How can Argentina's inflation between 2014 and November 2016 be predicted?

What is the impact of M2 growth on the demand for US dollars (USD) and the exchange rate in Argentina?

How effective has the new National Consumer Price Index been in combating inflation since its introduction in 2017?

In [23]:
```
import pandas as pd
import math
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

DATA EXPLORATION

In [24]:
```
df = pd.read_csv('argentina merged - Arg_pt2 (1).csv')
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 271 entries, 0 to 270
Data columns (total 5 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   year     271 non-null    int64  
 1   month    271 non-null    int64  
 2   ncpi     236 non-null    float64
 3   ex_rate  271 non-null    float64
 4   m2       271 non-null    float64
dtypes: float64(3), int64(2)
memory usage: 10.7 KB
```

In [25]:
```
pd.set_option('display.max_rows', df.shape[0]+1)
print(df)
```

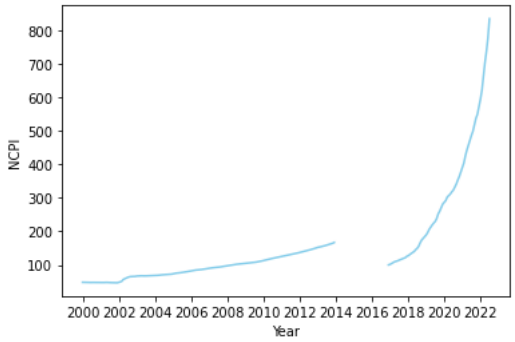
```
     year  month       ncpi    ex_rate            m2
0    2000      1   48.09879    0.99900  2.958935e+04
1    2000      2   48.10076    0.99900  2.877582e+04
2    2000      3   47.84662    0.99900  2.907953e+04
3    2000      4   47.79282    0.99900  2.876504e+04
4    2000      5   47.60705    0.99900  2.920590e+04
5    2000      6   47.51903    0.99900  3.001776e+04
6    2000      7   47.72541    0.99900  2.960987e+04
7    2000      8   47.62273    0.99900  2.914851e+04
8    2000      9   47.54960    0.99900  2.940293e+04
9    2000     10   47.63481    0.99900  2.845849e+04
10   2000     11   47.40065    0.99900  2.813883e+04
11   2000     12   47.34766    0.99900  3.004754e+04
12   2001      1   47.38574    0.99900  2.880066e+04
13   2001      2   47.27780    0.99900  2.912824e+04
14   2001      3   47.36788    0.99900  2.579778e+04
15   2001      4   47.68451    0.99900  2.691109e+04
16   2001      5   47.71537    0.99900  2.640372e+04
17   2001      6   47.37121    0.99900  2.634358e+04
```

In [26]:
```
df['year'] = df['year'].astype(str)
df['month'] = df['month'].astype(str)
df['m2_usd'] = df['m2']/df['ex_rate']
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 271 entries, 0 to 270
Data columns (total 6 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   year     271 non-null    object 
 1   month    271 non-null    object 
 2   ncpi     236 non-null    float64
 3   ex_rate  271 non-null    float64
 4   m2       271 non-null    float64
 5   m2_usd   271 non-null    float64
dtypes: float64(4), object(2)
memory usage: 12.8+ KB
```

In [27]:
```
plt.xticks([0,24,48,72,96,120,144,168,192,216,240,264], ['2000',"2002","2004","2006","2008","2010","2012","2014","2016","2018", '
plt.xlabel("Year")
plt.ylabel("NCPI")
df["ncpi"].plot(color="skyblue")
```

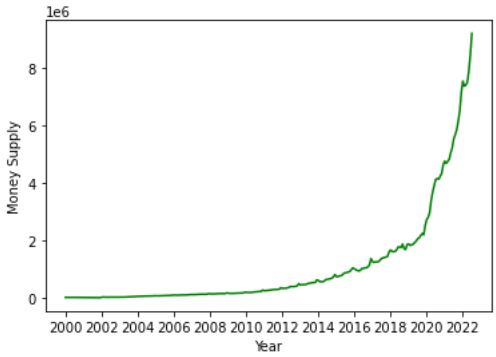
Out[27]: <AxesSubplot:xlabel='Year', ylabel='NCPI'>



The graph demonstrates a hiatus in data between 2014 and 2016, as there is a blank space in the visualization during this time period. This is due to the absence of official data for this time frame.

In [28]:
```
plt.xticks([0,24,48,72,96,120,144,168,192,216,240,264], ['2000',"2002","2004","2006","2008","2010","2012","2014","2016","2018", '
plt.xlabel("Year")
plt.ylabel("Money Supply")
df["m2"].plot(color='green')
```

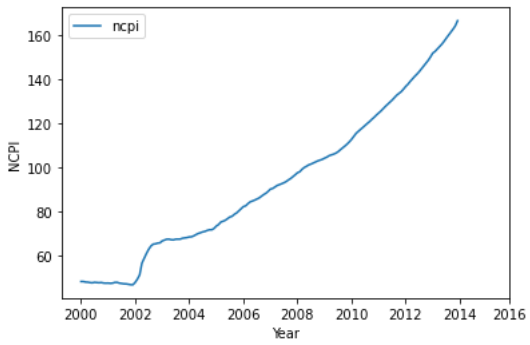
Out[28]: <AxesSubplot:xlabel='Year', ylabel='Money Supply'>



The graph illustrates a dramatic increase in the levels of M2 over the years.

In [29]:
```
df["ncpi"].iloc[0:203].plot()
plt.xticks([0,24,48,72,96,120,144,168,190], ['2000',"2002","2004","2006","2008","2010","2012","2014","2016"])
plt.legend(loc='upper left')
plt.xlabel("Year")
plt.ylabel("NCPI")
```

Out[29]: Text(0, 0.5, 'NCPI')

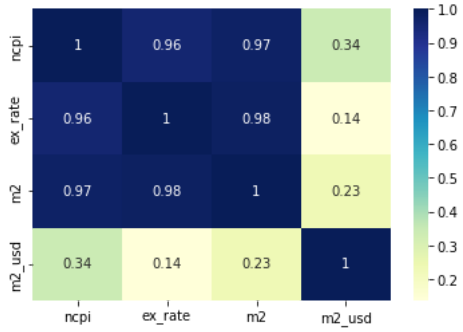


The graph illustrates a dramatic increase in the consumer prices.

In [30]:
```
numeric_features = df.select_dtypes(include=[np.number])
corr = numeric_features.corr()
print (corr['ncpi'].sort_values(ascending=False)[:10], '\n')
```

```
ncpi       1.000000
m2         0.974690
ex_rate    0.955132
m2_usd     0.340189
Name: ncpi, dtype: float64
```

In [31]:
```
corr_matrix = df.corr()
sns.heatmap(corr_matrix, annot=True, cmap="YlGnBu")
plt.show()
```



To create the linear regression model, M2 appears to be the best variable for the model

ARGENTINA'S INFLATION WITH LINEAR REGRESSION

In [38]:
```
df["m2_pctchange"]=df["m2"].pct_change()+1
df["inflation"]=100*df["ncpi"].pct_change()
df["inflation"]=df["inflation"].round(decimals = 2)
df["m2_pctchange"]=df["m2_pctchange"].round(decimals = 2)
df["ncpi"]=df["ncpi"].round(decimals = 2)
df["ncpi"]=df["ncpi"].round(decimals = 2)
```

In [39]:
```
while df['ncpi'].isna().sum() > 0:
 df.loc[df['ncpi'].isna(), 'ncpi'] = df['ncpi'].shift(1) * df['m2_pctchange']
```

In [40]:
```
df
```

Out[40]:

	year	month	ncpi	ex_rate	m2	m2_usd	m2_pctchange	inflation
0	2000	1	48.10	0.99900	2.958935e+04	29618.972973	NaN	NaN
1	2000	2	48.10	0.99900	2.877582e+04	28804.628218	0.97	0.00
2	2000	3	47.85	0.99900	2.907953e+04	29108.641762	1.01	-0.52
3	2000	4	47.79	0.99900	2.876504e+04	28793.836897	0.99	-0.13
4	2000	5	47.61	0.99900	2.920590e+04	29235.134775	1.02	-0.38
5	2000	6	47.52	0.99900	3.001776e+04	30047.806036	1.03	-0.19
6	2000	7	47.73	0.99900	2.960987e+04	29639.510490	0.99	0.44
7	2000	8	47.62	0.99900	2.914851e+04	29177.691832	0.98	-0.23
8	2000	9	47.55	0.99900	2.940293e+04	29432.364234	1.01	-0.15
9	2000	10	47.63	0.99900	2.845849e+04	28486.976937	0.97	0.17
10	2000	11	47.40	0.99900	2.813883e+04	28166.993373	0.99	-0.48

In [41]:
```
df=df.replace([-67.92], 0)
```

In [42]:
```
#Inf 2014
df["inflation"].iloc[168:180].sum()
```

Out[42]: 27.0

In [43]:
```
#inf 2015
df["inflation"].loc[180:191].sum()
```

Out[43]: 28.0

In [44]:
```
#inf 2016
df["inflation"].loc[192:202].sum()
```

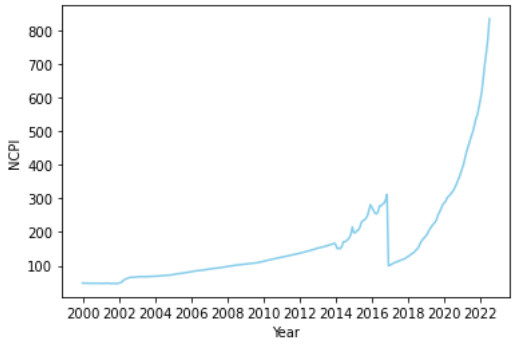
Out[44]: 11.0

In [45]:
```
#accumulative infl 2014-2016
df["inflation"].loc[156:202].sum().round(decimals = 2)
```

Out[45]: 76.45

In [46]:
```
df["ncpi"].plot(color='skyblue')
plt.xticks([0,24,48,72,96,120,144,168,192,216,240,264], ['2000',"2002","2004","2006","2008","2010","2012","2014","2016","2018", '
plt.xlabel("Year")
plt.ylabel("NCPI")
```

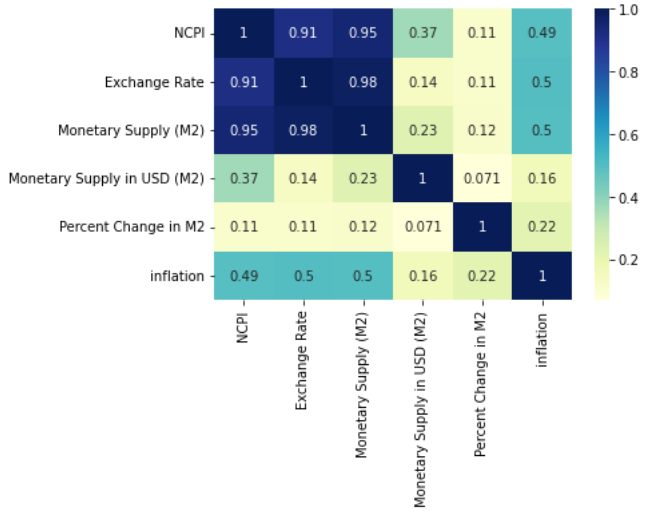
Out[46]: Text(0, 0.5, 'NCPI')



According to the predicted data for the years 2014-2016, there was a significant increase in the prices of goods in Argentina compared to previous years. This trend was observed even when the method of measuring the NCPI (National Consumer Price Index) was introduced, indicating that the inflation rate continued to rise at unprecedented levels.

NEW VARIABLES RELATIONS

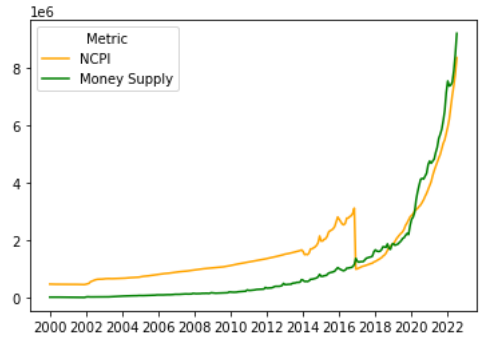
In [47]:
```
df = df.rename(columns={"ncpi": "NCPI", "ex_rate": "Exchange Rate", "m2": "Monetary Supply (M2)", "m2_usd": "Monetary Supply in U
corr_matrix = df.corr()
sns.heatmap(corr_matrix, annot=True, cmap="YlGnBu")
plt.show()
```



This correlation matrix will help us identify the relationship between M2 and the other variables, allowing us to assess the impact that M2 has on these variables.

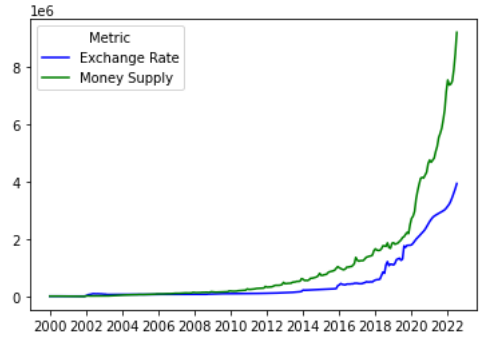
In [48]:
```
plt.plot(10000*df['NCPI'], label='NCPI', color='orange')
plt.plot(df['Monetary Supply (M2)'], label='Money Supply', color='green')
plt.xticks([0,24,48,72,96,120,144,168,192,216,240,264], ['2000',"2002","2004","2006","2008","2010","2012","2014","2016","2018", '
plt.legend(loc='upper left', title='Metric')
```

Out[48]: <matplotlib.legend.Legend at 0x22f4dbe4250>



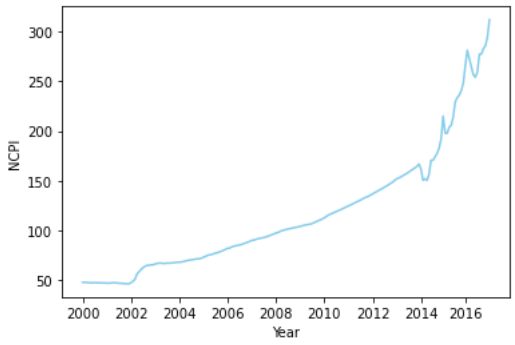
In [49]:
```
plt.plot(30000*df['Exchange Rate'], label='Exchange Rate', color='blue')
plt.plot(df['Monetary Supply (M2)'], label='Money Supply', color='green')
plt.xticks([0,24,48,72,96,120,144,168,192,216,240,264], ['2000',"2002","2004","2006","2008","2010","2012","2014","2016","2018", '
plt.legend(loc='upper left', title='Metric')
```

Out[49]: <matplotlib.legend.Legend at 0x22f4da77d00>



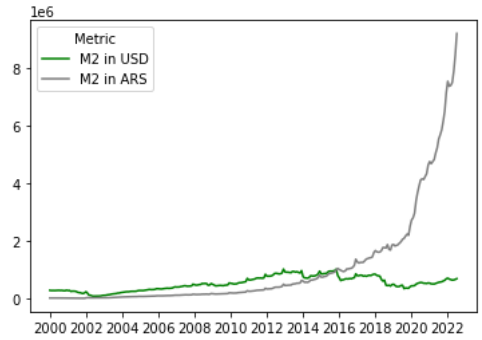
In [50]:
```
df["NCPI"].iloc[0:203].plot(color='skyblue')
plt.xticks([0,24,48,72,96,120,144,168,190], ['2000',"2002","2004","2006","2008","2010","2012","2014","2016"])
plt.xlabel("Year")
plt.ylabel("NCPI")
```

Out[50]: Text(0, 0.5, 'NCPI')



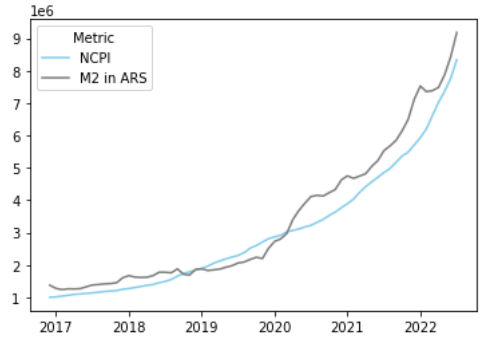
In [51]:
```
plt.plot(10*df['Monetary Supply in USD (M2)'], label='M2 in USD', color='green')
plt.plot(df['Monetary Supply (M2)'], label='M2 in ARS', color='grey')
plt.xticks([0,24,48,72,96,120,144,168,192,216,240,264], ['2000',"2002","2004","2006","2008","2010","2012","2014","2016","2018", '
plt.legend(loc='upper left', title='Metric')
```

Out[51]: <matplotlib.legend.Legend at 0x22f4c676130>



In [52]:
```
plt.plot(10000*df["NCPI"].iloc[203:], label='NCPI', color='skyblue')
plt.plot(df['Monetary Supply (M2)'].iloc[203:], label='M2 in ARS', color='grey')
plt.xticks([204,216,228,240,252,264], ["2017","2018","2019", "2020","2021","2022"])
plt.legend(loc='upper left', title='Metric')
```

Out[52]: <matplotlib.legend.Legend at 0x22f4c6731f0>



In [ ]:

In [ ]: