

In [1]:

```
!ls
```

```
Project.ipynb
world-development-indicators
```

In [2]:

```
!ls world-development-indicators
```

```
Country.csv
CountryNotes.csv
Footnotes.csv
Indicators.csv
Series.csv
SeriesNotes.csv
database.sqlite
hashes.txt
```

In [3]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

In [4]:

```
indicators=pd.read_csv('world-development-indicators/Indicators.csv')
```

In [5]:

```
indicators.head(2)
```

Out[5]:

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
0	Arab World	ARB	Adolescent fertility rate (births per 1,000 wo...	SP.ADO.TFRT	1960	133.560907
1	Arab World	ARB	Age dependency ratio (% of working-age populat...	SP.POP.DPND	1960	87.797601

In [6]:

```
mask1=indicators['CountryName'].str.contains('Bulgaria')
```

In [7]:

```
BGindicators=indicators[mask1]
```

In [8]:

```
BGindicators.head()
```

Out[8]:

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
5876	Bulgaria	BGR	Adolescent fertility rate (births per 1,000 wo...	SP.ADO.TFRT	1960	6.766300e+01
5877	Bulgaria	BGR	Age dependency ratio (% of working-age populat...	SP.POP.DPND	1960	5.051325e+01
5878	Bulgaria	BGR	Age dependency ratio, old (% of working-age po...	SP.POP.DPND.OL	1960	1.126867e+01
5879	Bulgaria	BGR	Age dependency ratio, young (% of working-age ...	SP.POP.DPND.YG	1960	3.924457e+01
5880	Bulgaria	BGR	Arms imports (SIPRI trend indicator values)	MS.MIL.MPRT.KD	1960	4.740000e+08

In [9]:

```
BGindicators.isnull().any()
```

Out[9]:

```
CountryName    False
CountryCode    False
IndicatorName   False
IndicatorCode   False
Year           False
Value          False
dtype: bool
```

In [10]:

```
mask2=BGindicators['IndicatorName'].str.contains('GDP')
mask3=BGindicators['IndicatorName'].str.contains('Inflation')
```

In [11]:

```
GDP=BGindicators[mask2]
Inflation=BGindicators[mask3]
```

In [12]:

GDP[:5]

Out[12]:

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Val
1030335	Bulgaria	BGR	Agriculture, value added (% of GDP)	NV.AGR.TOTL.ZS	1980	1.461081e+
1030354	Bulgaria	BGR	CO2 emissions (kg per 2005 US\$ of GDP)	EN.ATM.CO2E.KD.GD	1980	3.955400e+
1030369	Bulgaria	BGR	Coal rents (% of GDP)	NY.GDP.COAL.RT.ZS	1980	4.035520e-
1030374	Bulgaria	BGR	Discrepancy in expenditure estimate of GDP (co...	NY.GDP.DISC.KN	1980	1.532658e+
1030375	Bulgaria	BGR	Discrepancy in expenditure estimate of GDP (cu...	NY.GDP.DISC.CN	1980	-2.075900e+

In [13]:

mask4=GDP['IndicatorName'].str.contains('GDP per capita \ (constant 2005 US')

In [14]:

GDPnew=GDP[mask4]

In [15]:

GDPnew[:5]

Out[15]:

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
1030425	Bulgaria	BGR	GDP per capita (constant 2005 US\$)	NY.GDP.PCAP.KD	1980	2210.709339
1112435	Bulgaria	BGR	GDP per capita (constant 2005 US\$)	NY.GDP.PCAP.KD	1981	2311.321906
1196899	Bulgaria	BGR	GDP per capita (constant 2005 US\$)	NY.GDP.PCAP.KD	1982	2358.294773
1282064	Bulgaria	BGR	GDP per capita (constant 2005 US\$)	NY.GDP.PCAP.KD	1983	2433.112166
1367680	Bulgaria	BGR	GDP per capita (constant 2005 US\$)	NY.GDP.PCAP.KD	1984	2509.872167

In [16]:

Inflation[:5]

Out[16]:

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
1112541	Bulgaria	BGR	Inflation, GDP deflator (annual %)	NY.GDP.DEFL.KD.ZG	1981	2.820939
1197007	Bulgaria	BGR	Inflation, GDP deflator (annual %)	NY.GDP.DEFL.KD.ZG	1982	1.916473
1282172	Bulgaria	BGR	Inflation, GDP deflator (annual %)	NY.GDP.DEFL.KD.ZG	1983	-0.645272
1367788	Bulgaria	BGR	Inflation, GDP deflator (annual %)	NY.GDP.DEFL.KD.ZG	1984	2.736749
1454126	Bulgaria	BGR	Inflation, GDP deflator (annual %)	NY.GDP.DEFL.KD.ZG	1985	0.229177

In [17]:

mask5=Inflation['IndicatorName'].str.contains('Inflation, consumer prices \\\(annual %')

In [18]:

Inflationnew=Inflation[mask5]

In [19]:

Inflationnew[:5]

Out[19]:

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
1541571	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1986	2.700000
1629812	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1987	2.726388
1718998	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1988	2.369668
1809568	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1989	6.388889
1908692	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1990	23.800000

In [20]:

Inflationnew.shape, GDPnew.shape

Out[20]:

((29, 6), (35, 6))

In [21]:

```
mask6=GDPnew['Year']>1985
GDPfinal=GDPnew[mask6]
```

In [22]:

GDPfinal.shape, Inflationnew.shape

Out[22]:

((29, 6), (29, 6))

In [23]:

```
print(min(GDPfinal['Year']),max(GDPfinal['Year']))
```

1986 2014

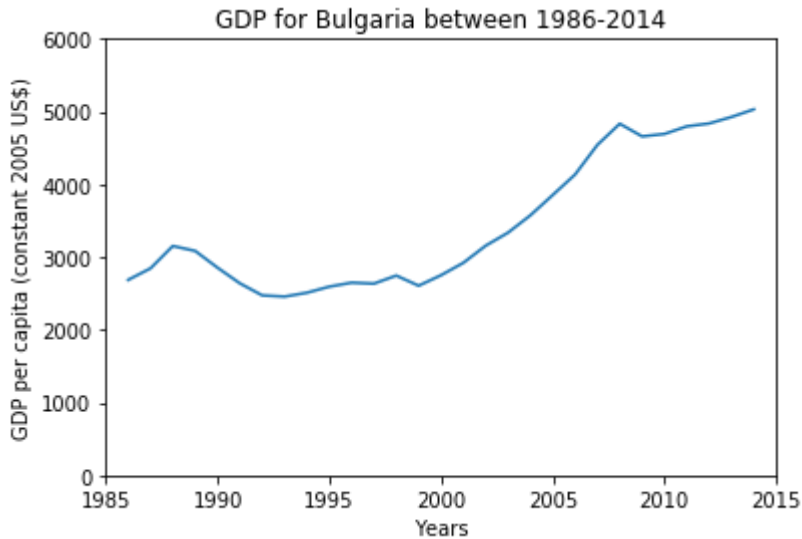
In [24]:

```
print(min(Inflationnew['Year']), max(Inflationnew['Year']))
```

1986 2014

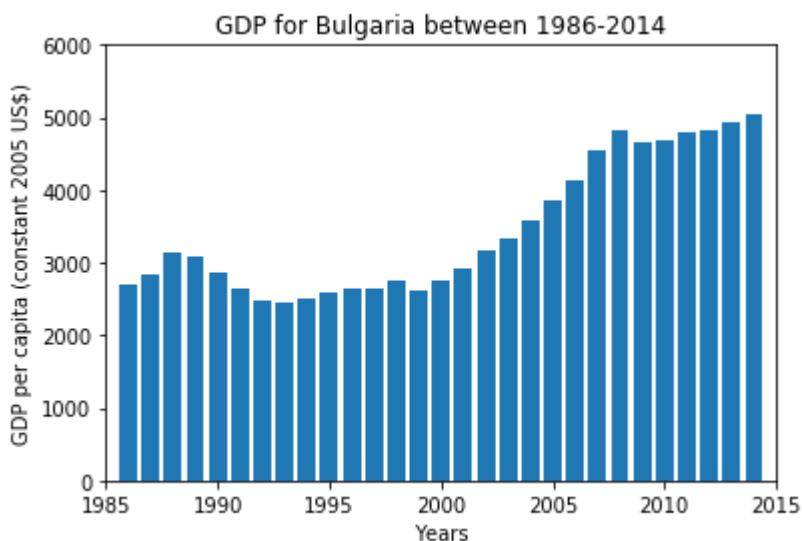
In [25]:

```
plt.plot(GDPfinal['Year'].values, GDPfinal['Value'].values)
plt.title('GDP for Bulgaria between 1986-2014')
plt.xlabel('Years')
plt.ylabel(GDPfinal['IndicatorName'].iloc[0])
plt.axis([1985,2015,0,6000])
plt.show()
```



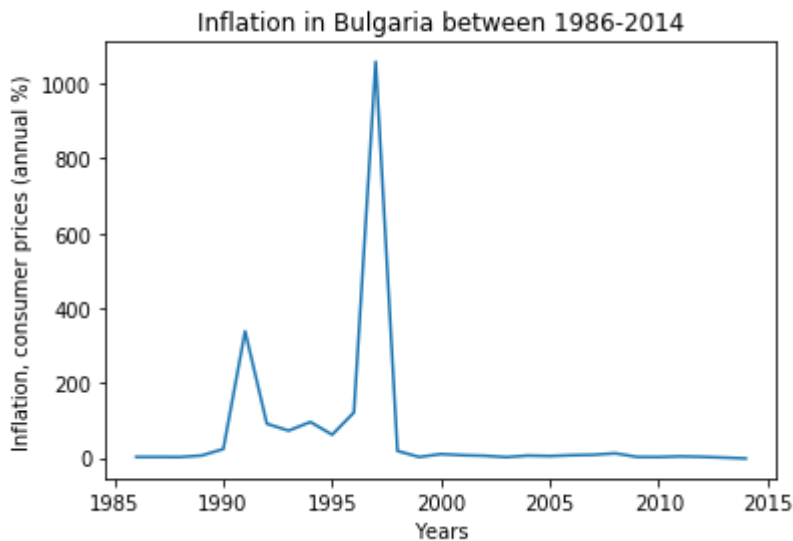
In [26]:

```
plt.bar(GDPfinal['Year'].values, GDPfinal['Value'].values)
plt.title('GDP for Bulgaria between 1986-2014')
plt.xlabel('Years')
plt.ylabel(GDPfinal['IndicatorName'].iloc[0])
plt.axis([1985,2015,0,6000])
plt.show()
```



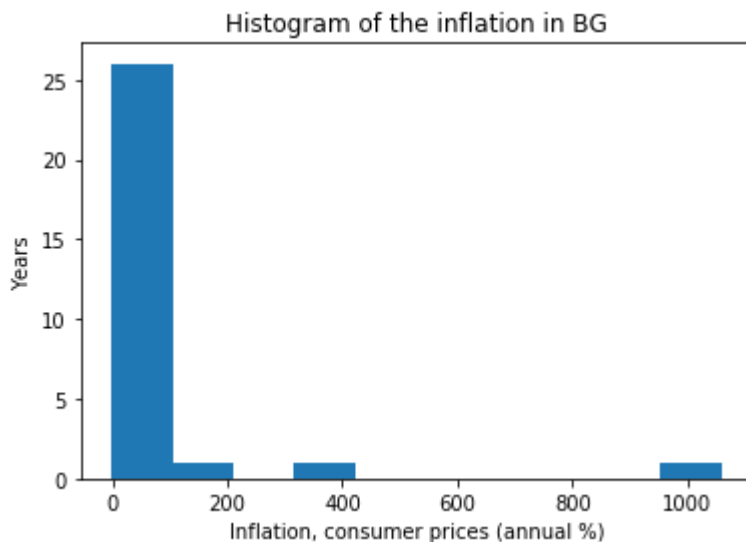
In [27]:

```
plt.plot(Inflationnew['Year'].values, Inflationnew['Value'].values)
plt.title("Inflation in Bulgaria between 1986-2014")
plt.xlabel('Years')
plt.ylabel(Inflationnew['IndicatorName'].iloc[0])
plt.show()
```



In [28]:

```
plt.hist(Inflationnew['Value'].values)
plt.title('Histogram of the inflation in BG')
plt.xlabel(Inflationnew['IndicatorName'].iloc[0])
plt.ylabel('Years')
plt.show()
```



In [29]:

#There are definitely outliers in the graphs of inflation for the periods 1990-1991 and 1995-1999.
#I am not sure whether it's right to delete or change the data when we are talking about macroeconomic indicators, showing the economy of a country honestly.
#Nonetheless, for the goal of the research, i am going to replace the data for the years - 1991 and 1995, with the value of 200 (to avoid/decrease the hyperinflation).

In [30]:

Inflationnew[3:13]

Out[30]:

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
1809568	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1989	6.388889
1908692	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1990	23.800000
2025904	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1991	338.449111
2142821	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1992	91.297933
2265191	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1993	72.878791
2389354	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1994	96.057338
2517087	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1995	62.054834
2652197	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1996	121.607500
2787642	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1997	1058.373852
2924094	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1998	18.672260

In [31]:

```
Inflationnew
```

Out[31]:

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
1541571	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1986	2.700000
1629812	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1987	2.726388
1718998	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1988	2.369668
1809568	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1989	6.388889
1908692	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1990	23.800000
2025904	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1991	338.449111
2142821	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1992	91.297933
2265191	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1993	72.878791
2389354	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1994	96.057338
2517087	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1995	62.054834
2652197	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1996	121.607500
2787642	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1997	1058.373852
2924094	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1998	18.672260
3062355	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1999	2.573009
3207978	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2000	10.316260
3361420	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2001	7.360951
3512692	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2002	5.810131
3667659	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2003	2.157107

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
3821705	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2004	6.346133
3985708	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2005	5.038844
4165542	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2006	7.261613
4343539	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2007	8.402487
4524062	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2008	12.348772
4703622	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2009	2.753172
4884345	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2010	2.438991
5068479	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2011	4.219903
5244437	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2012	2.954568
5415374	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2013	0.890094
5558930	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2014	-1.418123

In [32]:

Inflationnew[3:13]

Out[32]:

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
1809568	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1989	6.388889
1908692	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1990	23.800000
2025904	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1991	338.449111
2142821	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1992	91.297933
2265191	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1993	72.878791
2389354	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1994	96.057338
2517087	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1995	62.054834
2652197	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1996	121.607500
2787642	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1997	1058.373852
2924094	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1998	18.672260

In [33]:

Inflationnew.iloc[5][5]

Out[33]:

338.449111470112

In [34]:

Inflationnew.iat[5,5]=200

In [35]:

```
Inflationnew
```

Out[35]:

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
1541571	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1986	2.700000
1629812	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1987	2.726388
1718998	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1988	2.369668
1809568	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1989	6.388889
1908692	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1990	23.800000
2025904	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1991	200.000000
2142821	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1992	91.297933
2265191	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1993	72.878791
2389354	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1994	96.057338
2517087	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1995	62.054834
2652197	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1996	121.607500
2787642	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1997	1058.373852
2924094	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1998	18.672260
3062355	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1999	2.573009
3207978	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2000	10.316260
3361420	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2001	7.360951
3512692	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2002	5.810131

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
3667659	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2003	2.157107
3821705	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2004	6.346133
3985708	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2005	5.038844
4165542	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2006	7.261613
4343539	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2007	8.402487
4524062	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2008	12.348772
4703622	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2009	2.753172
4884345	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2010	2.438991
5068479	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2011	4.219903
5244437	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2012	2.954568
5415374	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2013	0.890094
5558930	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2014	-1.418123

In [36]:

```
Inflationnew.iloc[11][5]
```

Out[36]:

```
1058.3738516671801
```

In [37]:

```
Inflationnew.at[2787642, 'Value']= 200
```

In [38]:

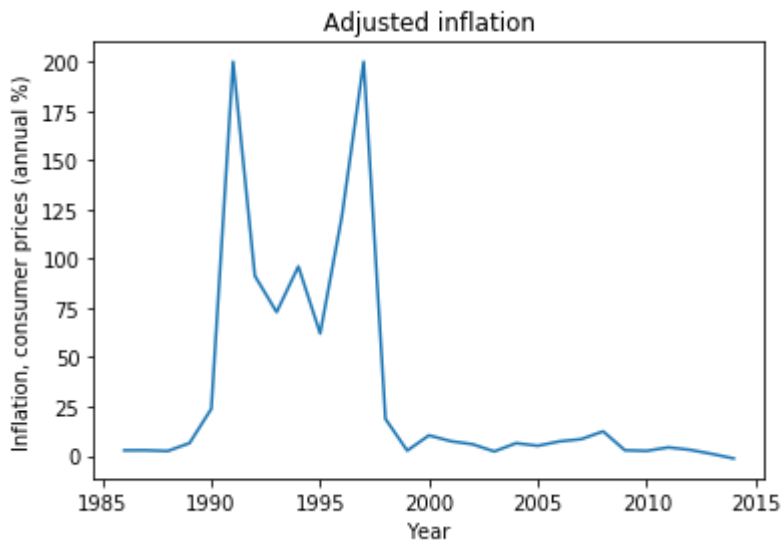
Inflationnew.head(15)

Out[38]:

	CountryName	CountryCode	IndicatorName	IndicatorCode	Year	Value
1541571	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1986	2.700000
1629812	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1987	2.726388
1718998	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1988	2.369668
1809568	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1989	6.388889
1908692	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1990	23.800000
2025904	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1991	200.000000
2142821	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1992	91.297933
2265191	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1993	72.878791
2389354	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1994	96.057338
2517087	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1995	62.054834
2652197	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1996	121.607500
2787642	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1997	200.000000
2924094	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1998	18.672260
3062355	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	1999	2.573009
3207978	Bulgaria	BGR	Inflation, consumer prices (annual %)	FP.CPI.TOTL.ZG	2000	10.316260

In [39]:

```
plt.plot(Inflationnew['Year'], Inflationnew['Value'])  
plt.title('Adjusted inflation')  
plt.xlabel('Year')  
plt.ylabel(Inflationnew['IndicatorName'].iloc[0])  
plt.show()
```



In [40]:

#There are still 2 peaks at the figure, that show the values of the outliers. I will choose to do not alter the data any more.

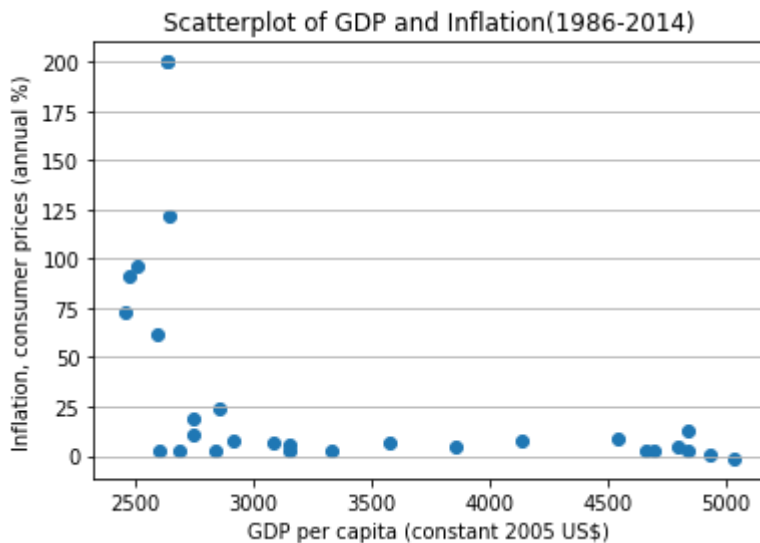
In [41]:

```
fig, axis=plt.subplots()

axis.set_title('Scatterplot of GDP and Inflation(1986-2014)')
axis.set_xlabel(GDPfinal['IndicatorName'].iloc[0])
axis.set_ylabel(Inflationnew['IndicatorName'].iloc[1])
axis.yaxis.grid(True)

X=GDPfinal['Value'].values
Y=Inflationnew['Value'].values

axis.scatter(X,Y)
plt.show()
```



In [42]:

```
np.corrcoef(GDPfinal['Value'].values,Inflationnew['Value'].values )
```

Out[42]:

```
array([[ 1.          , -0.4903754],
       [-0.4903754,  1.          ]])
```

In [43]:

```
#As it seems there is relationship between the two indicators(GDP and Inflation).
#The correlation is (-0,49). The relationship has negative direction and it's strength
is medium.
```

In []: