Bank Stock Analysis

We'll focus on bank stocks and see how they progressed in the past 20 years

pip install yfinanace
pip install pandas_datareader

Lets import all the required libraries

In [164…
```python
from pandas_datareader import data as pdr # datareader to read data from yahoo finance API
import yfinance as yf
import pandas as pd
import numpy as np
import datetime as dt
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
import plotly
import cufflinks as cf
cf.go_offline()
```

Data

We will import data of stocks information of these 5 stocks:

- State Bank of India
- HDFC Bank
- ICICI Bank
- Punjab National Bank
- IndusInd Bank

In [3]:
```python
start = dt.datetime(2005,1,1)
print(start)
```
```
2005-01-01 00:00:00
```

In [4]:
```python
end = dt.datetime.now()
print(end)
```
```
2024-05-19 07:15:06.152890
```

In [5]:
```python
yf.pdr_override()
```

In [6]:
```python
tickers = ['SBI','HDFC','ICICI','PNB','KMB']
```

In [7]:
```python
#State Bank of India
SBI = pdr.get_data_yahoo("SBIN.NS", start, end)

#HDFC
HDFC = pdr.get_data_yahoo("HDFCBANK.NS",start,end)

#ICICI
ICICI = pdr.get_data_yahoo("ICICIBANK.NS",start,end)

#Punjab National Bank
PNB = pdr.get_data_yahoo("PNB.NS",start,end)

#Kotak Mahindra Bank
KMB = pdr.get_data_yahoo("KOTAKBANK.NS",start,end)
```
```
[*********************100%%**********************]  1 of 1 completed
[*********************100%%**********************]  1 of 1 completed
[*********************100%%**********************]  1 of 1 completed
[*********************100%%**********************]  1 of 1 completed
[*********************100%%**********************]  1 of 1 completed
```

Arranging data in multi-level indexed dataframe

In [8]:
```python
bank_stocks = pd.concat([SBI,HDFC,ICICI,PNB,KMB],axis=1,keys=tickers)
```

In [9]:
```python
bank_stocks.columns.names = ['Bank Ticker','Stock Info']
bank_stocks.head()
```

Out[9]:

Bank Ticker	SBI						HDFC				...	PNB				KMB					
Stock Info	Open	High	Low	Close	Adj Close	Volume	Open	High	Low	Close	...	Low	Close	Adj Close	Volume	Open	High	Low	Close	Adj Close	Volume
Date																					
2005-01-03	61.753441	62.545998	61.338287	61.871380	48.866093	22590407	51.605000	52.779999	51.605000	52.525002	...	81.000000	83.809998	61.972977	5412820	29.000000	29.100000	28.000000	28.705000	28.154261	761120
2005-01-04	62.163872	62.168587	60.965599	61.319420	48.430161	26206416	52.505001	53.099998	50.500000	51.945000	...	83.110001	86.980003	64.317032	12291095	29.000000	30.400000	28.200001	29.750000	29.179207	745130
2005-01-05	61.324139	61.876095	55.762081	58.257694	46.011997	52142335	52.000000	52.000000	48.700001	50.005001	...	80.199997	84.669998	62.608898	11409410	29.799999	30.200001	27.900000	28.900000	28.345520	736430
2005-01-06	58.050117	59.338024	56.247993	57.016964	45.032070	47719200	50.005001	50.980000	47.900002	48.514999	...	80.709999	82.849998	61.263107	11366290	28.900000	28.900000	26.299999	28.094999	27.555962	1027790
2005-01-07	57.498161	58.493572	57.106598	58.087860	45.877865	30985674	48.799999	49.375000	48.450001	49.025002	...	78.540001	80.540001	59.555000	16589205	29.000000	29.150000	28.100000	28.410000	27.864922	226710

5 rows × 30 columns

EDA

Highest Closing Price:

In [12]:
```python
bank_stocks.xs('Close',axis=1,level = 'Stock Info',drop_level=True).max()
```
Out[12]:
```
Bank Ticker
SBI       831.450012
HDFC     1728.199951
ICICI    1160.150024
PNB       277.079987
KMB      2210.949951
dtype: float64
```

Date of Highest Closing Price:

In [13]:
```python
bank_stocks.xs('Close',axis=1,level = 'Stock Info',drop_level=True).idxmax()
```
Out[13]:
```
Bank Ticker
SBI     2024-05-03
HDFC    2023-07-04
ICICI   2024-04-29
PNB     2010-11-09
KMB     2021-10-26
dtype: datetime64[ns]
```

Lowest Closing Price:

In [14]:
```python
bank_stocks.xs('Close',axis=1,level = 'Stock Info',drop_level=True).min()
```
Out[14]:
```
Bank Ticker
SBI      53.893909
HDFC     48.095001
ICICI    47.809093
PNB      26.600000
KMB      26.055000
dtype: float64
```

Date of Highest Closing Price:

In [15]:
```python
bank_stocks.xs('Close',axis=1,level = 'Stock Info',drop_level=True).idxmin()
```
Out[15]:
```
Bank Ticker
SBI     2005-01-24
HDFC    2005-01-12
ICICI   2009-03-09
PNB     2020-05-19
KMB     2005-01-25
dtype: datetime64[ns]
```

Dataframe to store returns of each stock

In [16]:
```python
returns = pd.DataFrame()
for tick in tickers:
    returns[tick+' Return'] = bank_stocks[tick]['Close'].pct_change()
```

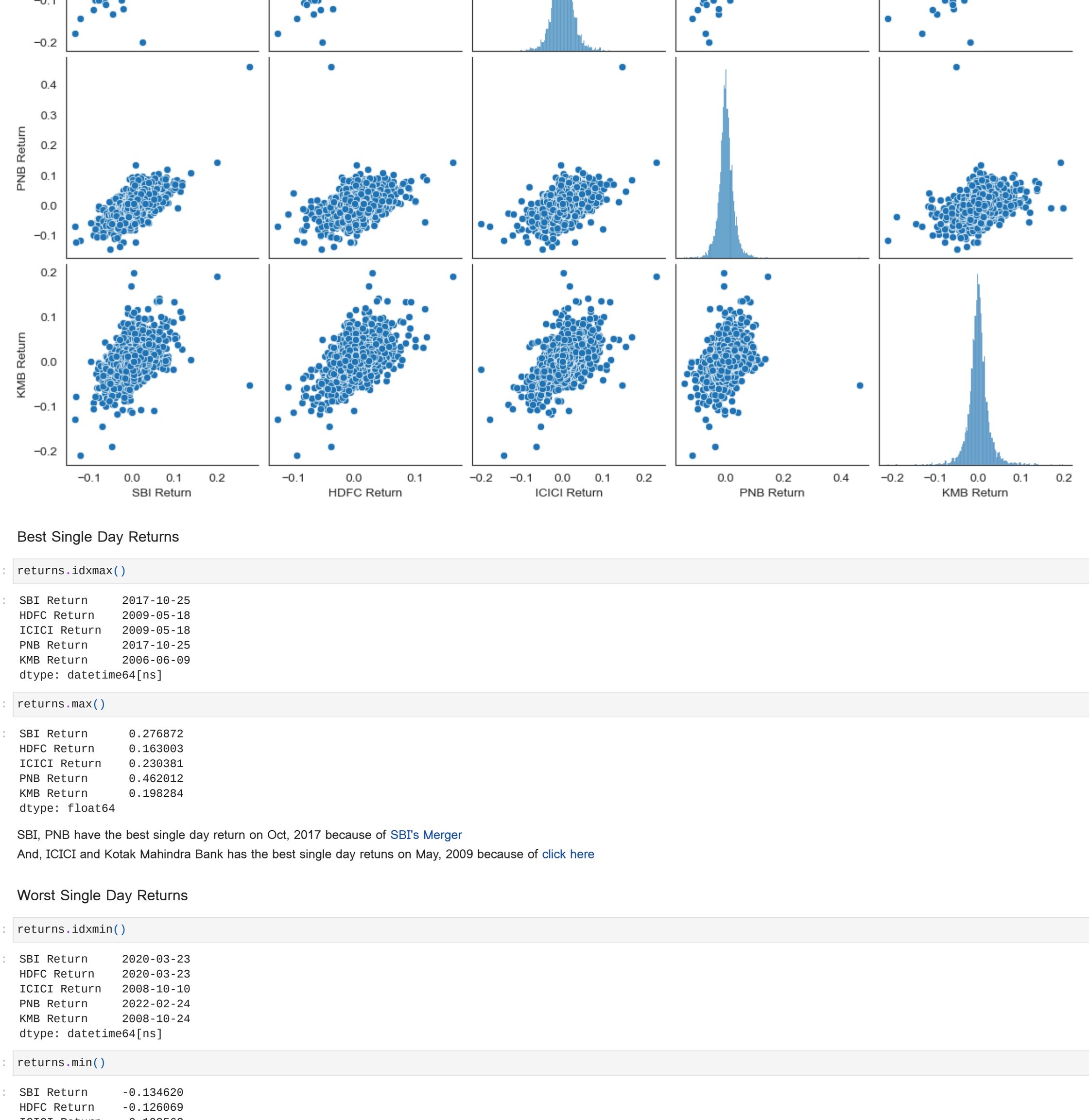
In [17]:
```python
returns = returns[1:]
```

In [18]:
```python
returns.head()
```

Out[18]:

	SBI Return	HDFC Return	ICICI Return	PNB Return	KMB Return
Date					
2005-01-04	-0.008921	-0.011042	0.006867	0.037824	0.036405
2005-01-05	-0.049931	-0.037347	-0.032495	-0.026558	-0.028571
2005-01-06	-0.021297	-0.029797	-0.023082	-0.021495	-0.027855
2005-01-07	0.018782	0.010512	0.014997	-0.027882	0.011212
2005-01-10	-0.025501	-0.001020	-0.027321	-0.053886	0.004928

In [19]:
```python
sns.pairplot(returns)
```
Out[19]:
```
<seaborn.axisgrid.PairGrid at 0x2c1475c5390>
```



Best Single Day Returns

In [20]:
```python
returns.idxmax()
```
Out[20]:
```
SBI Return     2017-10-25
HDFC Return    2009-05-18
ICICI Return   2009-05-18
PNB Return     2017-10-25
KMB Return     2006-06-09
dtype: datetime64[ns]
```

In [21]:
```python
returns.max()
```
Out[21]:
```
SBI Return      0.276872
HDFC Return     0.163003
ICICI Return    0.230381
PNB Return      0.462012
KMB Return      0.198284
dtype: float64
```

SBI, PNB have the best single day return on Oct, 2017 because of SBI's Merger
And, ICICI and Kotak Mahindra Bank has the best single day retuns on May, 2009 because of click here

Worst Single Day Returns

In [22]:
```python
returns.idxmin()
```
Out[22]:
```
SBI Return     2020-03-23
HDFC Return    2020-03-23
ICICI Return   2008-10-10
PNB Return     2022-02-24
KMB Return     2008-10-24
dtype: datetime64[ns]
```

In [23]:
```python
returns.min()
```
Out[23]:
```
SBI Return     -0.134620
HDFC Return    -0.126069
ICICI Return   -0.198568
PNB Return     -0.143240
KMB Return     -0.210421
dtype: float64
```

SBI, HDFC have the worst single day return on March, 2020 because stock market crasis due to covid-19
And, ICICI and Kotak Mahindra Bank has the worst single day retuns on Oct, 2008 because of Global Financial Crisis, 2008

Let's check which stock was the riskiest overtime

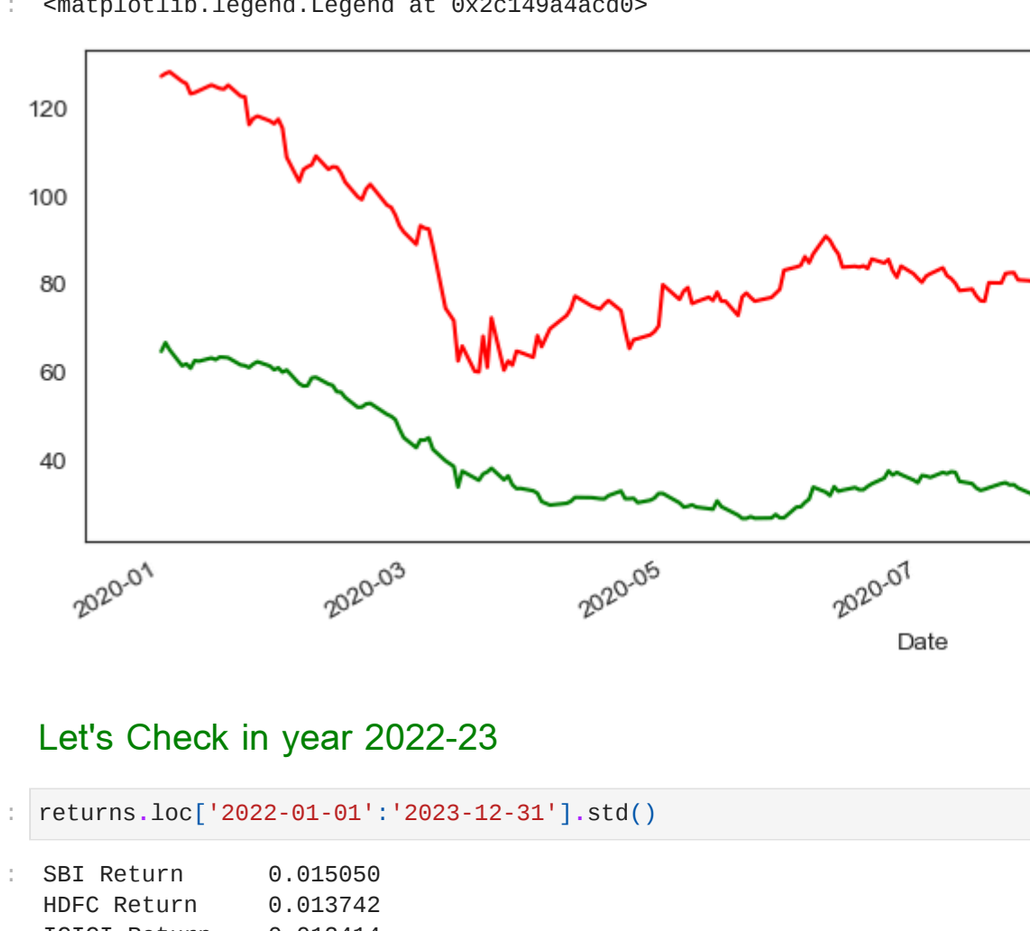
In [24]:
```python
returns.std()
```
Out[24]:
```
SBI Return      0.022731
HDFC Return     0.018180
ICICI Return    0.024411
PNB Return      0.026221
KMB Return      0.024079
dtype: float64
```

All Stocks have a similar risk profile

Banking Sector duirng covid (2020-21)

In [25]:
```python
returns.loc['2020-01-01':'2021-12-31'].std()
```
Out[25]:
```
SBI Return      0.026208
HDFC Return     0.021207
ICICI Return    0.027496
PNB Return      0.028254
KMB Return      0.023766
dtype: float64
```

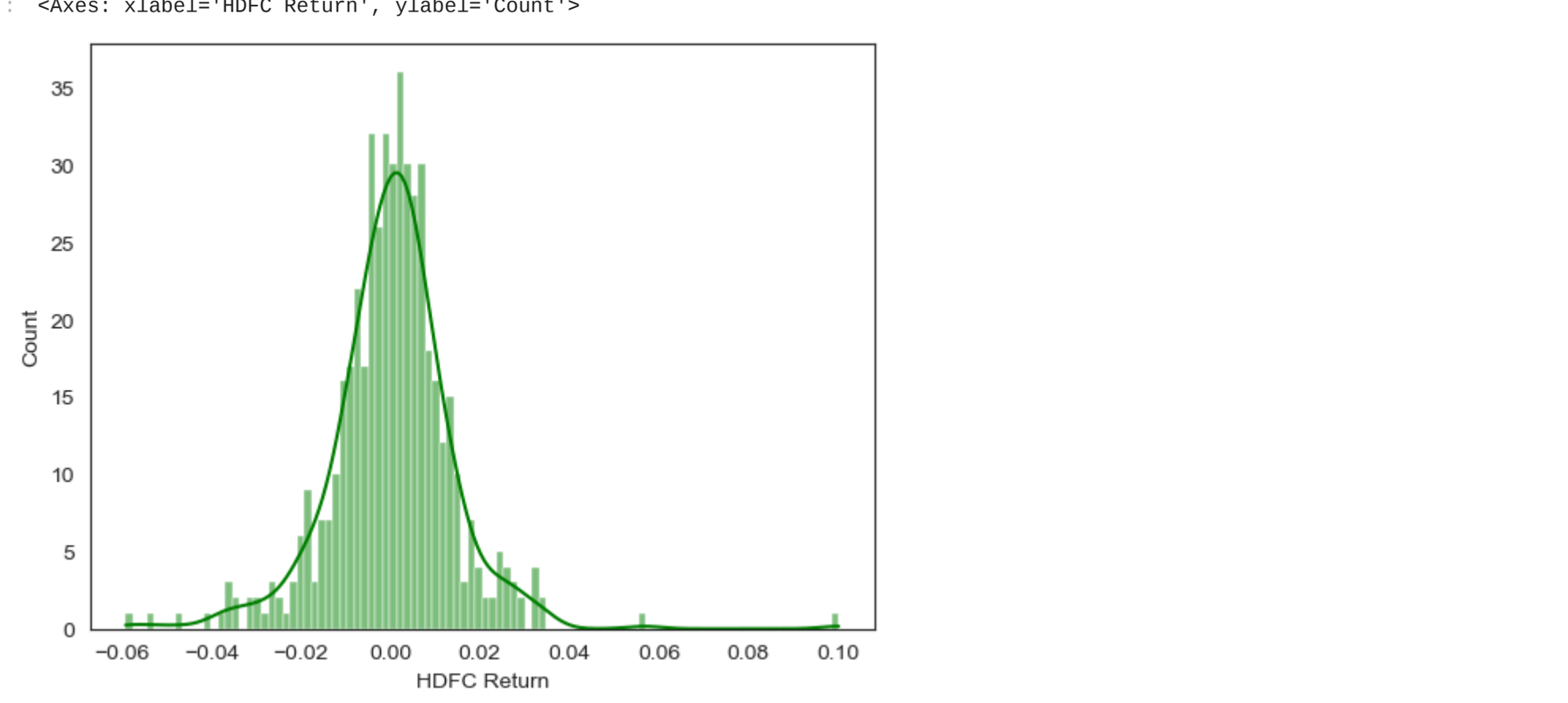
In [26]:
```python
sns.histplot(returns['SBI Return'].loc['2022-01-01':'2023-12-31'],color='green',bins=100,kde=True)
```
Out[26]:
```
<Axes: xlabel='SBI Return', ylabel='Count'>
```



Let's Compare returns of banking v/s other industry during covid-19

In [27]:
```python
ONGC = pdr.get_data_yahoo("ONGC.NS", start, end)
```
```
[*********************100%%**********************]  1 of 1 completed
```

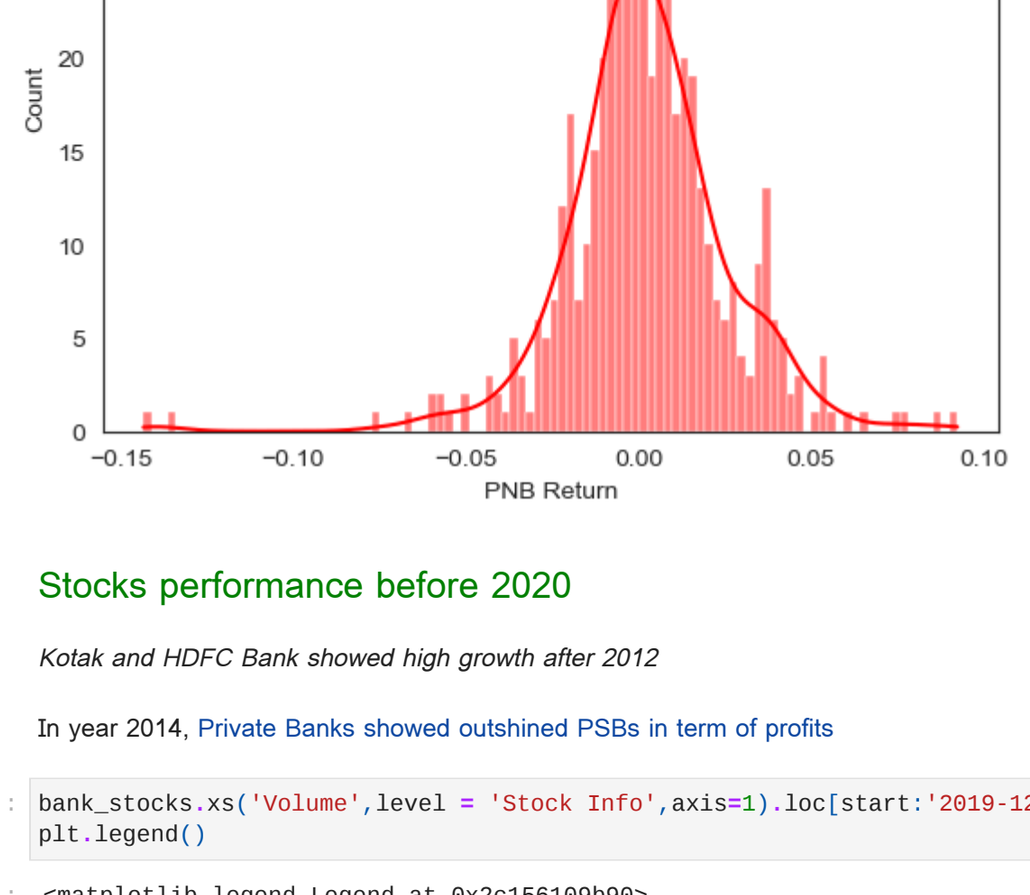
In [32]:
```python
ONGC['Close'].loc['2020-01-01':'2020-12-31'].plot(figsize=(12,4),color = 'red')
bank_stocks.xs('Close',level = 'Stock Info',axis=1)['PNB'].loc['2020-01-01':'2020-12-31'].plot(figsize=(12,4),color='green',label='ONGC')
plt.legend()
```
Out[32]:
```
<matplotlib.legend.Legend at 0x2c149a4acd0>
```



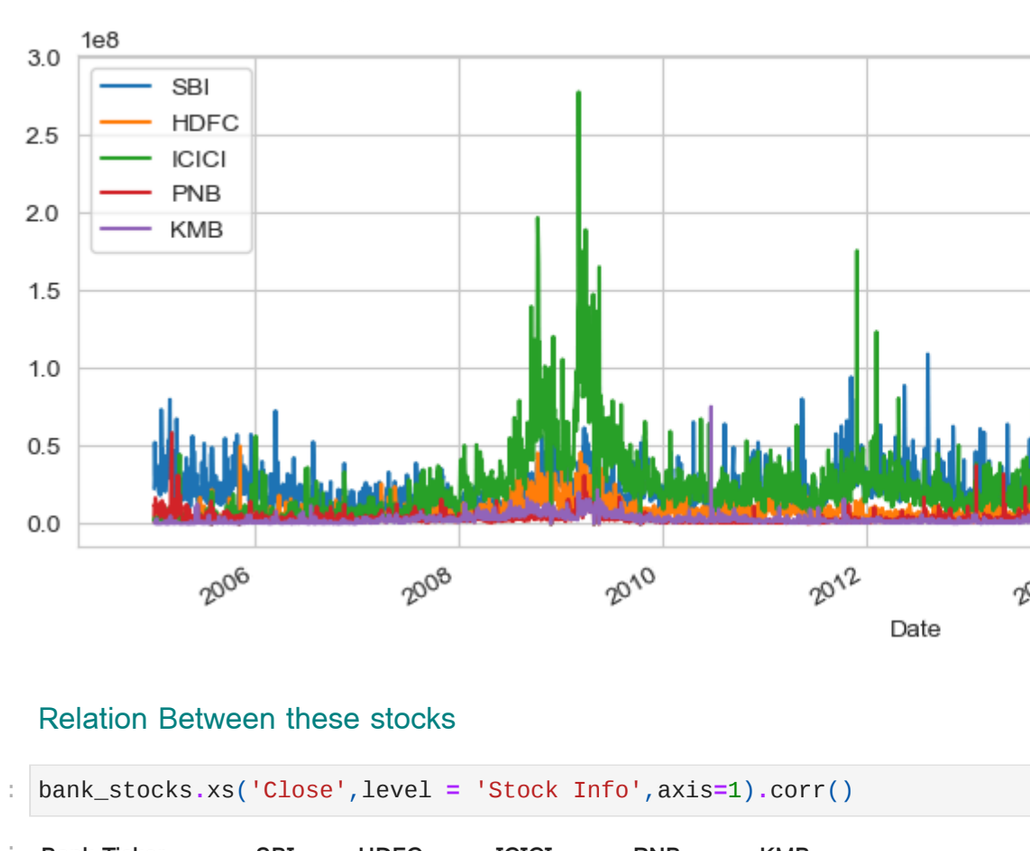
Let's Check in year 2022-23

In [29]:
```python
returns.loc['2022-01-01':'2023-12-31'].std()
```
Out[29]:
```
SBI Return      0.015050
HDFC Return     0.013742
ICICI Return    0.012414
PNB Return      0.023727
KMB Return      0.013458
dtype: float64
```

In [30]:
```python
sns.histplot(returns['HDFC Return'].loc['2022-01-01':'2023-12-31'],color='green',bins=100,kde=True)
```
Out[30]:
```
<Axes: xlabel='HDFC Return', ylabel='Count'>
```



In [31]:
```python
sns.histplot(returns['PNB Return'].loc['2022-01-01':'2023-12-31'],color='red',bins=100,kde=True,)
```
Out[31]:
```
<Axes: xlabel='PNB Return', ylabel='Count'>
```

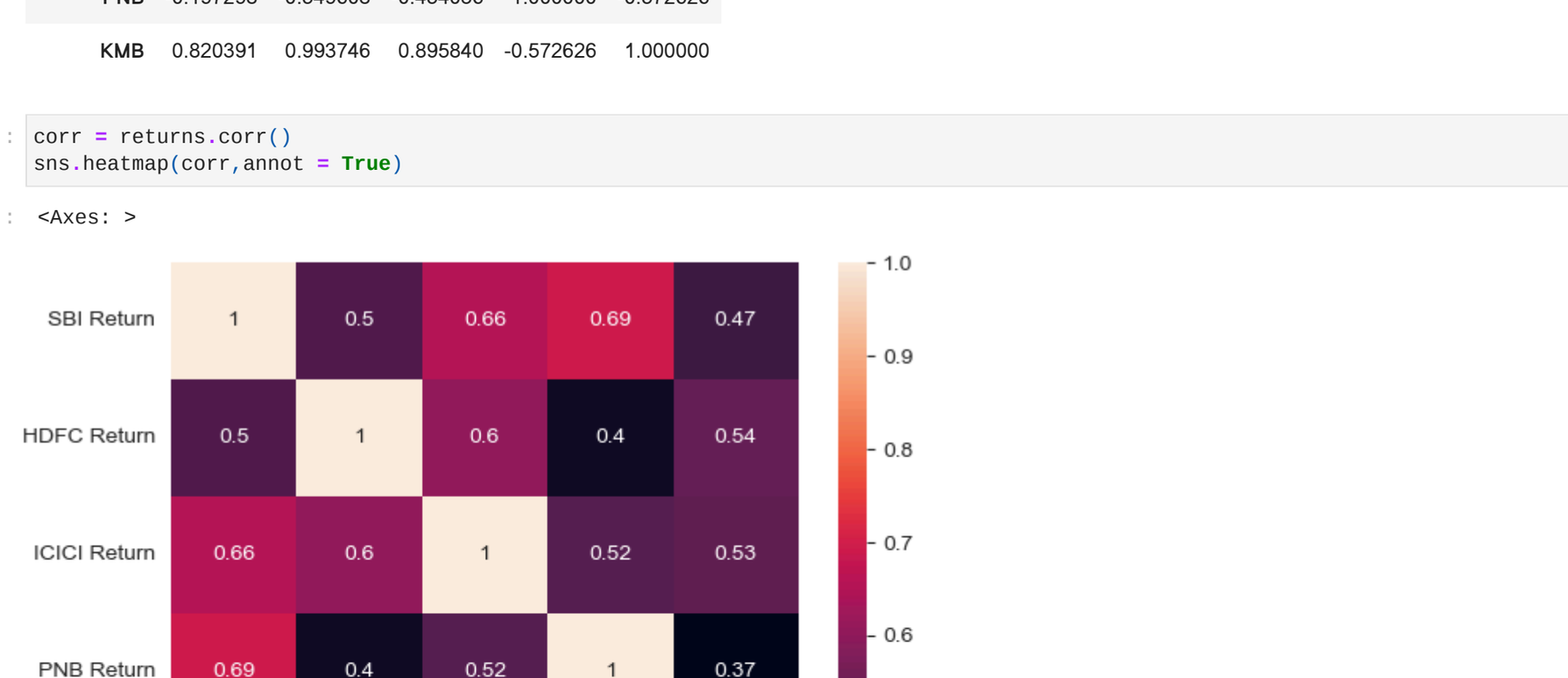


Stocks performance before 2020

Kotak and HDFC Bank showed high growth after 2012

In year 2014, Private Banks showed outshined PSBs in term of profits

In [80]:
```python
bank_stocks.xs('Volume',level = 'Stock Info',axis=1).loc[start:'2019-12-31'].plot(figsize=(12,4))
plt.legend()
```
Out[80]:
```
<matplotlib.legend.Legend at 0x2c156109b90>
```



Relation Between these stocks

In [35]:
```python
bank_stocks.xs('Close',level = 'Stock Info',axis=1).corr()
```

Out[35]:

Bank Ticker	SBI	HDFC	ICICI	PNB	KMB
Bank Ticker					
SBI	1.000000	0.843734	0.948432	-0.197298	0.820391
HDFC	0.843734	1.000000	0.911484	-0.549608	0.993746
ICICI	0.948432	0.911484	1.000000	-0.454036	0.895840
PNB	-0.197298	-0.549608	-0.454036	1.000000	-0.572626
KMB	0.820391	0.993746	0.895840	-0.572626	1.000000

In [41]:
```python
corr = returns.corr()
sns.heatmap(corr,annot = True)
```
Out[41]:
```
<Axes: >
```

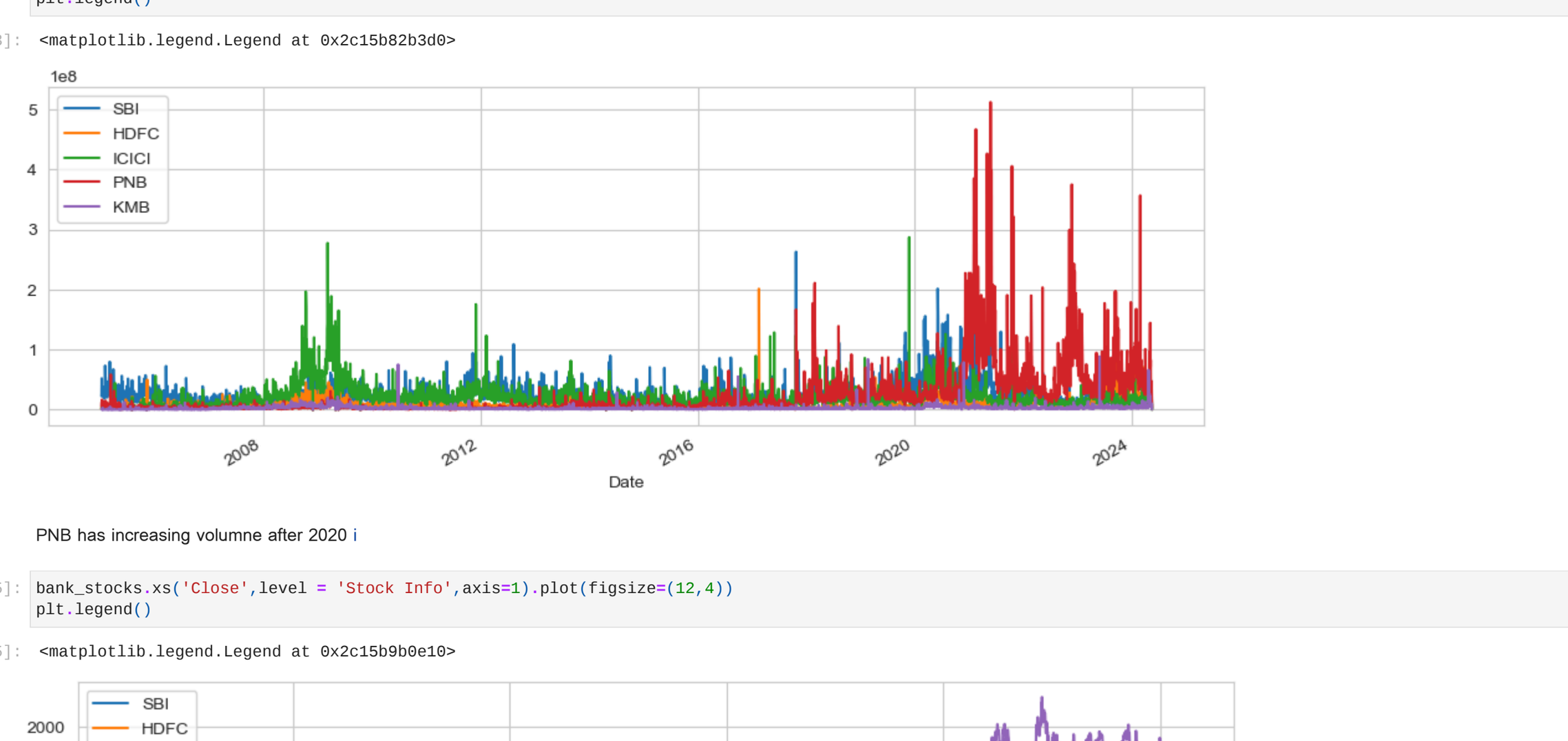
Private v/s Public Bank

HDFC

In [59]:
```python
bank_stocks['HDFC'].loc['2015-01-01':].iplot(kind='candle',
                                    annotations=[dict(
       x='2016-12-09', y=0.05, xref='x', yref='paper',
       showarrow=True, xanchor='left', text='Increase Period Begins'),
                                             dict(
       x='2020-03-01', y=0.05, xref='x', yref='paper',
       showarrow=True, xanchor='left', text='Covid 19 Breakout')])
```

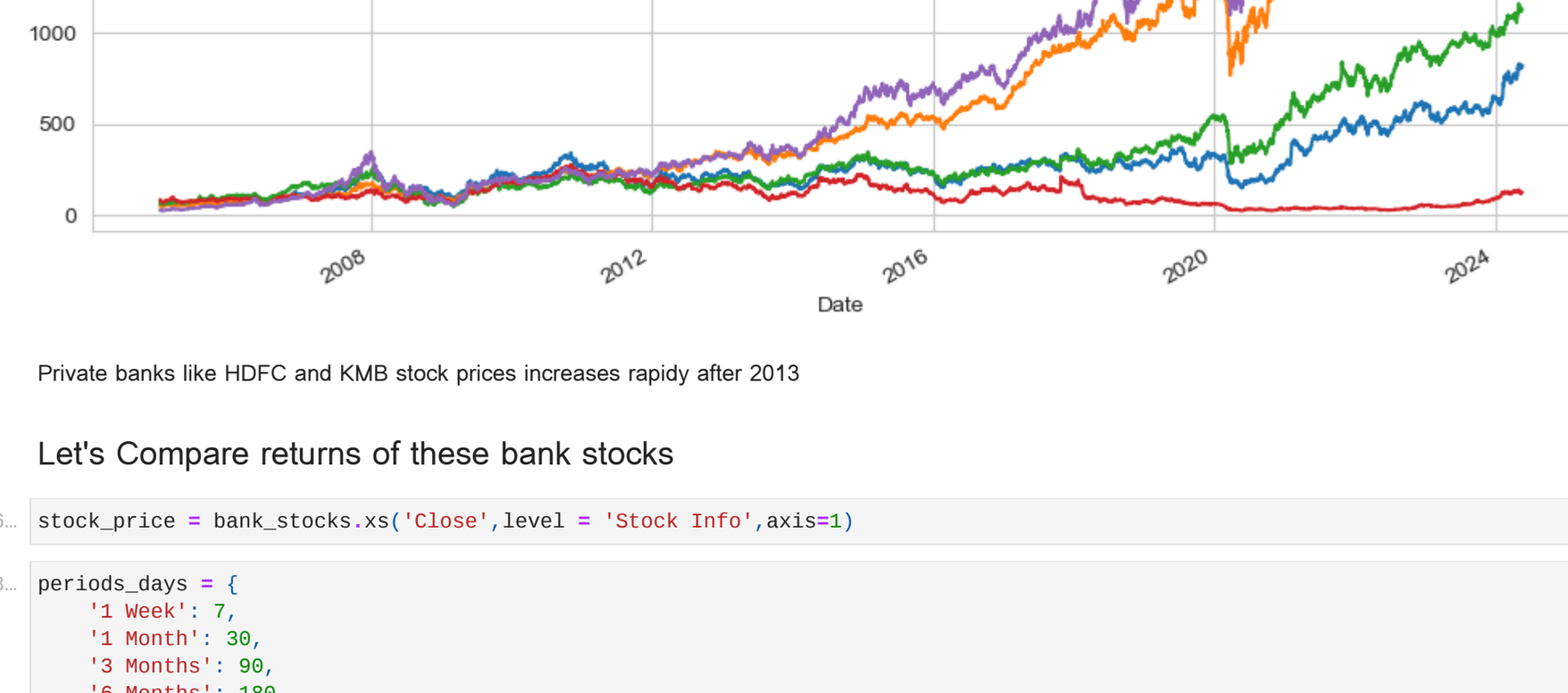
SBI

In [58]:
```python
bank_stocks['SBI'].loc['2015-01-01':].iplot(kind='candle',
                                   annotations=[dict(
       x='2016-12-09', y=0.05, xref='x', yref='paper',
       showarrow=True, xanchor='left', text='Increase Period Begins'),
                                             dict(
       x='2020-03-01', y=0.05, xref='x', yref='paper',
       showarrow=True, xanchor='left', text='Covid 19 Breakout')])
```



Stock Volume

In [83]:
```python
bank_stocks.xs('Volume',level = 'Stock Info',axis=1).plot(figsize=(12,4))
plt.legend()
```
Out[83]:
```
<matplotlib.legend.Legend at 0x2c15b82b3d0>
```



PNB has increasing volumne after 2020 i

In [85]:
```python
bank_stocks.xs('Close',level = 'Stock Info',axis=1).plot(figsize=(12,4))
plt.legend()
```
Out[85]:
```
<matplotlib.legend.Legend at 0x2c15b9b0e10>
```

Private banks like HDFC and KMB stock prices increases rapidy after 2013

Let's Compare returns of these bank stocks

In [156…
```python
stock_price = bank_stocks.xs('Close',level = 'Stock Info',axis=1)
```

In [168…
```python
periods_days = {
    '1 Week': 7,
    '1 Month': 30,
    '3 Months': 90,
    '6 Months': 180,
    '1 Year': 365,
    '3 Years': 3 * 365,
    '5 Years': 5 * 365,
    '10 Years': 10 * 365,
    '15 Years': 15 * 365
}
```

In [169…
```python
def calculate_returns(df, periods):
    returns = {}
    last_date = df.index[-1]

    for period,day in periods.items():
        period_date = last_date - dt.timedelta(days=day)
        if period_date in df.index:
            returns[period] = ((df.loc[last_date] / df.loc[period_date]) - 1) * 100
        else:
            # If the exact date doesn't exist, find the closest earlier date
            valid_dates = df.index[df.index <= period_date]
            if not valid_dates.empty:
                closest_date = valid_dates[-1]
                returns[period] = ((df.loc[last_date] / df.loc[closest_date]) - 1) * 100
            else:
                returns[period] = np.nan  # No valid data for this period

    return returns

returns_data = {}
for stock in stock_price.columns:
    # Convert dictionary values to list of integers to ensure correct timedelta usage
    returns_data[stock] = calculate_returns(stock_price[stock], periods_days)
```

In [170…
```python
print(returns_data)
```
```
{'SBI': {'1 Week': 0.446568119298707, '1 Month': 10.230936285704196, '3 Months': 8.784945901760643, '6 Months': 45.631929046563194, '1 Year': 42.745364713562985, '3 Years': 113.5796079697879, '5 Years': 13
8.1781174718662, '10 Years': 233.83484099166188, '15 Years': 374.0184841027114}, 'HDFC': {'1 Week': 1.9577177784341204, '1 Month': -1.916766125621927, '3 Months': 3.2502305528945064, '6 Months': -2.60097685
4488324, '1 Year': -10.981235831257008, '3 Years': 0.5383416485469805, '5 Years': 20.545973233110892, '10 Years': 262.2112535708771, '15 Years': 970.2266980296963}, 'ICICI': {'1 Week': 1.2264402285508513,
'1 Month': 7.134402606634138, '3 Months': 10.50574150989494, '6 Months': 22.714198819278252, '1 Year': 18.489994180458, '3 Years': 80.78982779293776, '5 Years': 177.34853228942308, '10 Years': 331.718787048
34876, '15 Years': 785.095697568785}, 'PNB': {'1 Week': 1.775623019490169, '1 Month': -2.6630679246363087, '3 Months': -3.1117907124793787, '6 Months': 60.841831657996835, '1 Year': 156.04060603882454, '3 Y
ears': 248.34252987977487, '5 Years': 42.72778794790526, '10 Years': -36.08393594943446, '15 Years': -4.923475961914581}, 'KMB': {'1 Week': 4.238459539270889, '1 Month': -5.025887719497691, '3 Months': -2.2
071775725760023, '6 Months': -4.156905799130827, '1 Year': -12.602686898532678, '3 Years': -1.9415848550004666, '5 Years': 12.937998471023793, '10 Years': 278.5088730200588, '15 Years': 953.8425806510304}}
```

In [171…
```python
returns_df = pd.DataFrame.from_dict(returns_data, orient='index')

returns_df.head()
```

Out[171…

	1 Week	1 Month	3 Months	6 Months	1 Year	3 Years	5 Years	10 Years	15 Years
SBI	0.446568	10.230936	8.784946	45.631929	42.745365	113.579608	138.178117	233.834841	374.018484
HDFC	1.957718	-1.916766	3.250231	-2.600977	-10.981236	0.538342	20.545973	262.211254	970.226698
ICICI	1.226440	7.134403	10.505742	22.714199	18.489994	80.789828	177.348532	331.718787	785.095698
PNB	1.775623	-2.663068	-3.111791	60.841832	156.040606	248.342530	42.727788	-36.083936	-4.923476
KMB	4.238460	-5.025888	-2.207178	-4.156906	-12.602687	-1.941585	12.937998	278.508873	953.842581

Above table compares the result of stock with each other, You can also compare the accuracy

The highest returns of

- 958% is yielded by **Kotak Mahindra Bank** in a span of past 15 years
- 331% is yielded by **ICICI Bank** in a span of past 10 Years
- 248% is yielded by **Punjab National Bank** in a span of past 3 Years
- 156% is yielded by **Punjab National Bank** in a span of past 1 Year