there is sufficient evidence to claim that GDP is dependent on the level on investment. This correlation can be seen where 90% of countries who invested had a High or moderate GDP while there where 10% of countries who experienced a contraction in their economy. The majority of the 10% are developing countries who have experienced external or internal whether governmental problems or even war.

Conclusion:

Overall, there is a relationship between GDP and Investment. However, Aggregate demand an economics concept, which includes Consumption+Investment+Government purchases+Exports-Imports, measures relative demand in a country and its effects on GDP.

The equation shows many variables effect AD, hence investment Is one factor to a change in a countries GDP.

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Appendix:

Table 7-Raw data

Column1	Column2	Column3
Country	Inv2015	gGDP2015
Afghanistan	18.467	1.45
Albania	26.237	2.22
Algeria	50.781	3.70
Angola	34.202	0.94
Antigua and Barbuda	4.95	3.83
Argentina	17.071	2.73
Armenia	21.204	3.20
Australia	25.908	2.17
Austria	23.806	1.01
Azerbaijan	27.914	1.09
Bahamas, The	24.639	1.00
Bahrain	25.531	2.49
Bangladesh	29.442	6.55
Barbados	16.888	2.47
Belarus	29.035	-3.83
Belgium	23.628	2.04
Belize	22.043	2.89
Benin	20.732	1.78
Bhutan	53.301	6.64
Bolivia	20.281	4.86
Bosnia and Herzegovina	20.676	3.09
Botswana	28.443	-5.72
Brazil	17.412	-3.55
Brunei Darussalam	35.247	-0.39
Bulgaria	20.993	3.43
Burkina Faso	19.43	3.92
Burundi	17.286	-3.90
Cabo Verde	35.166	1.01
Cambodia	22.453	6.97

Cameroon	18.25	5.67
Canada	23.822	0.66
Central African Republic	13.616	4.34
Chad	26.905	2.77
Chile	25.599	2.15
China	43.033	7.04
Colombia	23.774	2.96
Comoros	13.759	1.15
Congo, Dem. Rep.	17.819	6.92
Congo, Rep.	79.401	-3.55
Costa Rica	18.854	3.65
Cote d'Ivoire	23.39	7.19
Croatia	20.362	2.53
Cyprus	13.135	3.38
Czechia	27.983	5.39
Denmark	20.631	2.34
Djibouti	-3.946	7.53
Dominica	16.553	-2.73
Dominican Republic	23.442	6.93
Ecuador	26.87	0.10
Egypt, Arab Rep.	16.618	4.37
El Salvador	16.017	2.40
Equatorial Guinea	24.701	-9.11
Estonia	25.094	1.85
Eswatini	12.515	2.23
Ethiopia	39.417	10.39
Fiji	21.109	4.50
Finland	21.686	0.54
France	22.712	1.11
Gabon	35.049	3.88
Gambia, The	13.538	4.06
Georgia	26.295	3.02
Germany	19.743	1.49
Ghana	27.71	2.12
Greece	12.077	-0.20
Grenada	17.733	6.44
Guatemala	14.828	4.09
Guinea	7.255	3.83
Guinea-Bissau	14.975	6.13
Guyana	10.347	0.69
Haiti	14.052	2.56
Honduras	25.118	3.84
Hungary	23.38	3.70
Iceland	19.404	4.44
India	32.117	8.00
Indonesia	34.063	4.88

Iran, Islamic Rep.	32.991	-1.42
Ireland	25.909	25.18
Israel	21.876	2.28
Italy	17.107	0.78
Jamaica	21.352	0.92
Japan	25.165	1.56
Jordan	24.835	2.50
Kazakhstan	27.908	1.20
Kenya	22.103	4.97
Kuwait	25.428	0.59
Kyrgyz Republic	34.285	3.88
Latvia	23.646	3.89
Lesotho	30.011	3.13
Libya	17.382	-0.84
Lithuania	21.27	2.02
Luxembourg	18.958	2.27
Madagascar	15.992	3.13
Malawi	8.482	2.80
Malaysia	25.424	5.09
Maldives	20	2.88
Mali	20.761	6.17
Malta	24.14	9.61
Mauritania	38.461	5.38
Mauritius	17.492	3.55
Mexico	23.736	3.29
Moldova	23.595	-0.34
Mongolia	24.514	2.38
Montenegro	20.095	3.39
Morocco	29.994	4.54
Mozambique	41.249	6.72
Myanmar	33.552	3.28
Namibia	28.895	4.26
Nepal	31.277	3.98
Netherlands	22.475	1.96
New Zealand	23.011	3.74
Nicaragua	33.477	4.79
Niger	32.368	4.39
Nigeria	15.49	2.65
Norway	26.908	1.97
Oman	36.376	5.02
Pakistan	15.811	4.73
Palau	28.41	7.54
Panama	42.493	5.73
Paraguay	21.879	2.96
Peru	24.293	3.25
Philippines	21.341	6.35

Poland	20.984	4.24
Portugal	15.855	1.79
Romania	25.522	2.95
Russian Federation	22.149	-1.97
Rwanda	24.244	8.86
Sao Tome and Principe	37.196	3.91
Saudi Arabia	34.223	4.11
Senegal	25.833	6.37
Serbia	18.681	1.81
Seychelles	33.604	5.64
Sierra Leone	15.407	-20.60
Singapore	25.353	2.98
Slovak Republic	24.712	5.22
Slovenia	19.164	2.21
Solomon Islands	15.493	1.42
South Africa	18.633	1.32
Spain	18.987	3.84
Sri Lanka	34.276	5.01
St. Kitts and Nevis	24.003	0.72
St. Lucia	18.124	-1.36
St. Vincent and the Grenadines	24.325	2.79
Sweden	24.429	4.49
Switzerland	25.076	1.66
Tajikistan	18.177	6.02
Tanzania	32.759	6.16
Thailand	22.356	3.13
Timor-Leste	36.824	2.76
Togo	25.185	5.74
Tunisia	21.739	0.97
Turkiye	28.199	6.08
Uganda	24.152	5.19
Ukraine	15.933	-9.77
United Arab Emirates	22.327	5.06
United Kingdom	17.719	2.62
United States	21.201	2.71
Uruguay	19.683	0.37
Uzbekistan	24.698	7.22
Vanuatu	32.9	0.37
Vietnam	32.109	6.99
Zambia	42.791	2.92

Table 8 Data with new variable

Inv2015	InvGroup	gGDP2015	gGDPGroup
18.467	Low Inv	1.45	Moderate gGDP

26.237	High Inv	2.22	Moderate gGDP
50.781	High Inv	3.70	Moderate gGDP
34.202	High Inv	0.94	Moderate gGDP
4.95	Low Inv	3.83	Moderate gGDP
17.071	Low Inv	2.73	Moderate gGDP
21.204	Low Inv	3.20	Moderate gGDP
25.908	High Inv	2.17	Moderate gGDP
23.806	Low Inv	1.01	Moderate gGDP
27.914	High Inv	1.09	Moderate gGDP
24.639	High Inv	1.00	Moderate gGDP
25.531	High Inv	2.49	Moderate gGDP
29.442	High Inv	6.55	High gGDP
16.888	Low Inv	2.47	Moderate gGDP
29.035	High Inv	-3.83	Contraction gGDP
23.628	Low Inv	2.04	Moderate gGDP
22.043	Low Inv	2.89	Moderate gGDP
20.732	Low Inv	1.78	Moderate gGDP
53.301	High Inv	6.64	High gGDP
20.281	Low Inv	4.86	Moderate gGDP
20.676	Low Inv	3.09	Moderate gGDP
28.443	High Inv	-5.72	Contraction gGDP
17.412	Low Inv	-3.55	Contraction gGDP
35.247	High Inv	-0.39	Contraction gGDP
20.993	Low Inv	3.43	Moderate gGDP
19.43	Low Inv	3.92	Moderate gGDP
17.286	Low Inv	-3.90	Contraction gGDP
35.166	High Inv	1.01	Moderate gGDP
22.453	Low Inv	6.97	High gGDP
18.25	Low Inv	5.67	High gGDP
23.822	Low Inv	0.66	Moderate gGDP
13.616	Low Inv	4.34	Moderate gGDP
26.905	High Inv	2.77	Moderate gGDP
25.599	High Inv	2.15	Moderate gGDP
43.033	High Inv	7.04	High gGDP
23.774	Low Inv	2.96	Moderate gGDP
13.759	Low Inv	1.15	Moderate gGDP
17.819	Low Inv	6.92	High gGDP
79.401	High Inv	-3.55	Contraction gGDP
18.854	Low Inv	3.65	Moderate gGDP
23.39	Low Inv	7.19	High gGDP
20.362	Low Inv	2.53	Moderate gGDP
13.135	Low Inv	3.38	Moderate gGDP
27.983	High Inv	5.39	High gGDP
20.631	Low Inv	2.34	Moderate gGDP
-3.946	Low Inv	7.53	High gGDP
16.553	Low Inv	-2.73	Contraction gGDP

23.442	Low Inv	6.93	High gGDP
26.87	High Inv	0.10	Moderate gGDP
16.618	Low Inv	4.37	Moderate gGDP
16.017	Low Inv	2.40	Moderate gGDP
24.701	High Inv	-9.11	Contraction gGDP
25.094	High Inv	1.85	Moderate gGDP
12.515	Low Inv	2.23	Moderate gGDP
39.417	High Inv	10.39	High gGDP
21.109	Low Inv	4.50	Moderate gGDP
21.686	Low Inv	0.54	Moderate gGDP
22.712	Low Inv	1.11	Moderate gGDP
35.049	High Inv	3.88	Moderate gGDP
13.538	Low Inv	4.06	Moderate gGDP
26.295	High Inv	3.02	Moderate gGDP
19.743	Low Inv	1.49	Moderate gGDP
27.71	High Inv	2.12	Moderate gGDP
12.077	Low Inv	-0.20	Contraction gGDP
17.733	Low Inv	6.44	High gGDP
14.828	Low Inv	4.09	Moderate gGDP
7.255	Low Inv	3.83	Moderate gGDP
14.975	Low Inv	6.13	High gGDP
10.347	Low Inv	0.69	Moderate gGDP
14.052	Low Inv	2.56	Moderate gGDP
25.118	High Inv	3.84	Moderate gGDP
23.38	Low Inv	3.70	Moderate gGDP
19.404	Low Inv	4.44	Moderate gGDP
32.117	High Inv	8.00	High gGDP
34.063	High Inv	4.88	Moderate gGDP
32.991	High Inv	-1.42	Contraction gGDP
25.909	High Inv	25.18	High gGDP
21.876	Low Inv	2.28	Moderate gGDP
17.107	Low Inv	0.78	Moderate gGDP
21.352	Low Inv	0.92	Moderate gGDP
25.165	High Inv	1.56	Moderate gGDP
24.835	High Inv	2.50	Moderate gGDP
27.908	High Inv	1.20	Moderate gGDP
22.103	Low Inv	4.97	Moderate gGDP
25.428	High Inv	0.59	Moderate gGDP
34.285	High Inv	3.88	Moderate gGDP
23.646	Low Inv	3.89	Moderate gGDP
30.011	High Inv	3.13	Moderate gGDP
17.382	Low Inv	-0.84	Contraction gGDP
21.27	Low Inv	2.02	Moderate gGDP
18.958	Low Inv	2.27	Moderate gGDP
15.992	Low Inv	3.13	Moderate gGDP
8.482	Low Inv	2.80	Moderate gGDP

25.424	High Inv	5.09	High gGDP
20	Low Inv	2.88	Moderate gGDP
20.761	Low Inv	6.17	High gGDP
24.14	High Inv	9.61	High gGDP
38.461	High Inv	5.38	High gGDP
17.492	Low Inv	3.55	Moderate gGDP
23.736	Low Inv	3.29	Moderate gGDP
23.595	Low Inv	-0.34	Contraction gGDP
24.514	High Inv	2.38	Moderate gGDP
20.095	Low Inv	3.39	Moderate gGDP
29.994	High Inv	4.54	Moderate gGDP
41.249	High Inv	6.72	High gGDP
33.552	High Inv	3.28	Moderate gGDP
28.895	High Inv	4.26	Moderate gGDP
31.277	High Inv	3.98	Moderate gGDP
22.475	Low Inv	1.96	Moderate gGDP
23.011	Low Inv	3.74	Moderate gGDP
33.477	High Inv	4.79	Moderate gGDP
32.368	High Inv	4.39	Moderate gGDP
15.49	Low Inv	2.65	Moderate gGDP
26.908	High Inv	1.97	Moderate gGDP
36.376	High Inv	5.02	High gGDP
15.811	Low Inv	4.73	Moderate gGDP
28.41	High Inv	7.54	High gGDP
42.493	High Inv	5.73	High gGDP
21.879	Low Inv	2.96	Moderate gGDP
24.293	High Inv	3.25	Moderate gGDP
21.341	Low Inv	6.35	High gGDP
20.984	Low Inv	4.24	Moderate gGDP
15.855	Low Inv	1.79	Moderate gGDP
25.522	High Inv	2.95	Moderate gGDP
22.149	Low Inv	-1.97	Contraction gGDP
24.244	High Inv	8.86	High gGDP
37.196	High Inv	3.91	Moderate gGDP
34.223	High Inv	4.11	Moderate gGDP
25.833	High Inv	6.37	High gGDP
18.681	Low Inv	1.81	Moderate gGDP
33.604	High Inv	5.64	High gGDP
15.407	Low Inv	-20.60	Contraction gGDP
25.353	High Inv	2.98	Moderate gGDP
24.712	High Inv	5.22	High gGDP
19.164	Low Inv	2.21	Moderate gGDP
15.493	Low Inv	1.42	Moderate gGDP
18.633	Low Inv	1.32	Moderate gGDP
18.987	Low Inv	3.84	Moderate gGDP
34.276	High Inv	5.01	High gGDP

24.003	High Inv	0.72	Moderate gGDP
18.124	Low Inv	-1.36	Contraction gGDP
24.325	High Inv	2.79	Moderate gGDP
24.429	High Inv	4.49	Moderate gGDP
25.076	High Inv	1.66	Moderate gGDP
18.177	Low Inv	6.02	High gGDP
32.759	High Inv	6.16	High gGDP
22.356	Low Inv	3.13	Moderate gGDP
36.824	High Inv	2.76	Moderate gGDP
25.185	High Inv	5.74	High gGDP
21.739	Low Inv	0.97	Moderate gGDP
28.199	High Inv	6.08	High gGDP
24.152	High Inv	5.19	High gGDP
15.933	Low Inv	-9.77	Contraction gGDP
22.327	Low Inv	5.06	High gGDP
17.719	Low Inv	2.62	Moderate gGDP
21.201	Low Inv	2.71	Moderate gGDP
19.683	Low Inv	0.37	Moderate gGDP
24.698	High Inv	7.22	High gGDP
32.9	High Inv	0.37	Moderate gGDP
32.109	High Inv	6.99	High gGDP
42.791	High Inv	2.92	Moderate gGDP

Table 9-Catergorical variable

InvGroup Variable	=IFS(E2:E162<24,"Low Inv",E2:E162>=24,"High Inv")
gGDPgroup vairiable	=IF(G4<0,"Contraction gGDP","")&IF(AND(G4>=0,G4<=5),"Moderate gGDP","")&IF(G4>5,"High gGDP","")

Figure 2-scatter plot

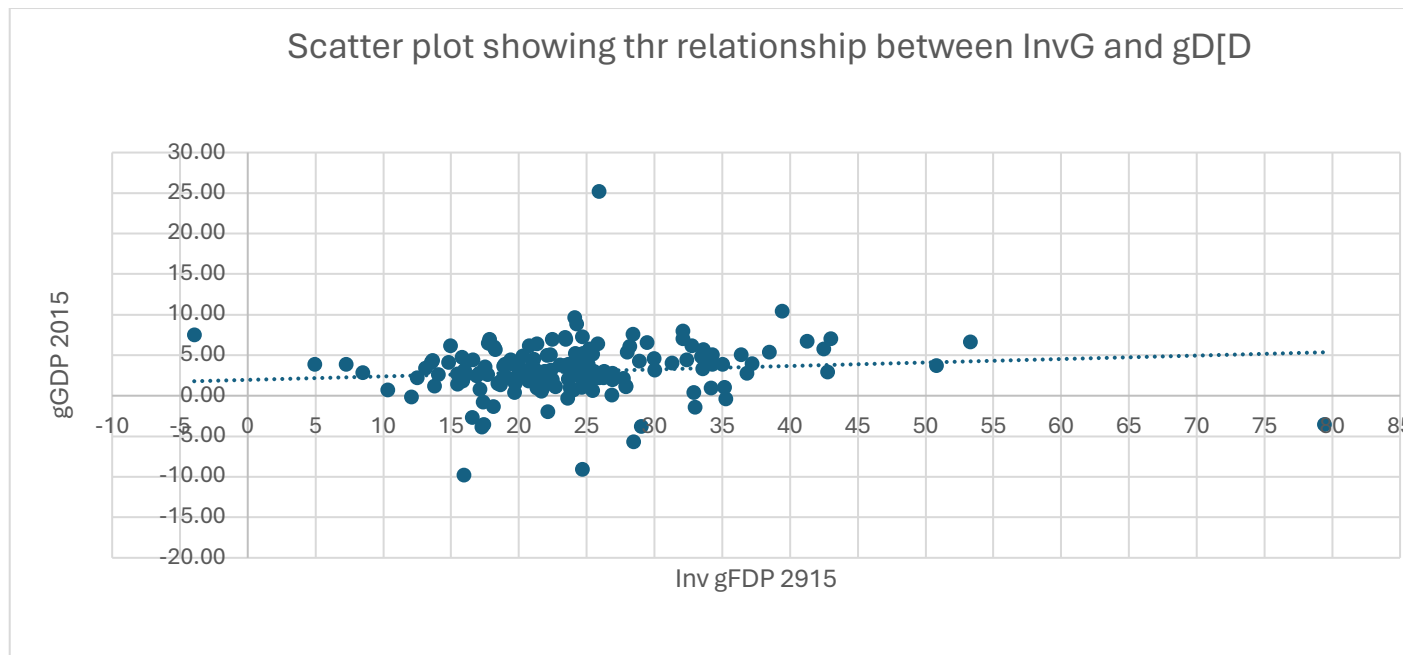


Table 1 Hypothesis variables

Correlation	
Coefficient	=CORREL(B2:B162,C2:C162)
T Statistic	=N21*SQRT(161-2)/SQRT(1-(N21*N21))
T Test	=T.TEST(B2:B162,C2:C162,2,2)

Table 1-Graphical method

Variables	Observations	Mean	Median	Min	Max	Std.Dev	Skewness
inv2015	161	24.23	23.60	-3.95	79.401	9.160939	1.646021
gGdp2015	161	2.99	3.02	-20.60	25.18	3.900968	-0.69302