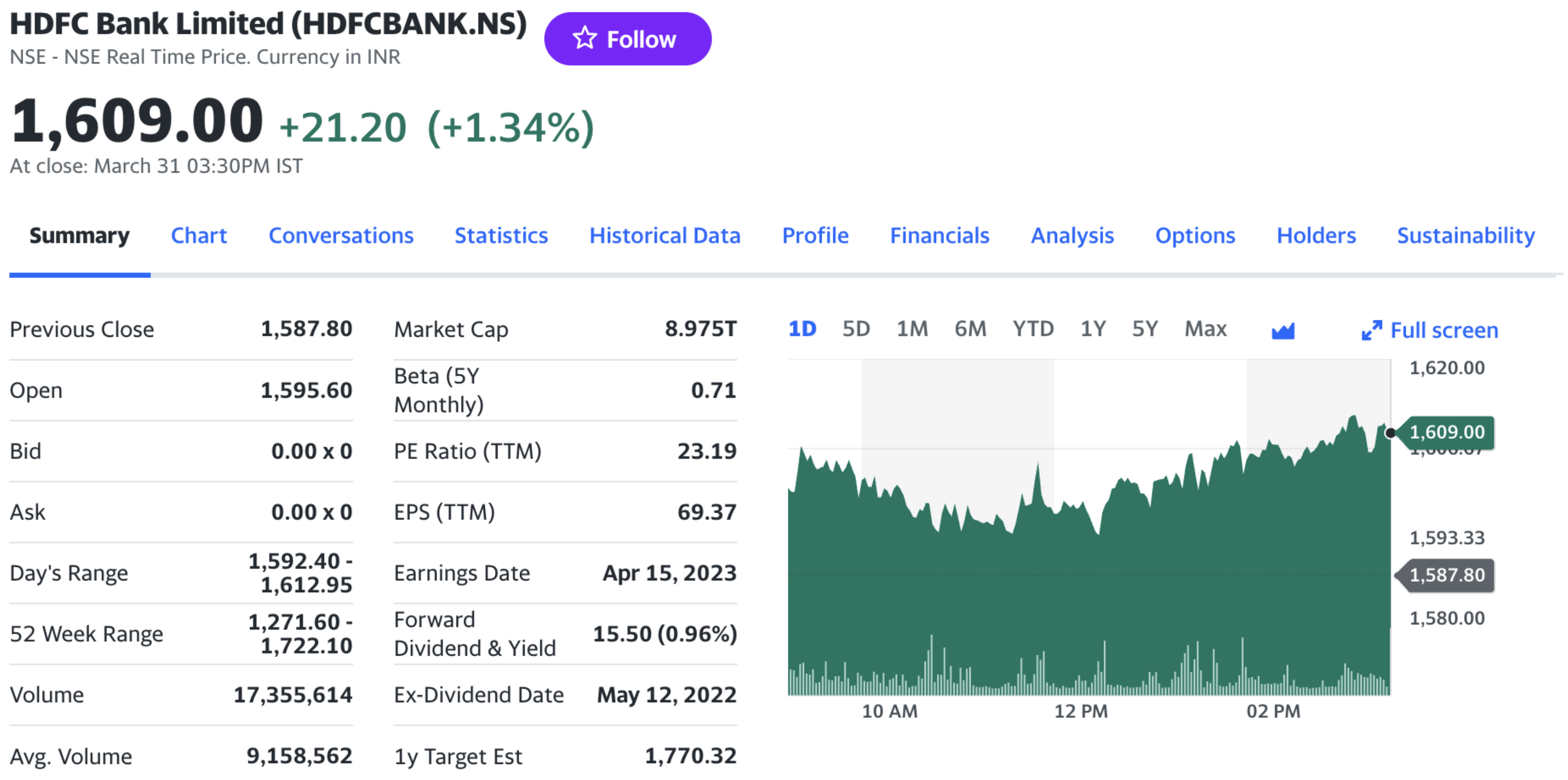
HDFC BANK FINANCIALS

Notebook created: April 3, 2023.

This project provides a comprehensive financial analysis of HDFC Bank. The project starts with importing financial data from yahoo finance and presents basic price analysis. It details in the company's financial statements such as the balance sheet, income statements, and cash flow statement.

This analysis provides insight into a company's profitability, liquidity, and solvency, allowing investors to assess a company's financial health and potential risks. Additionally, the notebook uses predictive modeling techniques to predict future financial performance based on historical data.



HDFC Bank Limited (HDFCBANK.NS)

NSE - NSE Real Time Price. Currency in INR

1,609.00 +21.20 (+1.34%)

At close: March 31 03:30PM IST

Previous Close	1,587.80	Market Cap	8.975T
Open	1,595.60	Beta (5Y Monthly)	0.71
Bid	0.00 x 0	PE Ratio (TTM)	23.19
Ask	0.00 x 0	EPS (TTM)	69.37
Day's Range	1,592.40 - 1,612.95	Earnings Date	Apr 15, 2023
52 Week Range	1,271.60 - 1,722.10	Forward Dividend & Yield	15.50 (0.96%)
Volume	17,355,614	Ex-Dividend Date	May 12, 2022
Avg. Volume	9,158,562	1y Target Est	1,770.32

IMPORTING LIBRARIES

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from matplotlib import ticker
import numpy_financial as npf
import yfinance as yf
import warnings
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from datetime import datetime
```

In [2]:
```
class Stock:
    def __init__(self, ticker):
        self.ticker = ticker
    def get_stock(self,ticker):
        stock = yf.Ticker(ticker).history(period="Max")
        return stock
```

In [3]:
```
HDFCBANK = Stock("HDFCBANK.NS").get_stock("HDFCBANK.NS")
```

In [4]:
```
HDFCBANK.tail()
```

Out[4]:
```
                                   Open         High          Low        Close    Volume  Dividends  Stock Splits
                     Date
2023-03-24 00:00:00+05:30   1560.000000  1573.900024  1554.949951  1560.650024  15738874        0.0           0.0
2023-03-27 00:00:00+05:30   1562.199951  1579.449951  1558.900024  1567.449951  15936003        0.0           0.0
2023-03-28 00:00:00+05:30   1565.699951  1582.900024  1564.099976  1580.199951  19638151        0.0           0.0
2023-03-29 00:00:00+05:30   1584.000000  1602.000000  1581.900024  1587.800049  19881806        0.0           0.0
2023-03-31 00:00:00+05:30   1595.599976  1612.949951  1592.400024  1609.550049  17355614        0.0           0.0
```

In [5]:
```
x = HDFCBANK.index
```

In [6]:
```
y = HDFCBANK.Close
```

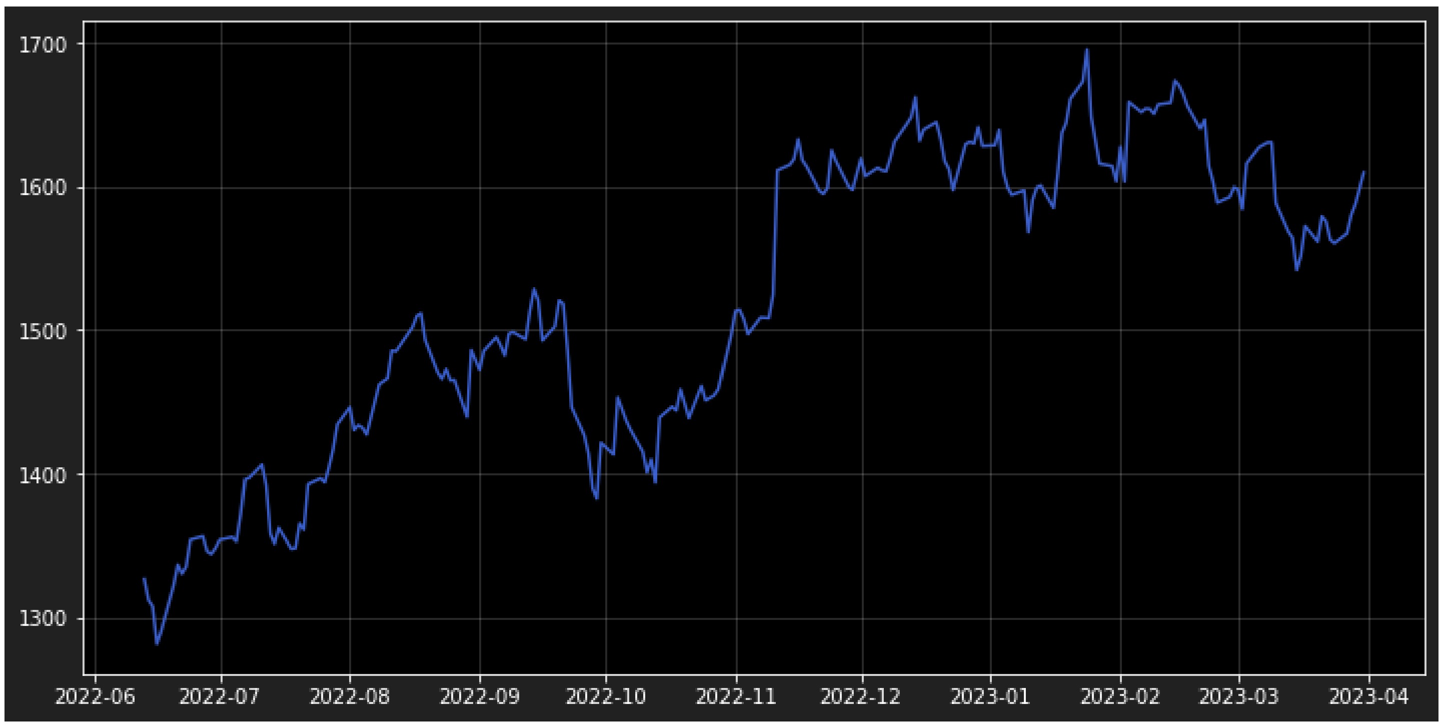
In [7]:

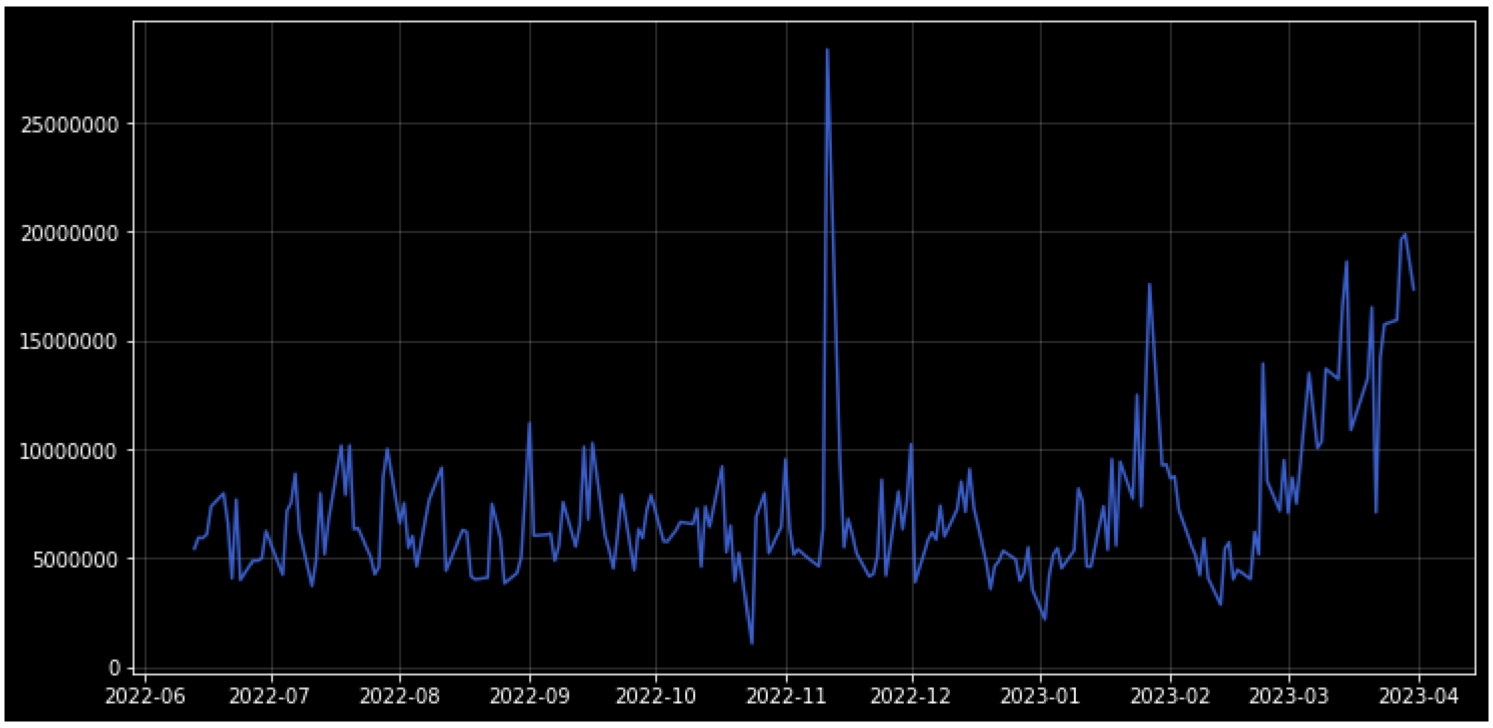
```
#Plot class will plot graph through taking two argument x and y
#These instance variables represent the data that will be plotted on the line plot.
class Plot:
    def __init__(self,x,y):
        self.x = x
        self.y = y
    def line_plot(self, x,y):
        from matplotlib.ticker import FuncFormatter
        plt.style.use('dark_background')
        fig, ax = plt.subplots(figsize=(12, 6))
        plt.plot(x,y, color="royalblue", alpha=0.9)
        plt.gca().yaxis.set_major_formatter(FuncFormatter(lambda x, _: '{:.0f}'.format(x)))
        ax.grid(color='white', alpha=0.20)
        plt.show()
    def bar_plot(self, x,y):
        from matplotlib.ticker import FuncFormatter
        plt.style.use('dark_background')
        fig, ax = plt.subplots(figsize=(12, 6))
        plt.bar(x,y, color="royalblue", alpha=0.9)
        plt.gca().yaxis.set_major_formatter(FuncFormatter(lambda x, _: '{:.0f}'.format(x)))
        ax.grid(color='white', alpha=0.20)
        plt.show()
```

CLOSE PRICE & VOLUME FOR 365 DAYS

In [8]:

```
my_plot = Plot(x,y).line_plot(x[6654:],y[6654:])
my_plot = Plot(x,y).line_plot(x = HDFCBANK.index[6654:], y = HDFCBANK.Volume[6654:])
```





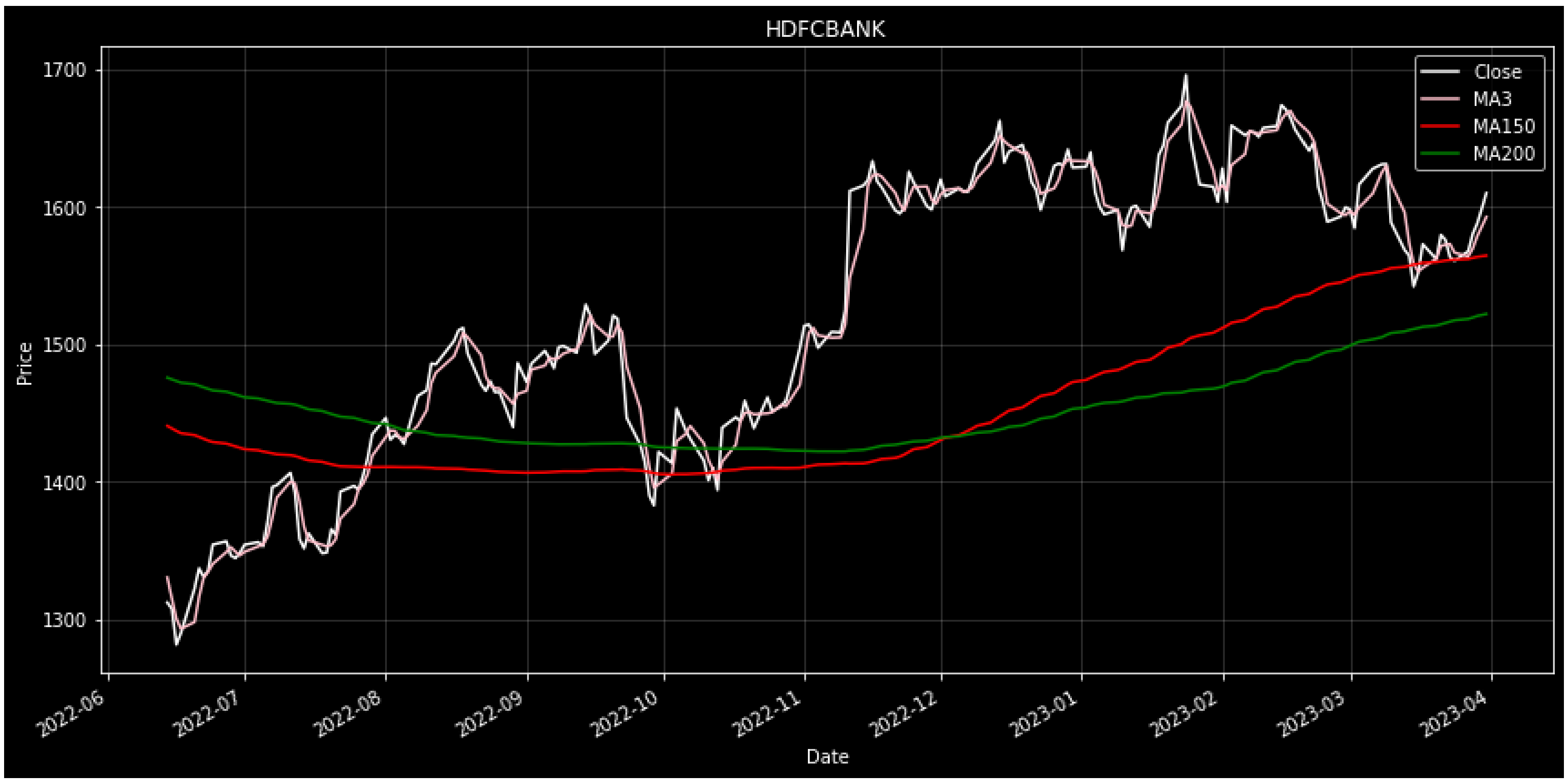
Calculating Moving Averages

In [9]:

```
class StockMovingAverageShort:
    def __init__(self, ticker):
        self.ticker = ticker

    def moving_average(self, ticker):
        stock = yf.Ticker(ticker).history(period="max")
        stock['Price_shift_1'] = stock['Close'].shift(-1)
        stock['Price_Difference'] = stock["Price_shift_1"] - stock['Close']
        stock['Return'] = stock['Price_Difference'] / stock['Close']
        stock['Direction'] = np.where(stock['Price_Difference'] > 0, 1, -1)
        stock['3-Day_Moving_Average'] = (stock['Close'] + stock['Close'].shift(1) + stock['Close'].shift(2))/3
        stock['150-Day_Moving_Average'] = stock['Close'].rolling(150).mean()
        stock['200-Day_Moving_Average'] = stock['Close'].rolling(200).mean()
        return stock
```

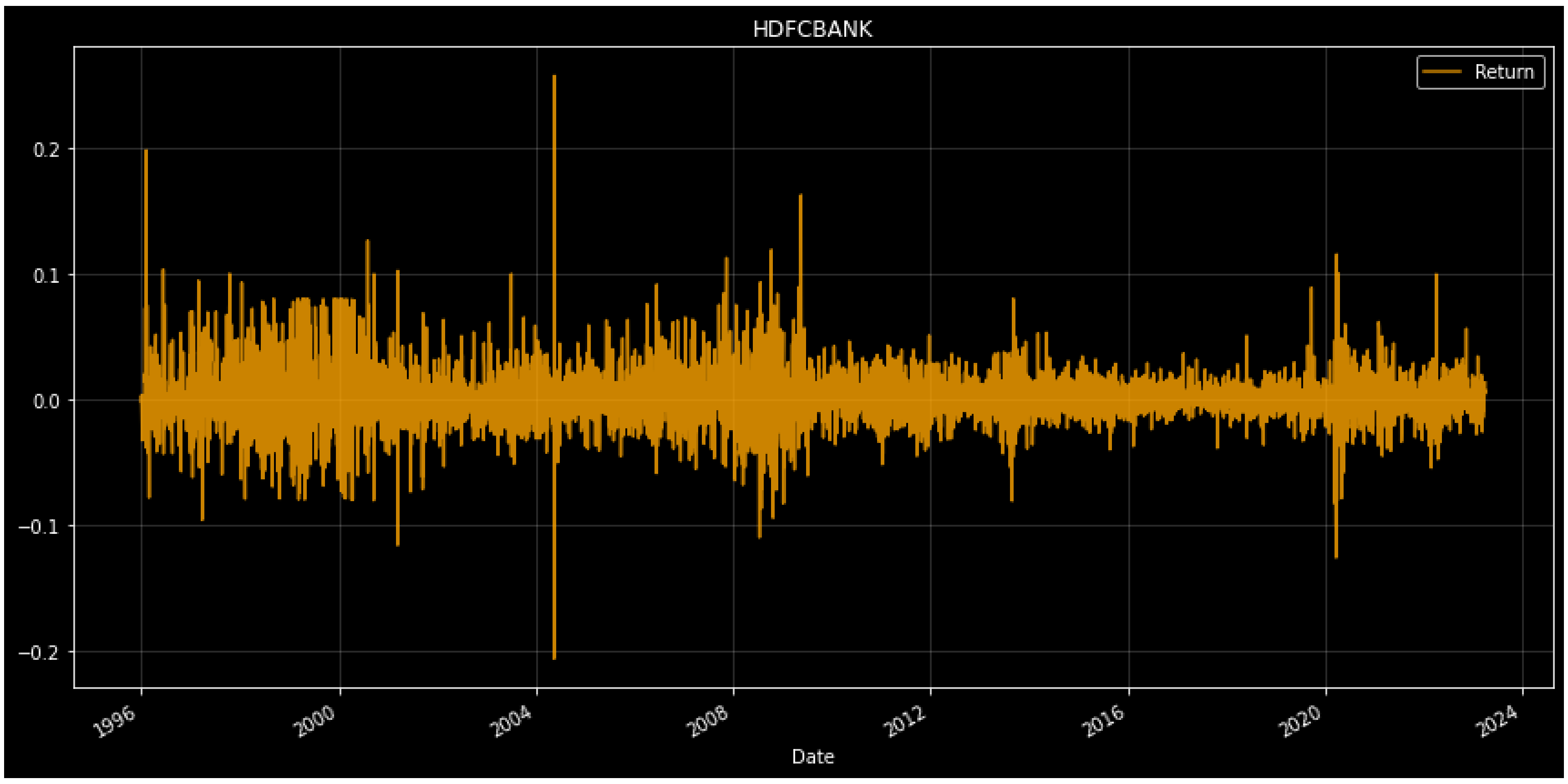
```
In [10]: obj = StockMovingAverageShort("HDFCBANK.NS").moving_average("HDFCBANK.NS")
```

```
In [11]: fig, ax = plt.subplots(figsize=(12, 6))
         obj['Close'].tail(200).plot(label='Close', ax=ax, color="white")
         obj['3-Day_Moving_Average'].tail(200).plot(label='MA3', ax=ax, color="pink")
         obj['150-Day_Moving_Average'].tail(200).plot(label='MA150', ax=ax, color="red")
         obj['200-Day_Moving_Average'].tail(200).plot(label='MA200', ax=ax, color="green")
         ax.set_xlabel('Date')
         ax.set_ylabel('Price')
         ax.set_title('HDFCBANK')
         ax.legend()
         ax.grid(color='white', alpha=0.20)
         plt.tight_layout()
         plt.show()
```



RETURNS

```
In [12]: fig, ax = plt.subplots(figsize=(12, 6))
         obj.Return.plot(color="orange", alpha=0.80)
         ax.set_xlabel('Date')
         ax.set_title('HDFCBANK')
         ax.legend()
         ax.grid(color='white', alpha=0.20)
         plt.tight_layout()
         plt.show()
```



3 YEAR TIME SERIES ANALYSIS

In [13]:

```
HDFCBANK = yf.Ticker("HDFCBANK.NS")
data = HDFCBANK.history(period="5y")
```

In [14]:

```
data['Date_ordinal'] = [datetime.toordinal(d) for d in data.index]
X_train, X_test, y_train, y_test = train_test_split(data['Date_ordinal'].values.reshape(-1, 1), data['Close'], test
```

In [15]:

```
# Create a linear regression model
model = LinearRegression()
```

In [16]:

```
# Train the model
model.fit(X_train, y_train)
```

Out[16]:

```
▾ LinearRegression
LinearRegression()
```

In [17]:

```
# Predict the values
y_pred = model.predict(X_test)
```

In [18]:

```
X_test = [datetime.fromordinal(int(d)) for d in X_test.flatten()]
```

In [19]:

```
model.intercept_
```

Out[19]:

```
-267862.43904379325
```

In [20]:

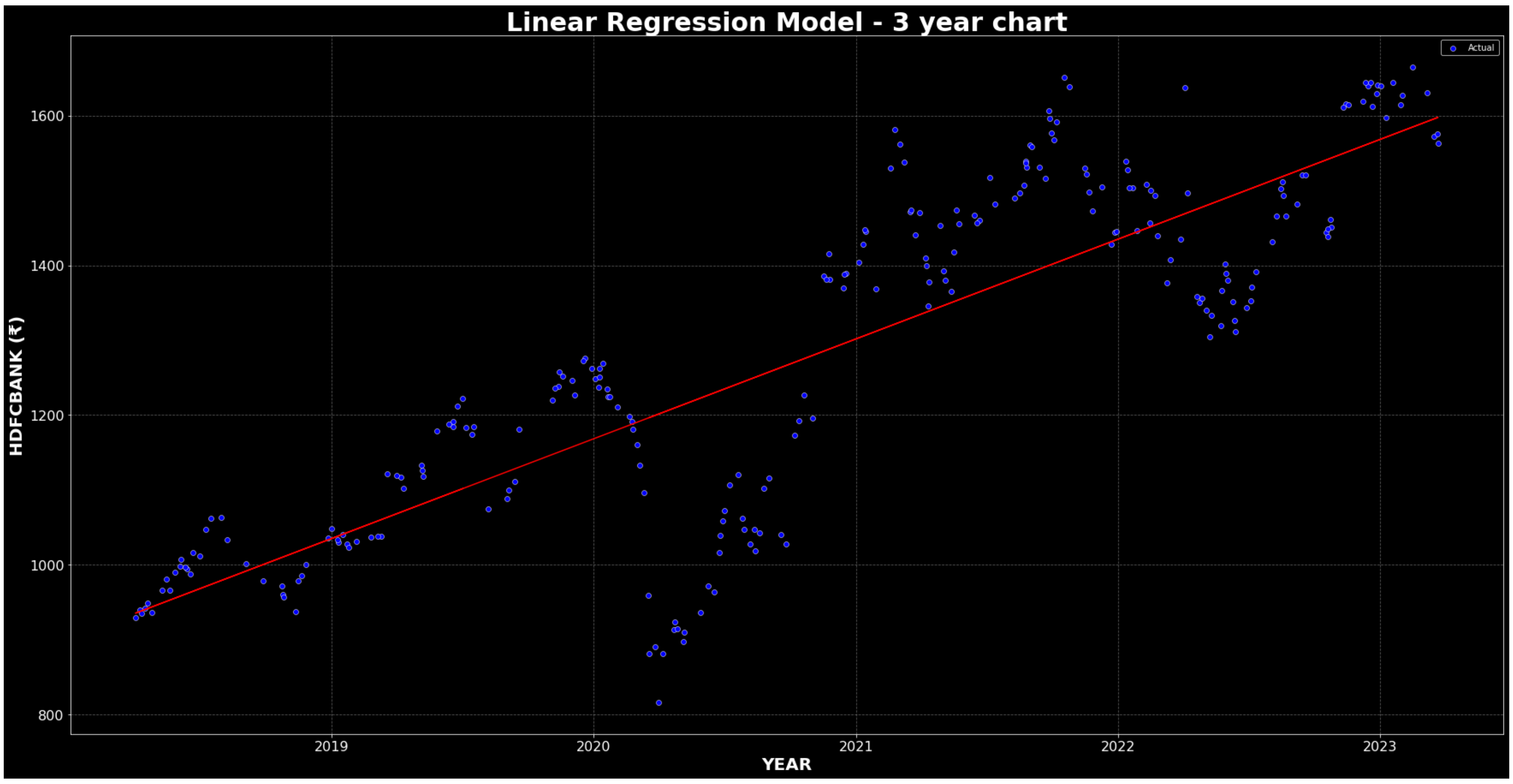
```
model.coef_
```

Out[20]:

```
array([0.36482439])
```

In [21]:

```
plt.style.use('dark_background')
plt.figure(figsize=(30,15))
sns.scatterplot(x=X_test, y=y_test, label='Actual', color='blue')
plt.plot(X_test, y_pred, label='Predicted', color='red')
plt.title('Linear Regression Model - 3 year chart', fontsize=30, color="White", fontweight='bold')
plt.xlabel("YEAR", fontsize=20, fontweight='bold')
plt.ylabel("HDFCBANK (₹)", fontsize=20, fontweight='bold')
plt.tick_params(axis="both", labelsize=16)
plt.grid(linestyle='--', color='gray', alpha=0.7)
plt.show()
```



DESIGNING MODEL FOR INCOME STATEMENT

In [22]:

```
hdfcbank_income_statement = pd.read_csv('HDFCBANK_INCOME STATEMENT .csv')
```

In [23]:

```
hdfcbank_income_statement.columns.values[0] = "breakdown"
```

In [24]:

```
hdfcbank_income_statement
```

Out[24]:

	breakdown	2022	2021	2020
0	Total Revenue	1019413700	9.366622e+08	7.917464e+08
1	Credit Losses Provision	-126979500	-1.542334e+08	-1.176219e+08
2	Non Interest Expense	373272000	3.426023e+08	3.082805e+08
3	Pretax Income	519162200	4.398265e+08	3.658440e+08
4	Tax Provision	132559200	1.138201e+08	1.054800e+08
5	Net Income Common Stockholders	386000400	3.259771e+08	2.602699e+08
6	Diluted NI Available to Com Stockholders	386000400	3.259771e+08	2.602699e+08
7	Basic EPS	-	5.927000e+01	4.759000e+01
8	Diluted EPS	-	5.902000e+01	4.727000e+01
9	Basic Average Shares	-	5.499587e+06	5.468802e+06
10	Diluted Average Shares	-	5.523478e+06	5.505793e+06
11	INTEREST_INCOME_AFTER_PROVISION_FOR_LOAN_LOSS	621860000	5.294531e+08	4.759055e+08
12	Net Income from Continuing & Discontinued Oper...	386000400	3.259771e+08	2.602699e+08
13	Normalized Income	386000400	3.259771e+08	2.602699e+08
14	Total Money Market Investments	-	2.414300e+07	1.828930e+07
15	Reconciled Depreciation	16816900	1.386020e+07	1.280030e+07
16	Net Income from Continuing Operation Net Minor...	386000400	3.259771e+08	2.602699e+08
17	Tax Rate for Calcs	0	0.000000e+00	0.000000e+00
18	Tax Effect of Unusual Items	0	0.000000e+00	0.000000e+00

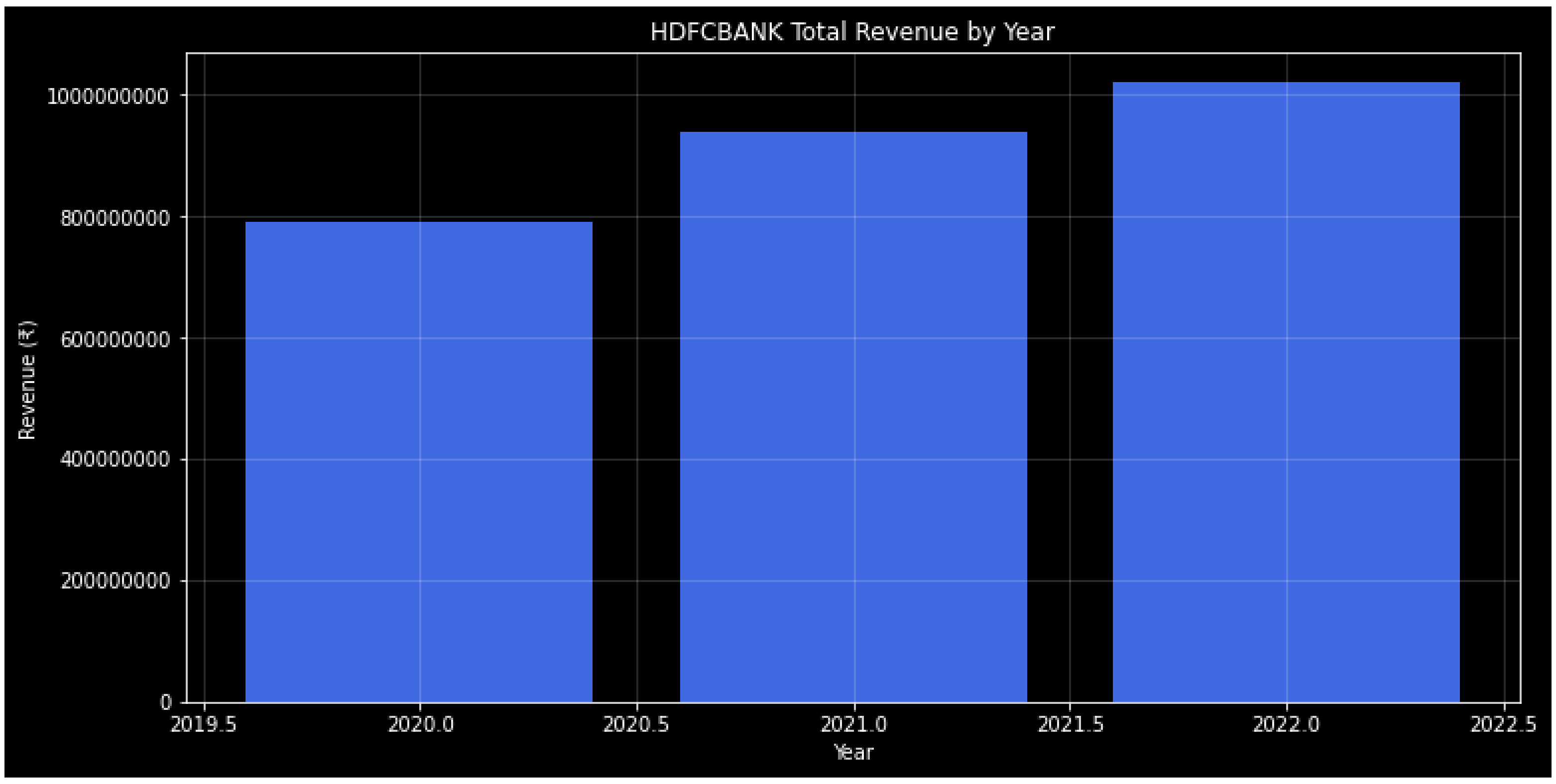
TOTAL REVENUE

In [25]:
```
data = hdfcbank_income_statement.loc[0]
data
```

Out[25]:
```
breakdown    Total Revenue
2022            1019413700
2021           936662200.0
2020           791746400.0
Name: 0, dtype: object
```

In [26]:
```
year = []
revenue = []
for k, v in data.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        revenue.append(int(v))
year = pd.DataFrame(year)
revenue = pd.DataFrame(revenue)
```

In [27]:
```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar(year[0],revenue[0], color="royalblue")
plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFCBANK Total Revenue by Year")
plt.xlabel("Year")
plt.ylabel("Revenue (₹)")
ax.grid(color='white', alpha=0.20)
plt.show()
```



TAX PROVISION

In [28]:

```
data = hdfcbank_income_statement.loc[4]
data = data.head(10)
data
```

Out[28]:

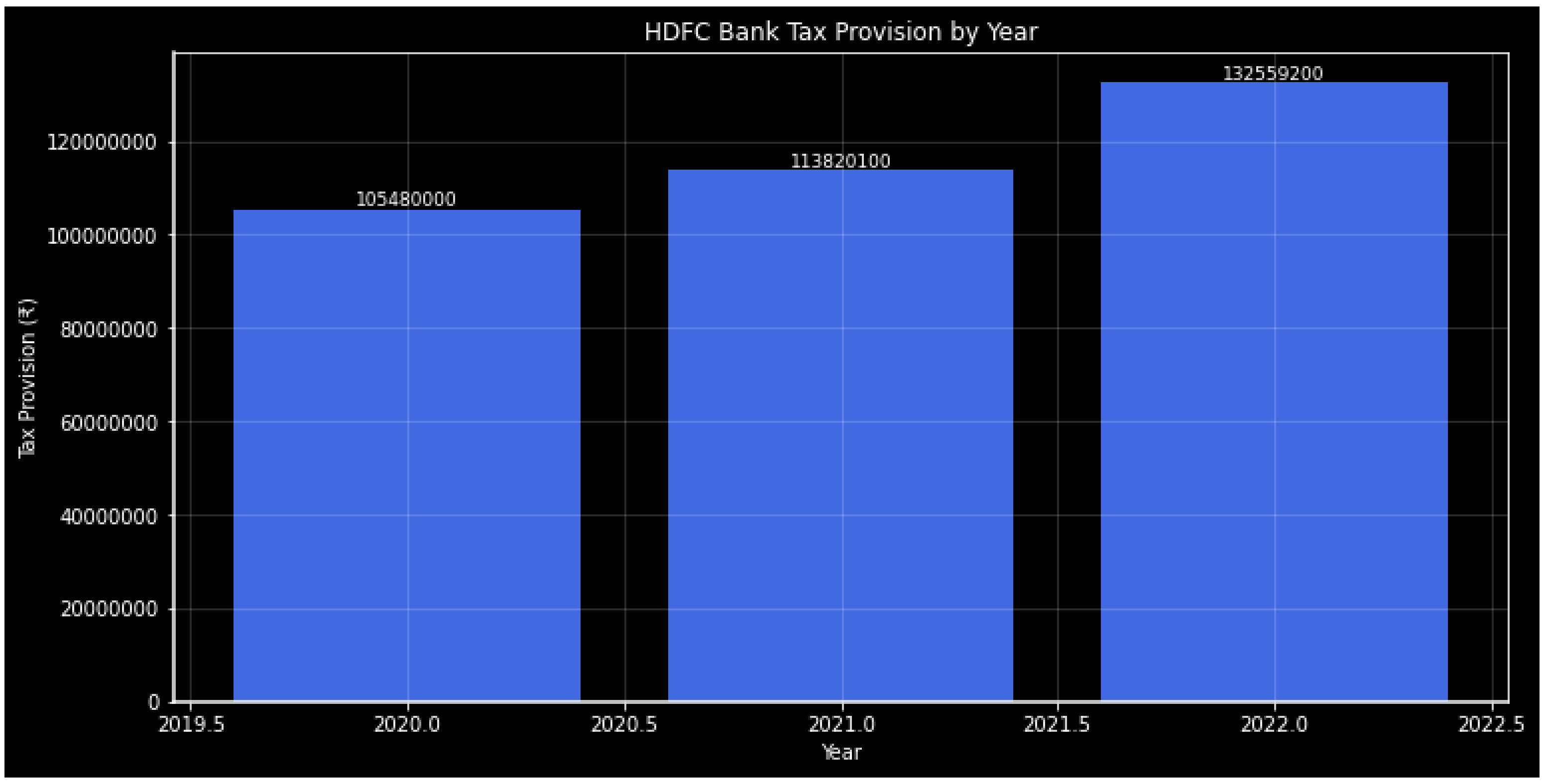
```
breakdown    Tax Provision
2022             132559200
2021           113820100.0
2020           105480000.0
Name: 4, dtype: object
```

In [29]:

```
year = []
revenue = []
for k, v in data.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        revenue.append(int(v))
year = pd.DataFrame(year)
revenue = pd.DataFrame(revenue)
```

In [30]:

```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar(year[0],revenue[0], color="royalblue")
plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFC Bank Tax Provision by Year")
plt.xlabel("Year")
plt.ylabel("Tax Provision (₹)")
for i in range(len(year)):
    plt.text(year.iloc[i], revenue.iloc[i], str(revenue.iloc[i][0]), ha='center', va='bottom', fontsize=9)
plt.gca().spines['bottom'].set_linewidth(1.5)
plt.gca().spines['left'].set_linewidth(1.5)
ax.grid(color='white', alpha=0.20)
plt.show()
```



INTEREST INCOME AFTER PROVISION FOR LOAN LOSS

In [31]:

```
data2 = hdfcbank_income_statement.loc[11]
data2
```

Out[31]:

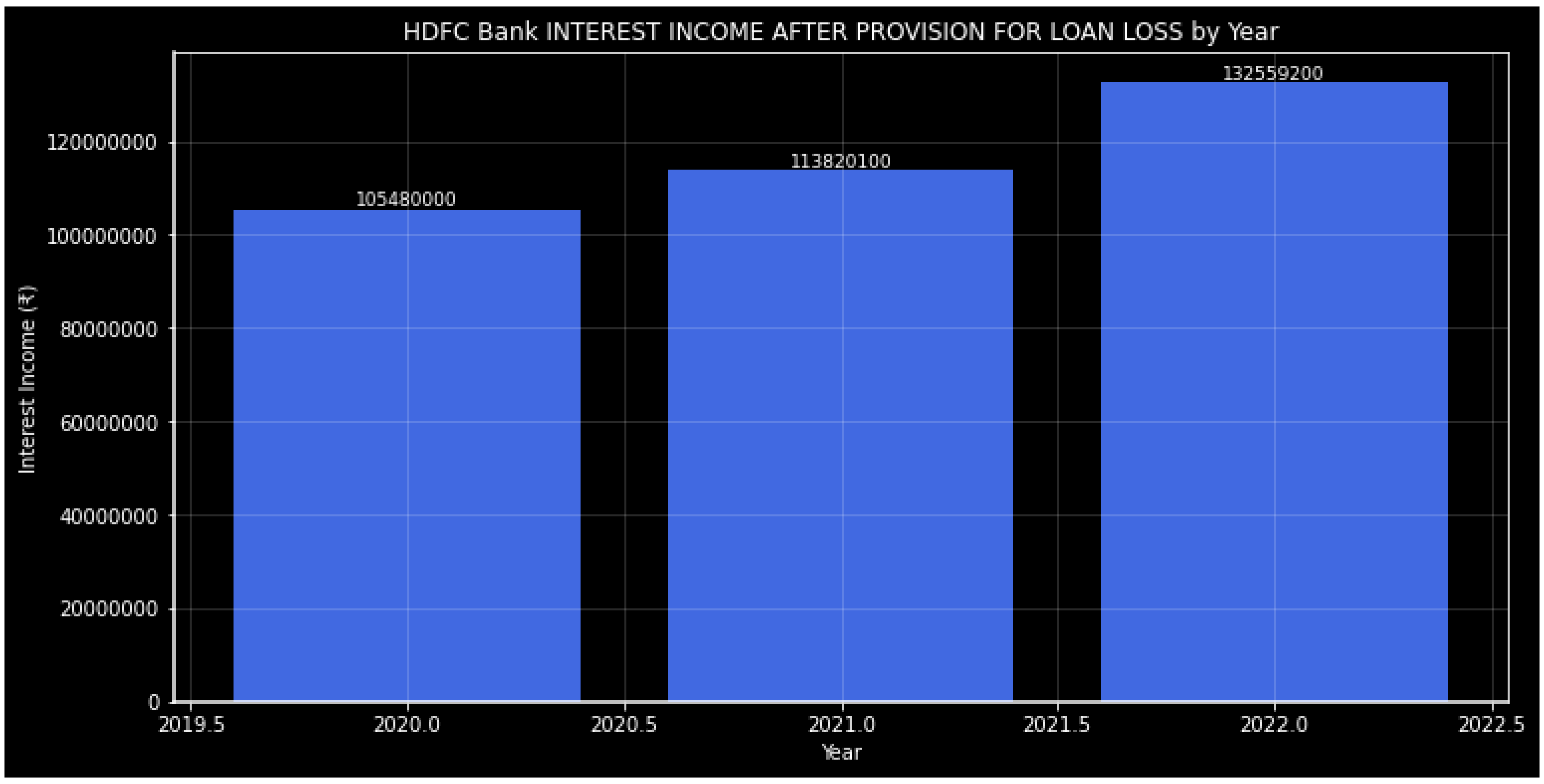
```
breakdown    INTEREST_INCOME_AFTER_PROVISION_FOR_LOAN_LOSS
2022                                             621860000
2021                                           529453100.0
2020                                           475905500.0
Name: 11, dtype: object
```

In [32]:

```
year = []
revenue = []
for k, v in data.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        revenue.append(int(v))
year = pd.DataFrame(year)
revenue = pd.DataFrame(revenue)
```

In [33]:

```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar(year[0],revenue[0], color="royalblue")
plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFC Bank INTEREST INCOME AFTER PROVISION FOR LOAN LOSS by Year")
plt.xlabel("Year")
plt.ylabel("Interest Income (₹)")
for i in range(len(year)):
    plt.text(year.iloc[i], revenue.iloc[i], str(revenue.iloc[i][0]), ha='center', va='bottom', fontsize=9)
plt.gca().spines['bottom'].set_linewidth(1.5)
plt.gca().spines['left'].set_linewidth(1.5)
ax.grid(color='white', alpha=0.20)
plt.show()
```



RECONCILED DEPRECIATION

In [34]:

```
data3 = hdfcbank_income_statement.loc[15]
data3
```

Out[34]:

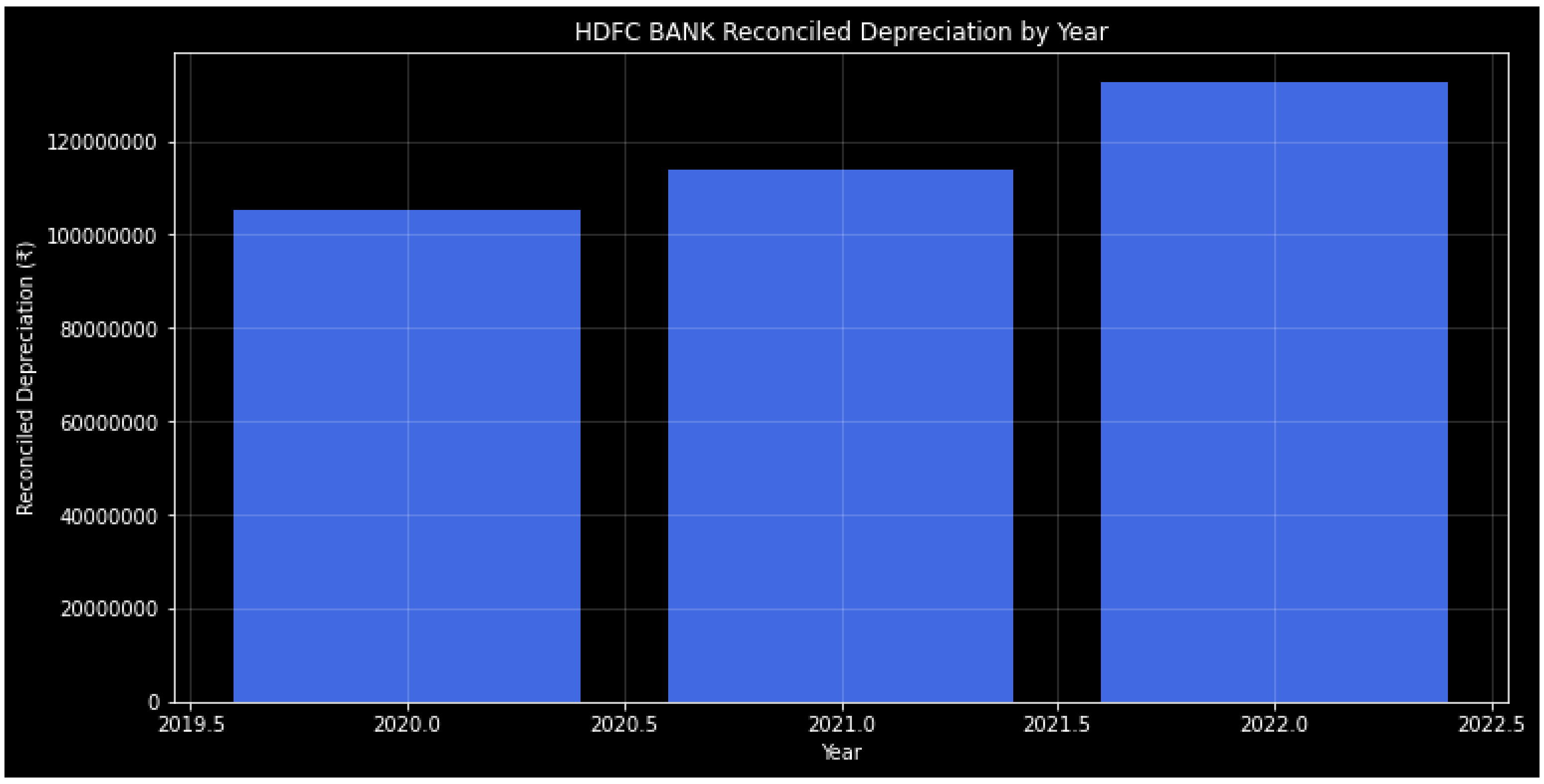
```
breakdown    Reconciled Depreciation
2022                        16816900
2021                      13860200.0
2020                      12800300.0
Name: 15, dtype: object
```

In [35]:

```
year = []
revenue = []
for k, v in data.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        revenue.append(int(v))
year = pd.DataFrame(year)
revenue = pd.DataFrame(revenue)
```

In [36]:

```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar(year[0],revenue[0], color="royalblue")
plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFC BANK Reconciled Depreciation by Year")
plt.xlabel("Year")
plt.ylabel("Reconciled Depreciation (₹)")
ax.grid(color='white', alpha=0.20)
plt.show()
```



NET INCOME FROM CONTINUING OPERATION NET MINORIOTY INTEREST BY YEAR

In [37]:

```
data4 = hdfcbank_income_statement.loc[16]
data4
```

Out[37]:

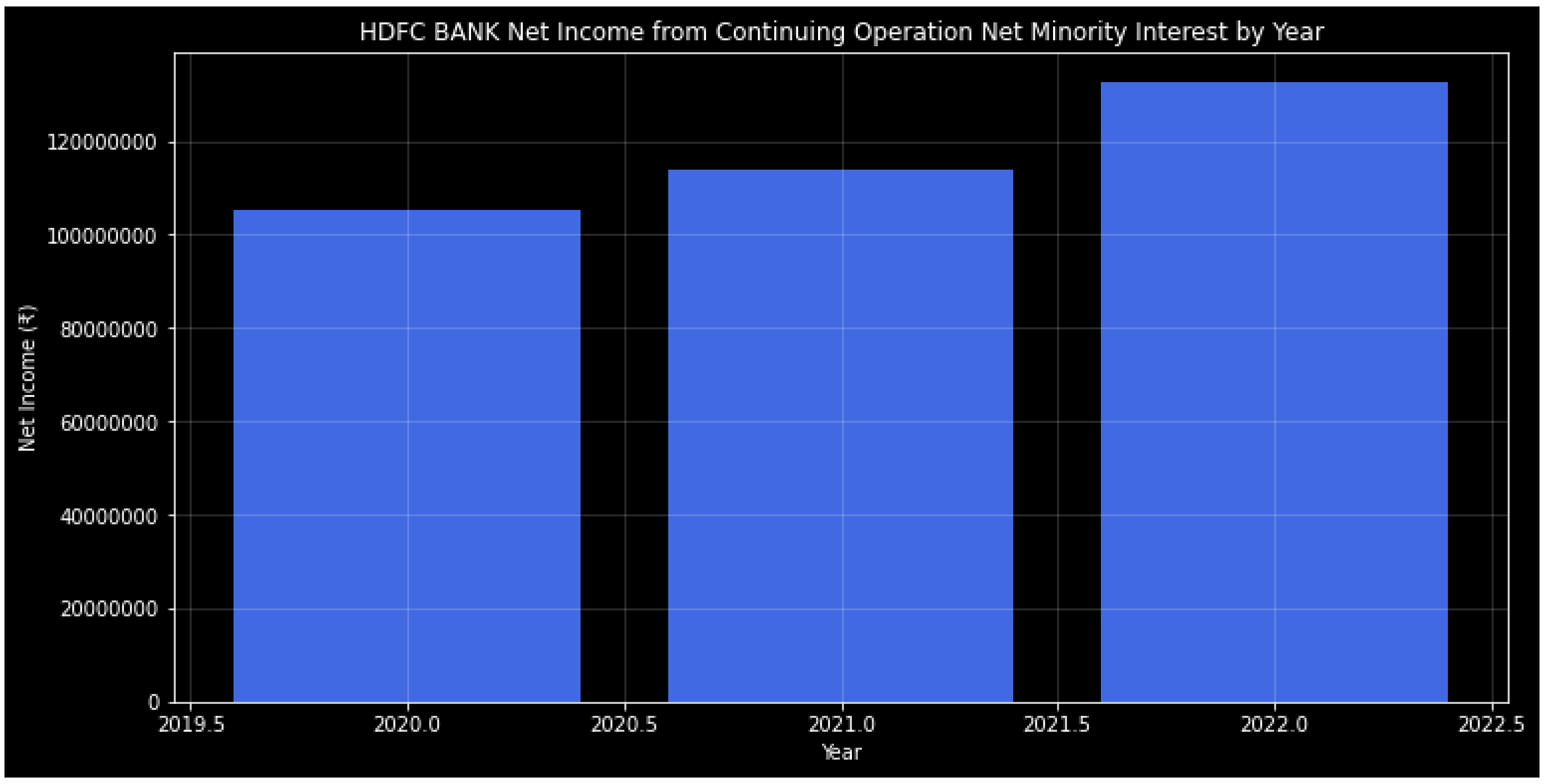
```
breakdown    Net Income from Continuing Operation Net Minor...
2022                                                 386000400
2021                                               325977100.0
2020                                               260269900.0
Name: 16, dtype: object
```

In [38]:

```
year = []
revenue = []
for k, v in data.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        revenue.append(int(v))
year = pd.DataFrame(year)
revenue = pd.DataFrame(revenue)
```

In [39]:

```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar(year[0],revenue[0], color="royalblue")
plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFC BANK Net Income from Continuing Operation Net Minority Interest by Year")
plt.xlabel("Year")
plt.ylabel("Net Income (₹)")
ax.grid(color='white', alpha=0.20)
plt.show()
```



BALANCE SHEET

In [40]:

```
balance_sheet_annually = pd.read_csv('HDFCBANK BALANCE_SHEET.csv')
balance_sheet_annually.columns.values[0] = "breakdown"
balance_sheet_annually
```

Out[40]:

	breakdown	2022	2021	2020
0	Total Assets	21113705500	17979782000	15961889100
1	Total Liabilities Net Minority Interest	18604252100	15816377200	14065395300
2	Total Equity Gross Minority Interest	2509453400	2163404800	1896493800
3	Total Capitalization	4059171800	3334386600	2919600700
4	Common Stock Equity	2504838400	2159628400	1893082400
5	Capital Lease Obligations	78138000	70422000	65615100
6	Net Tangible Assets	2429900500	2084690500	1818144500
7	Invested Capital	4613339400	3573650700	3297018300
8	Tangible Book Value	2429900500	2084690500	1818144500
9	Total Debt	2186639000	1484444300	1469551000
10	Net Debt	509280300	372639500	677191800
11	Share Issued	5545541	5512776	5483286
12	Ordinary Shares Number	5545541	5512776	5483286
13	Treasury Shares Number	-	0	-

TOTAL ASSETS

In [41]:

```
total_assets = balance_sheet_annually.loc[0]
total_assets
```

Out[41]:

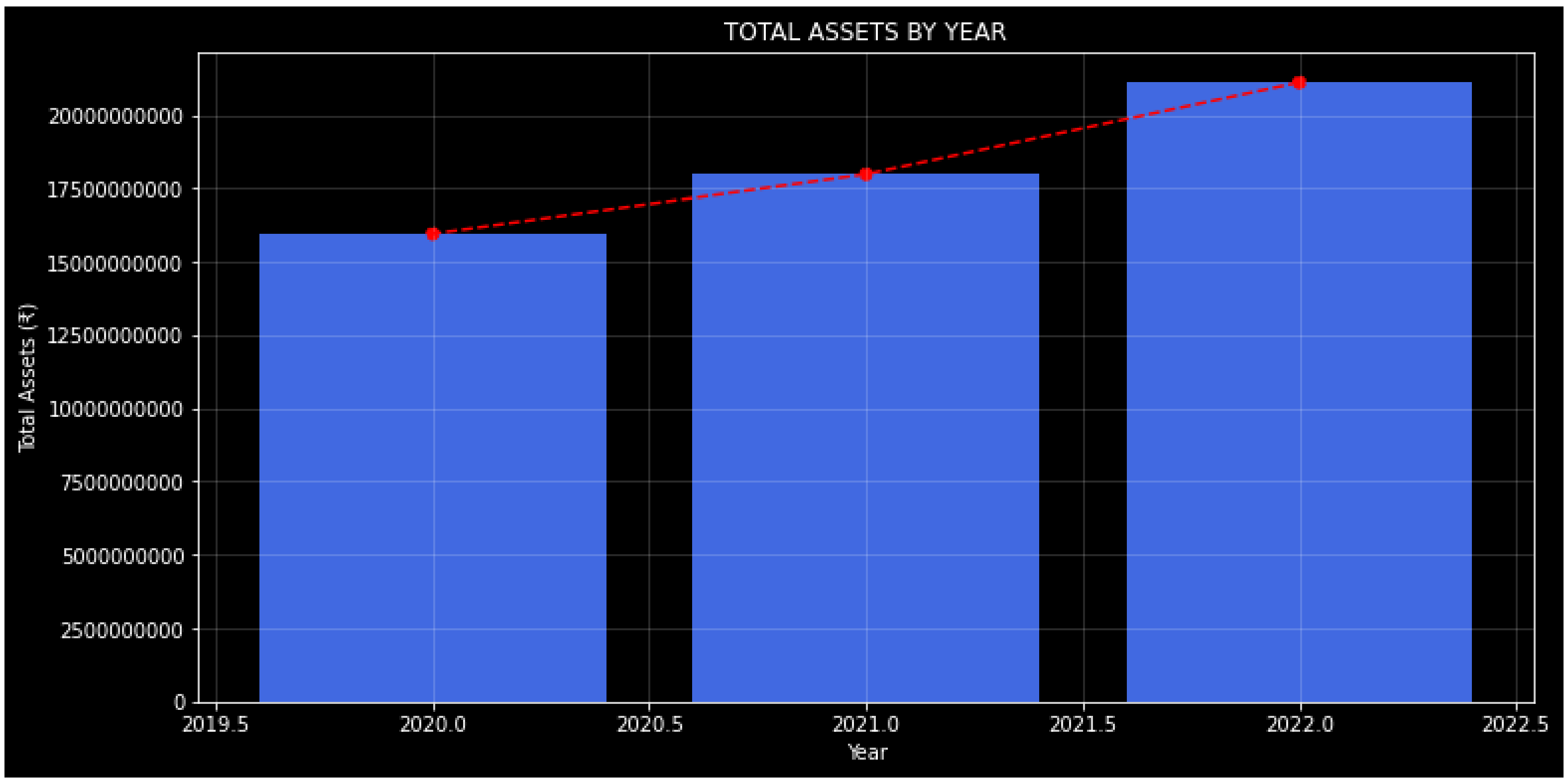
```
breakdown    Total Assets
2022          21113705500
2021          17979782000
2020          15961889100
Name: 0, dtype: object
```

In [42]:

```
year = []
cash = []

for k, v in total_assets.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        cash.append(int(v))

df_total_assets = pd.DataFrame({'year': year, 'cash': cash})
```

In [43]:

```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar( df_total_assets.year, df_total_assets.cash, color="royalblue")
plt.plot( df_total_assets.year, df_total_assets.cash, color="red", linestyle="--")
plt.scatter( df_total_assets.year, df_total_assets.cash, color="red", linestyle="--")
plt.ticklabel_format(axis='y', style='plain')
plt.title("TOTAL ASSETS BY YEAR")
plt.xlabel("Year")
plt.ylabel("Total Assets (₹)")
ax.grid(color='white', alpha=0.20)
plt.show()
```



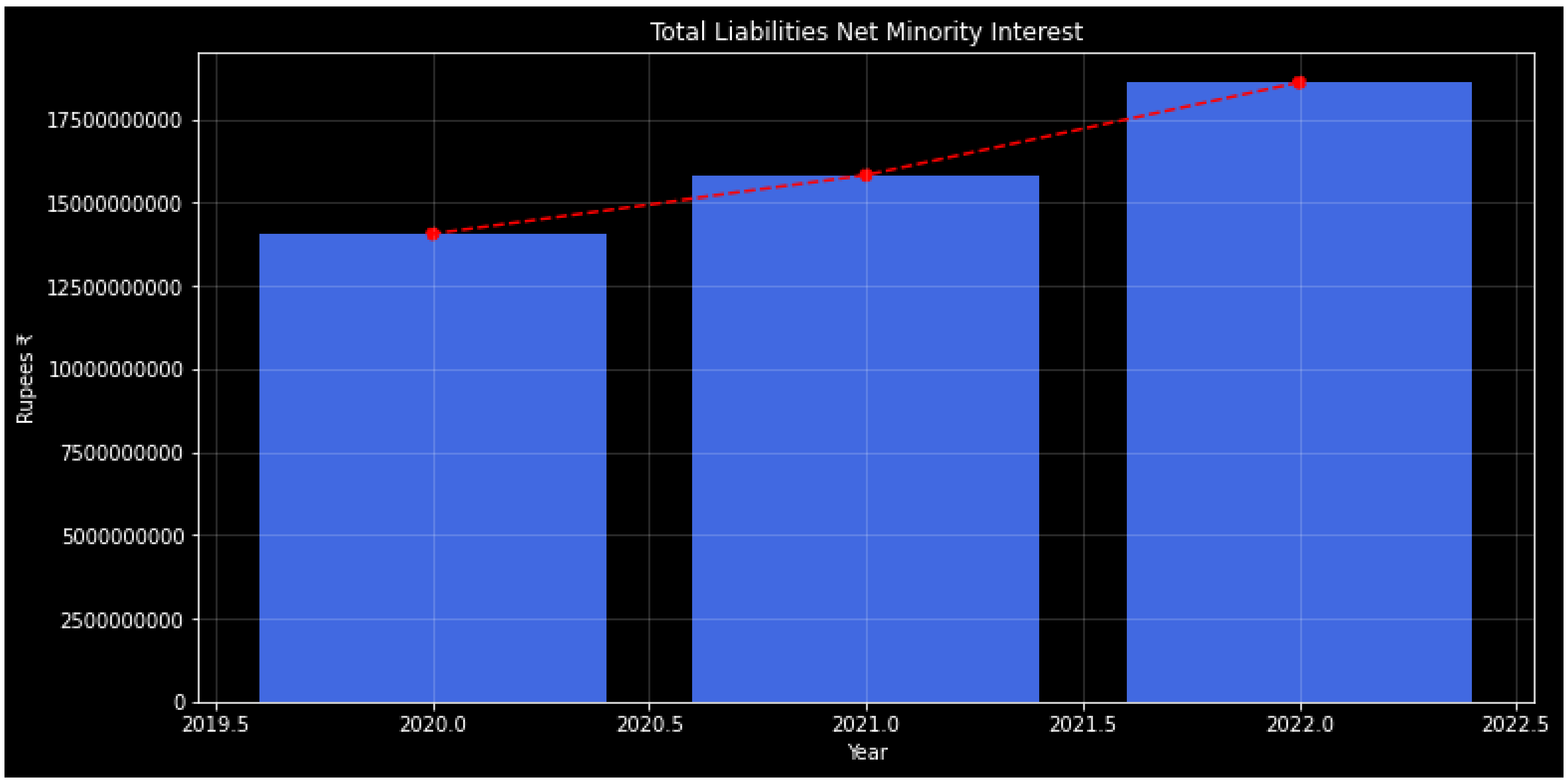
TOTAL LIABILITIES NET MINORITY INTEREST

In [44]:
```
Total_Liabilities_Net_Minority_Interests = balance_sheet_annually.loc[1]
Total_Liabilities_Net_Minority_Interests
```

Out[44]:
```
breakdown    Total Liabilities Net Minority Interest
2022                                     18604252100
2021                                     15816377200
2020                                     14065395300
Name: 1, dtype: object
```

In [45]:
```
year = []
cash = []

for k, v in Total_Liabilities_Net_Minority_Interests.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        cash.append(int(v))

df_Total_Liabilities_Net_Minority_Interests = pd.DataFrame({'year': year, 'cash': cash})
```

In [46]:
```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar( df_Total_Liabilities_Net_Minority_Interests.year, df_Total_Liabilities_Net_Minority_Interests.cash, color=
plt.plot( df_Total_Liabilities_Net_Minority_Interests.year, df_Total_Liabilities_Net_Minority_Interests.cash, color
plt.scatter( df_Total_Liabilities_Net_Minority_Interests.year, df_Total_Liabilities_Net_Minority_Interests.cash, co
plt.ticklabel_format(axis='y', style='plain')
plt.title("Total Liabilities Net Minority Interest")
plt.xlabel("Year")
plt.ylabel("Rupees ₹")
ax.grid(color='white', alpha=0.20)
plt.show()
```



TOTAL EQUITY GROSS MINORITY INTERESTS

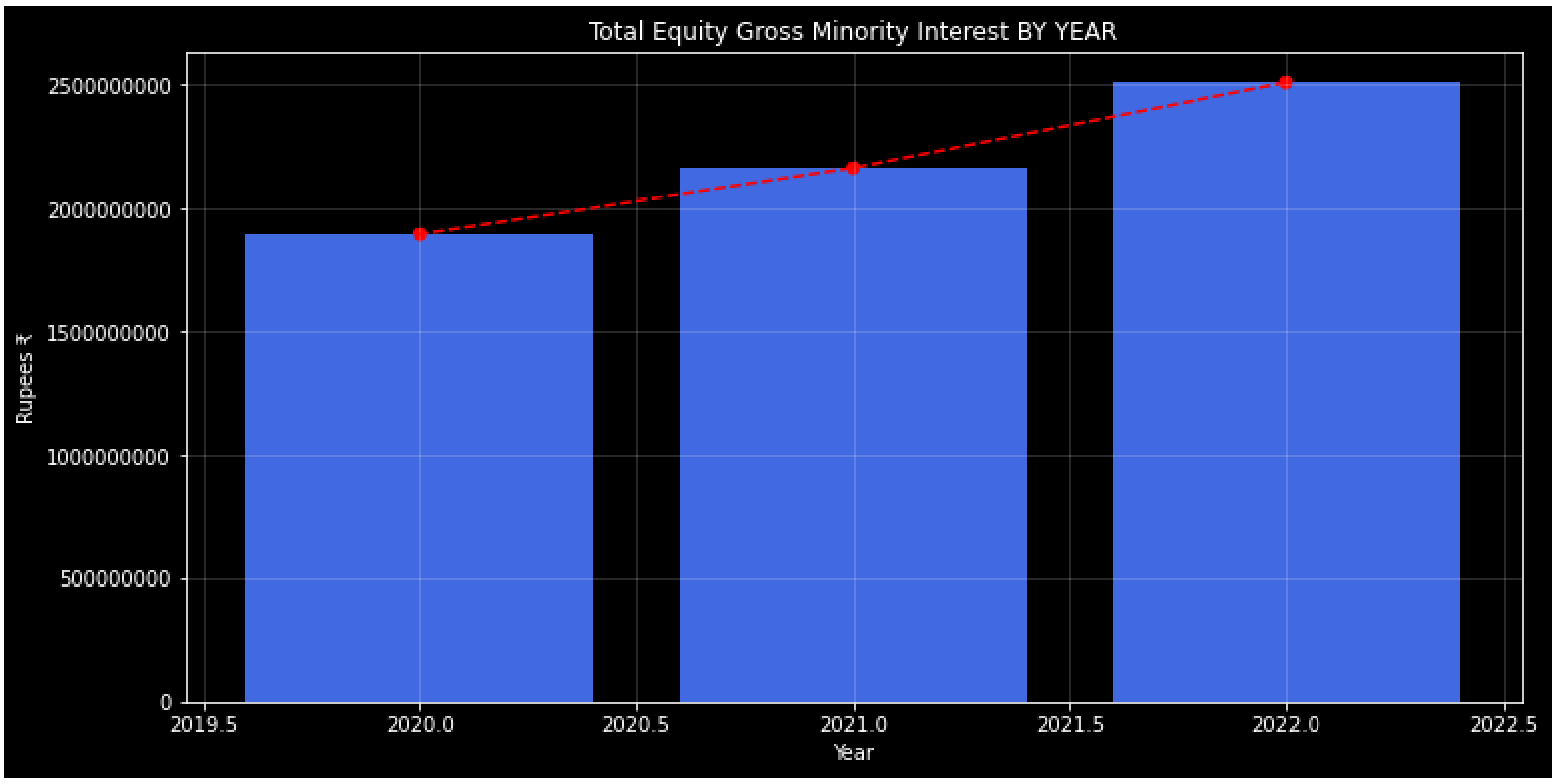
In [47]:
```
Total_Equity_Gross_Minority_Interests = balance_sheet_annually.loc[2]
Total_Equity_Gross_Minority_Interests
```

Out[47]:
```
breakdown    Total Equity Gross Minority Interest
2022                                   2509453400
2021                                   2163404800
2020                                   1896493800
Name: 2, dtype: object
```

In [48]:
```
year = []
cash = []

for k, v in Total_Equity_Gross_Minority_Interests.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        cash.append(int(v))

df_Total_Equity_Gross_Minority_Interests = pd.DataFrame({'year': year, 'cash': cash})
```

In [49]:
```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar( df_Total_Equity_Gross_Minority_Interests.year, df_Total_Equity_Gross_Minority_Interests.cash, color="royal
plt.plot( df_Total_Equity_Gross_Minority_Interests.year, df_Total_Equity_Gross_Minority_Interests.cash, color="red"
plt.scatter( df_Total_Equity_Gross_Minority_Interests.year, df_Total_Equity_Gross_Minority_Interests.cash, color="r
plt.ticklabel_format(axis='y', style='plain')
plt.title("Total Equity Gross Minority Interest BY YEAR")
plt.xlabel("Year")
plt.ylabel("Rupees ₹")
```

```
ax.grid(color='white', alpha=0.20)
plt.show()
```



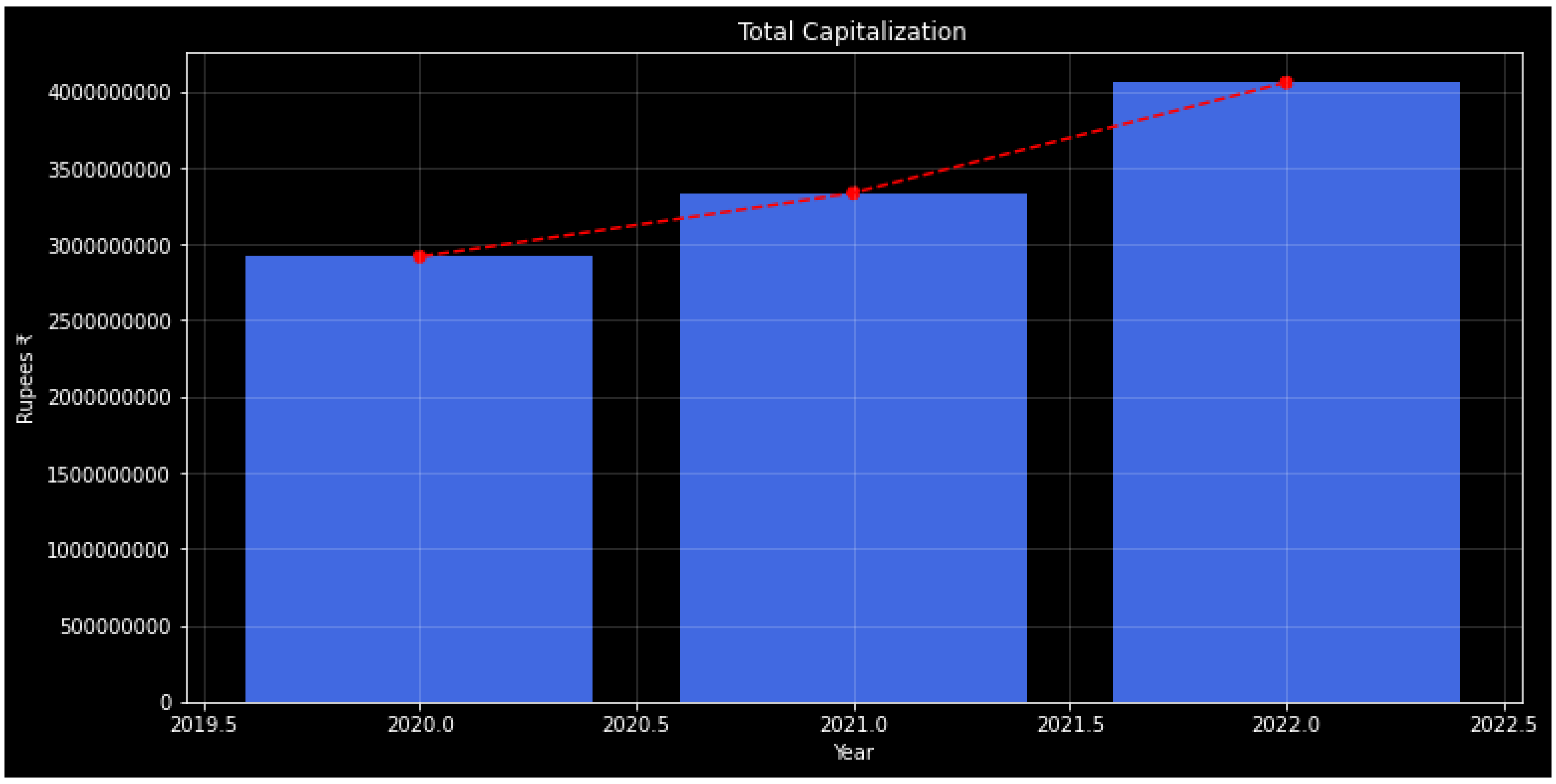
TOTAL CAPITALIZATION

```
In [50]: Total_Capitalization = balance_sheet_annually.loc[3]
         Total_Capitalization
```

```
Out[50]: breakdown    Total Capitalization
         2022                   4059171800
         2021                   3334386600
         2020                   2919600700
         Name: 3, dtype: object
```

```
In [51]: year = []
         cash = []

         for k, v in Total_Capitalization.items():
             if k != 'breakdown':  # skip the header
                 year.append(int(k))
                 cash.append(int(v))

         df_Total_Capitalization = pd.DataFrame({'year': year, 'cash': cash})
```

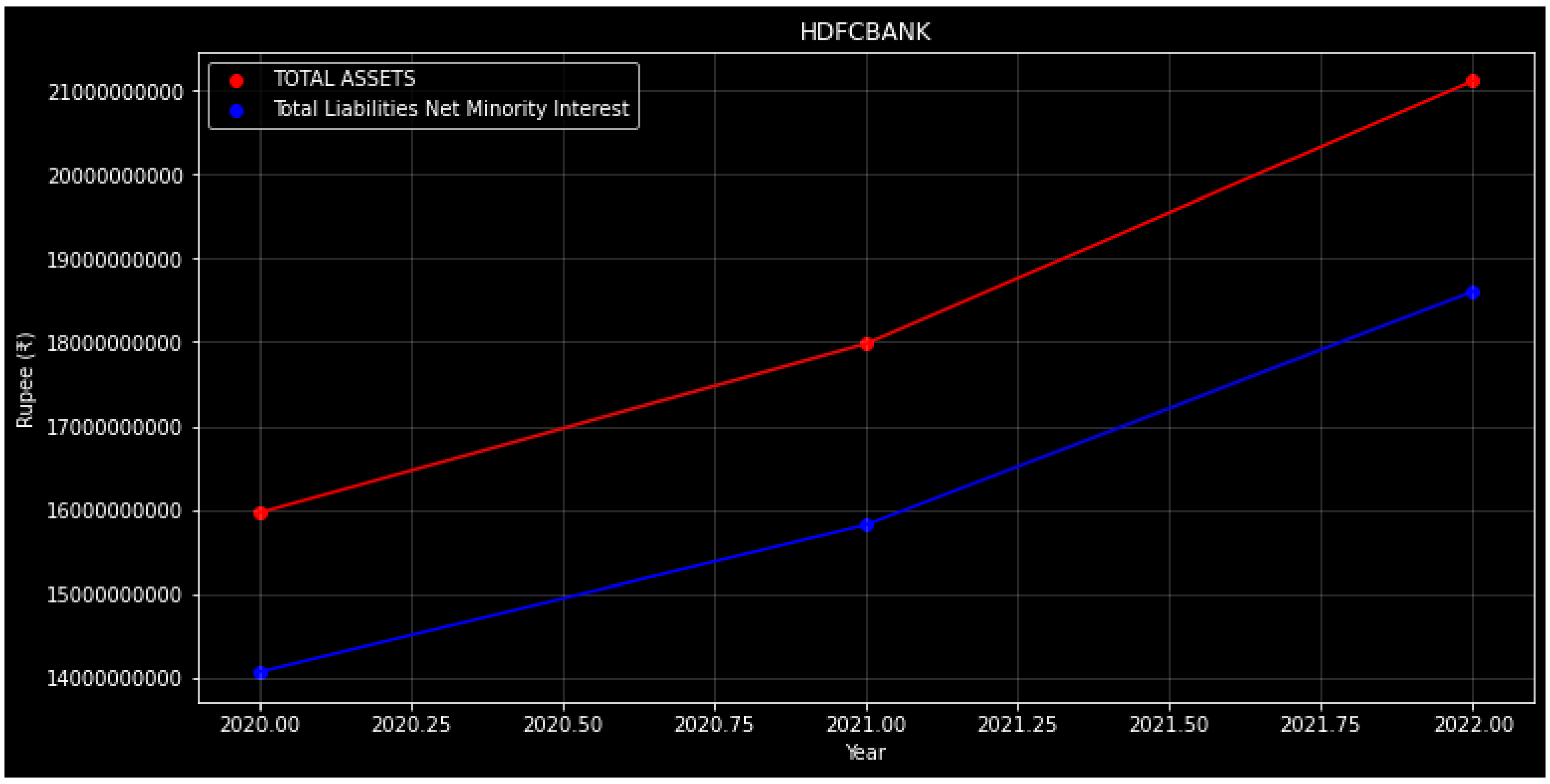
```
In [52]: plt.style.use('dark_background')
         fig, ax = plt.subplots(figsize=(12, 6))
         plt.bar( df_Total_Capitalization.year, df_Total_Capitalization.cash, color="royalblue")
         plt.plot( df_Total_Capitalization.year, df_Total_Capitalization.cash, color="red", linestyle="--")
         plt.scatter( df_Total_Capitalization.year, df_Total_Capitalization.cash, color="red", linestyle="--")
         plt.ticklabel_format(axis='y', style='plain')
         plt.title("Total Capitalization")
         plt.xlabel("Year")
         plt.ylabel("Rupees ₹")
         ax.grid(color='white', alpha=0.20)
         plt.show()
```



COMPARING TOTAL ASSETS AND LIABILITIES

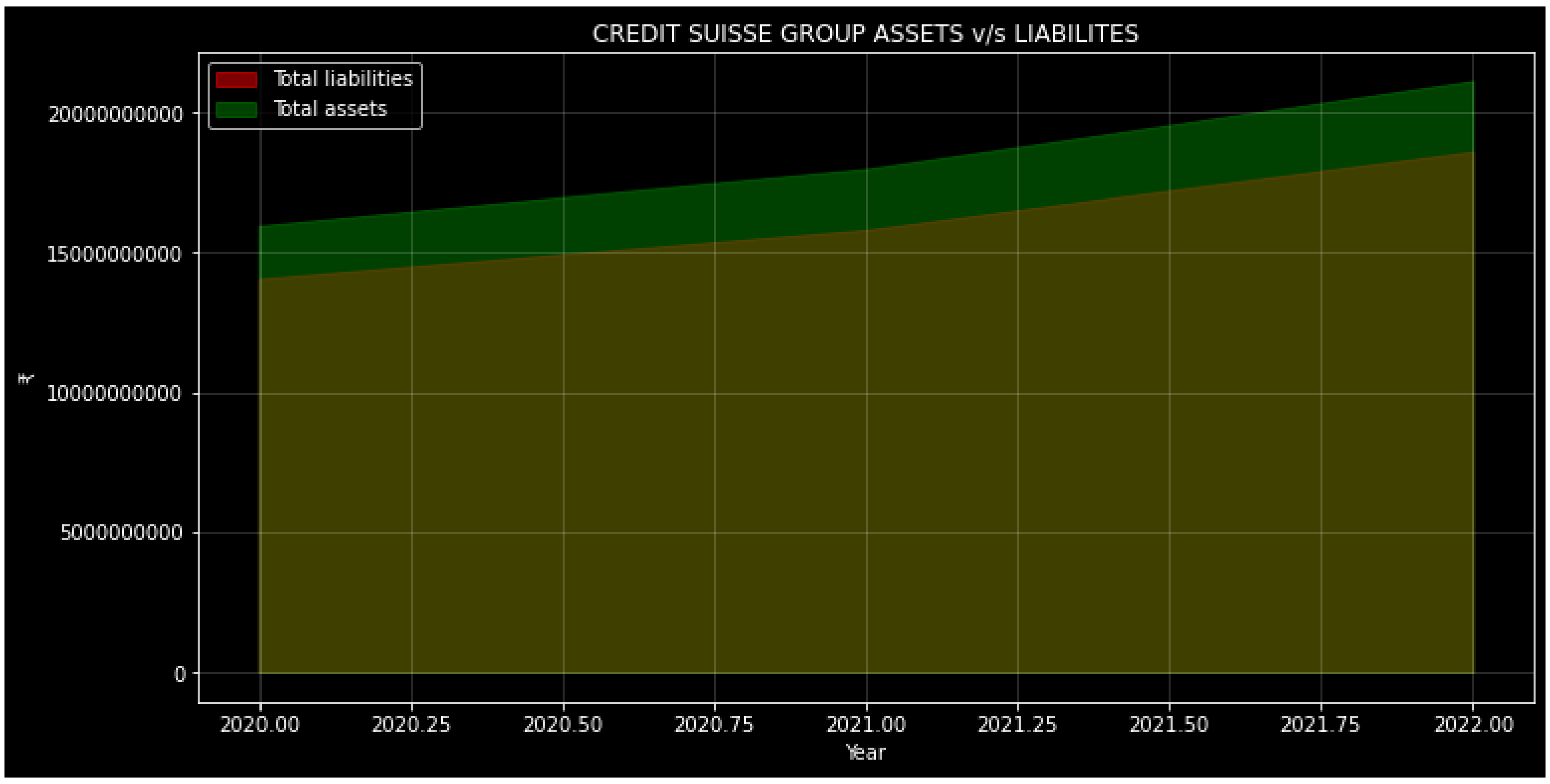
In [53]:

```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))

#Total Assets
plt.plot(df_total_assets.year,df_total_assets.cash, color="red")
plt.scatter(df_total_assets.year,df_total_assets.cash, color="red", label="TOTAL ASSETS")

# Total Liabilities
plt.plot(df_Total_Liabilities_Net_Minority_Interests.year,df_Total_Liabilities_Net_Minority_Interests.cash, color="
plt.scatter(df_Total_Liabilities_Net_Minority_Interests.year,df_Total_Liabilities_Net_Minority_Interests.cash, colo

plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFCBANK")
plt.xlabel("Year")
plt.ylabel("Rupee (₹)")
ax.grid(color='white', alpha=0.20)
plt.legend(loc="upper left")
plt.show()
```



In [54]:

```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
#Total liabilities
plt.fill_between(df_Total_Liabilities_Net_Minority_Interests.year, df_Total_Liabilities_Net_Minority_Interests.cash
#total assets
plt.fill_between(df_total_assets.year, df_total_assets.cash, color="green", alpha=0.5, label="Total assets")
plt.ticklabel_format(axis='y', style='plain')
plt.title("CREDIT SUISSE GROUP ASSETS v/s LIABILITES")
plt.xlabel("Year")
plt.ylabel("₹")
ax.grid(color='white', alpha=0.20)
plt.legend(loc="upper left")
plt.show()
```



COMMON STOCK EQUITY

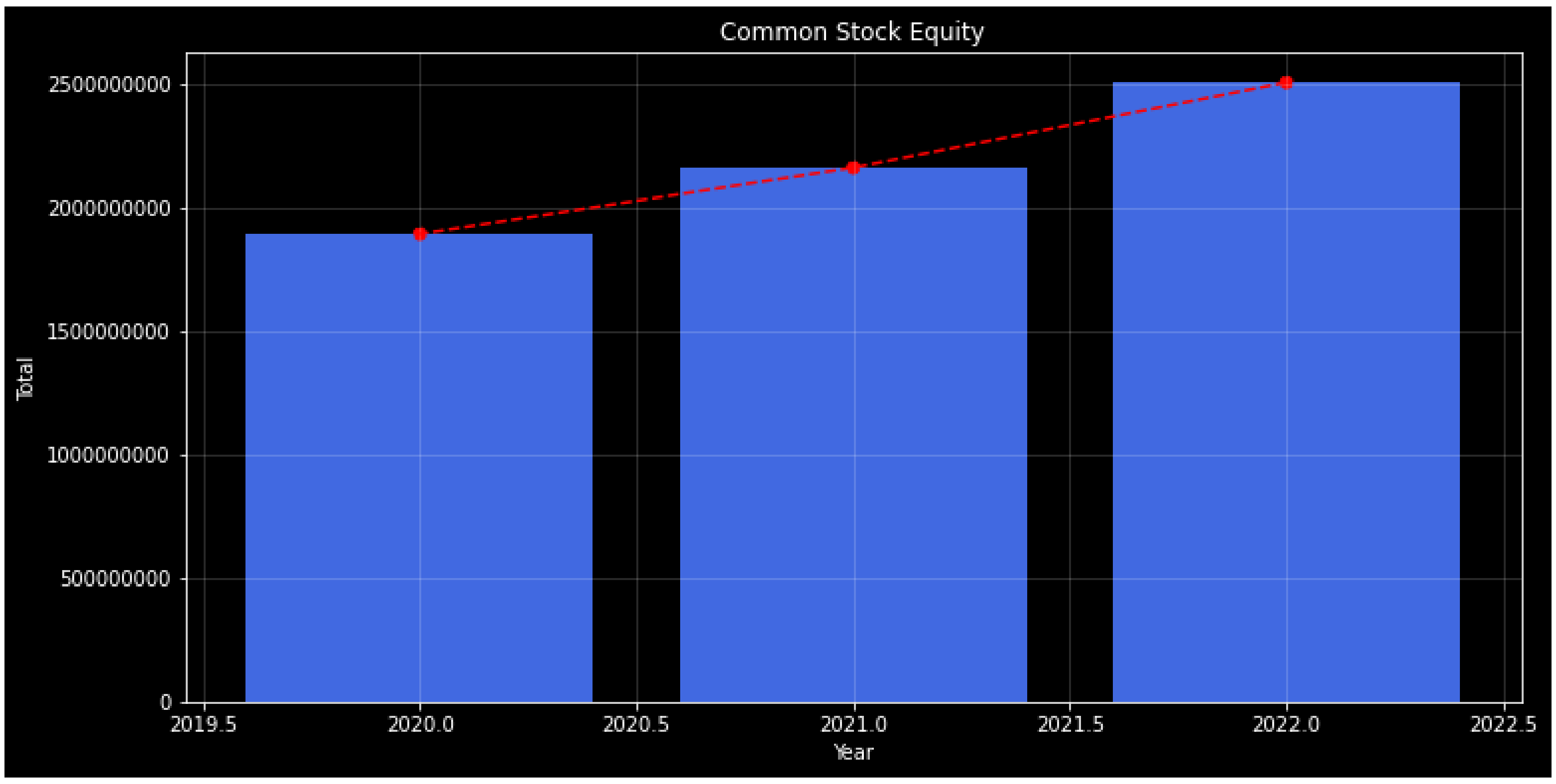
In [55]:

```
Common_Stock_Equity = balance_sheet_annually.loc[4]
Common_Stock_Equity
```

```
Out[55]: breakdown    Common Stock Equity
         2022                  2504838400
         2021                  2159628400
         2020                  1893082400
         Name: 4, dtype: object
```

```
In [56]: year = []
         cash = []

         for k, v in Common_Stock_Equity.items():
             if k != 'breakdown':  # skip the header
                 year.append(int(k))
                 cash.append(int(v))

         df_Common_Stock_Equity = pd.DataFrame({'year': year, 'cash': cash})
```

```
In [57]: plt.style.use('dark_background')
         fig, ax = plt.subplots(figsize=(12, 6))
         plt.bar( df_Common_Stock_Equity.year, df_Common_Stock_Equity.cash, color="royalblue")
         plt.plot( df_Common_Stock_Equity.year, df_Common_Stock_Equity.cash, color="red", linestyle="--")
         plt.scatter( df_Common_Stock_Equity.year, df_Common_Stock_Equity.cash, color="red", linestyle="--")
         plt.ticklabel_format(axis='y', style='plain')
         plt.title("Common Stock Equity")
         plt.xlabel("Year")
         plt.ylabel("Total")
         ax.grid(color='white', alpha=0.20)
         plt.show()
```



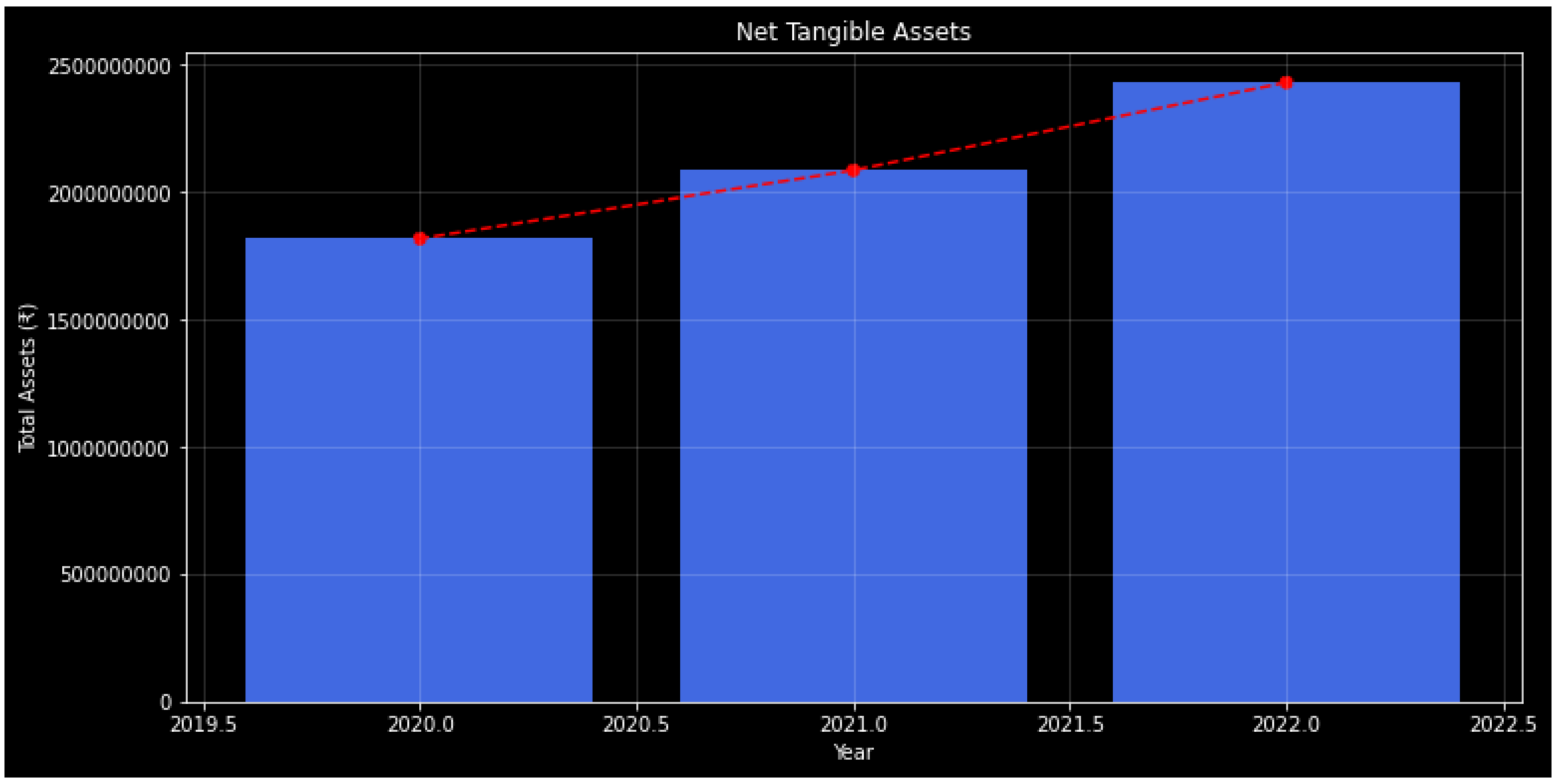
NET TANGIBLE ASSETS

```
In [58]: Net_Tangible_Assets = balance_sheet_annually.loc[6]
         Net_Tangible_Assets
```

```
Out[58]: breakdown    Net Tangible Assets
         2022                  2429900500
         2021                  2084690500
         2020                  1818144500
         Name: 6, dtype: object
```

```
In [59]: year = []
         cash = []

         for k, v in Net_Tangible_Assets.items():
             if k != 'breakdown':  # skip the header
                 year.append(int(k))
                 cash.append(int(v))

         df_Net_Tangible_Assets = pd.DataFrame({'year': year, 'cash': cash})
```

```
In [60]: plt.style.use('dark_background')
         fig, ax = plt.subplots(figsize=(12, 6))
         plt.bar( df_Net_Tangible_Assets.year, df_Net_Tangible_Assets.cash, color="royalblue")
         plt.plot( df_Net_Tangible_Assets.year, df_Net_Tangible_Assets.cash, color="red", linestyle="--")
         plt.scatter( df_Net_Tangible_Assets.year, df_Net_Tangible_Assets.cash, color="red", linestyle="--")
         plt.ticklabel_format(axis='y', style='plain')
         plt.title("Net Tangible Assets")
         plt.xlabel("Year")
         plt.ylabel("Total Assets (₹)")
         ax.grid(color='white', alpha=0.20)
         plt.show()
```



COMPARING TOTAL DEBT AND NET DEBT

```
In [61]: Total_Debt = balance_sheet_annually.loc[9]
         Net_Debt = balance_sheet_annually.loc[10]
         print(Total_Debt)
         print(Net_Debt)
```

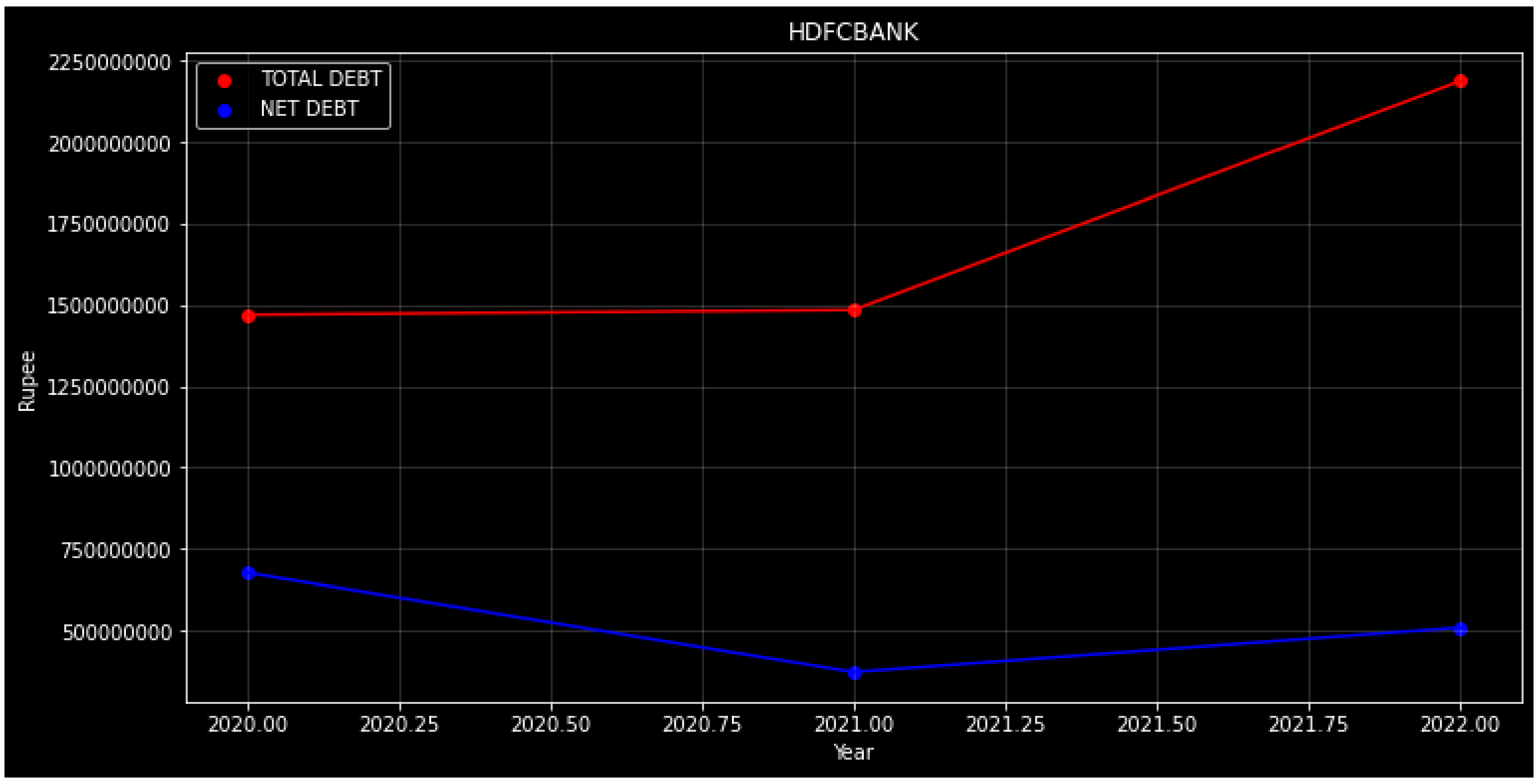
```
breakdown    Total Debt
2022         2186639000
2021         1484444300
2020         1469551000
Name: 9, dtype: object
breakdown     Net Debt
2022         509280300
2021         372639500
2020         677191800
Name: 10, dtype: object
```

```
In [62]: year = []
         cash = []

         for k, v in Total_Debt.items():
             if k != 'breakdown':  # skip the header
                 year.append(int(k))
                 cash.append(int(v))

         df_Total_Debt = pd.DataFrame({'year': year, 'cash': cash})
```

```
In [63]: year = []
         cash = []
         for k, v in Net_Debt.items():
             if k != 'breakdown':  # skip the header
                 year.append(int(k))
                 cash.append(int(v))
```

```
In [64]: df_Net_Debt = pd.DataFrame({'year': year, 'cash': cash})
```

```
In [65]: plt.style.use('dark_background')
         fig, ax = plt.subplots(figsize=(12, 6))

         #Total Assets
         plt.plot(df_Total_Debt.year,df_Total_Debt.cash, color="red")
         plt.scatter(df_Total_Debt.year,df_Total_Debt.cash, color="red", label="TOTAL DEBT")

         # Total Liabilities
         plt.plot(df_Net_Debt.year,df_Net_Debt.cash, color="blue")
         plt.scatter(df_Net_Debt.year,df_Net_Debt.cash, color="blue", label="NET DEBT")

         plt.ticklabel_format(axis='y', style='plain')
         plt.title("HDFCBANK")
         plt.xlabel("Year")
         plt.ylabel("Rupee")
         ax.grid(color='white', alpha=0.20)
         plt.legend(loc="upper left")
         plt.show()
```



CASHFLOW STATEMENT

In [66]:

```
## pd.set_option('display.max_rows', 100)
cashflow_annually = pd.read_csv('HDFCBANK_CASHFLOW STATEMENT.csv')
cashflow_annually.columns.values[0] = "breakdown"
cashflow_annually
```

Out[66]:

	breakdown	2022	2021	2020
0	Operating Cash Flow	581018200	921776200	171179700
1	Cash Flow from Continuing Operating Activities	581018200	921776200	171179700
2	Net Income from Continuing Operations	386603000	326006400	260364000
3	Operating Gains Losses	-21559700	-56298200	-13322800
4	Gain Loss On Sale of PPE	-900	-16200	81900
...	...	...	...	...
64	Capital Expenditure	-26324400	-17806500	-18294300
65	Issuance of Capital Stock	-	0	0
66	Issuance of Debt	722908900	481989200	272104700
67	Repayment of Debt	-353325700	-326285000	-315209600
68	Free Cash Flow	554693800	903969700	152885400

69 rows × 4 columns

Operating Cashflow Income

In [67]:

```
operating_cash_flow_income = cashflow_annually.loc[0]
operating_cash_flow_income
```

Out[67]:

```
breakdown    Operating Cash Flow
2022                   581018200
2021                   921776200
2020                   171179700
Name: 0, dtype: object
```

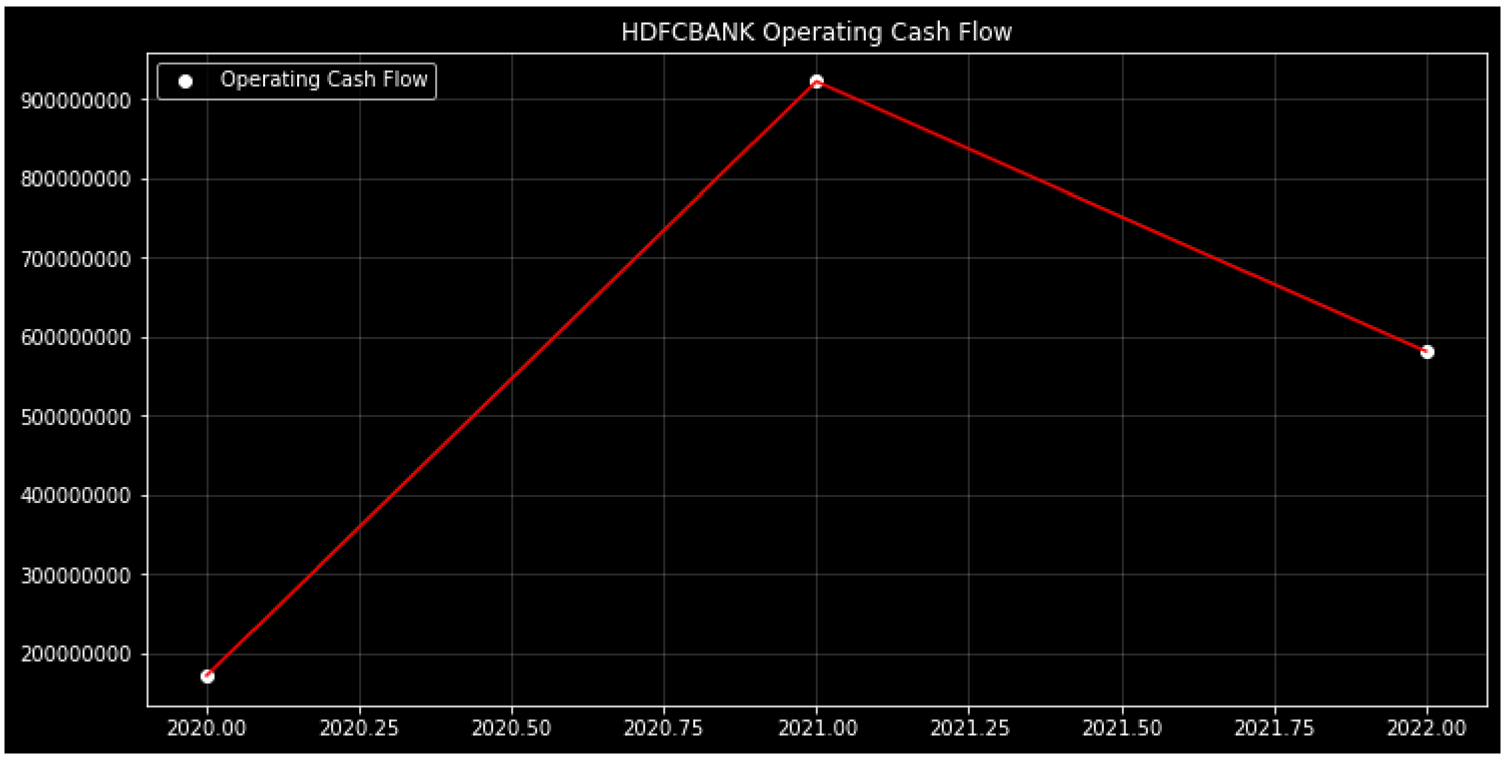
In [68]:

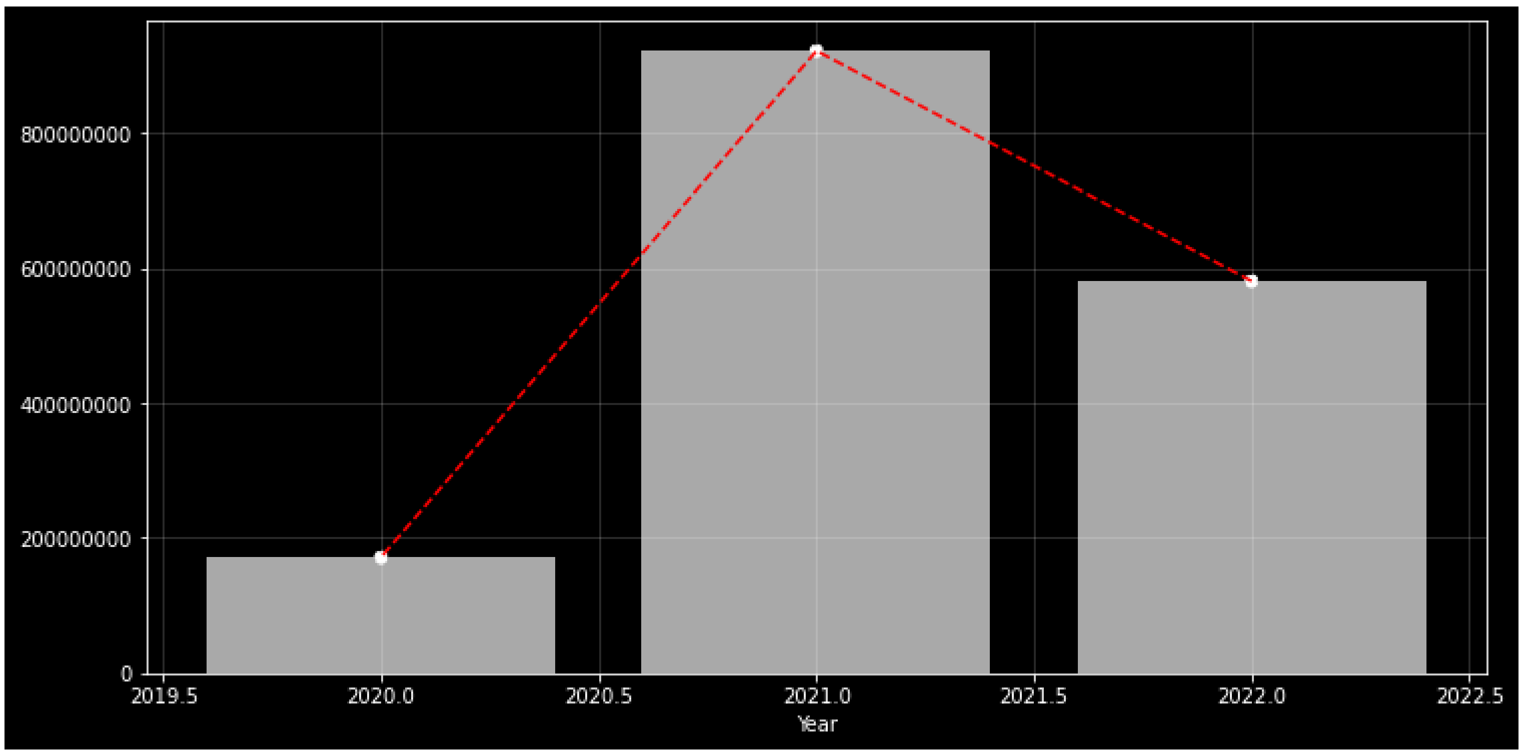
```
year = []
cash = []

for k, v in operating_cash_flow_income.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        cash.append(int(v))

df_operating_cash_flow_income = pd.DataFrame({'year': year, 'cash': cash})
```

In [69]:

```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))

# Total Liabilities
plt.plot(df_operating_cash_flow_income.year,df_operating_cash_flow_income.cash, color="red")
plt.scatter(df_operating_cash_flow_income.year,df_operating_cash_flow_income.cash, color="white", label="Operating

plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFCBANK Operating Cash Flow")
```

```
ax.grid(color='white', alpha=0.20)
plt.legend(loc="upper left")
plt.show()

plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar( df_operating_cash_flow_income.year, df_operating_cash_flow_income.cash, color="darkgrey")
plt.plot( df_operating_cash_flow_income.year, df_operating_cash_flow_income.cash, color="red", linestyle="--")
plt.scatter( df_operating_cash_flow_income.year, df_operating_cash_flow_income.cash, color="white", linestyle="--")
plt.ticklabel_format(axis='y', style='plain')
plt.xlabel("Year")
ax.grid(color='white', alpha=0.20)
plt.show()
```





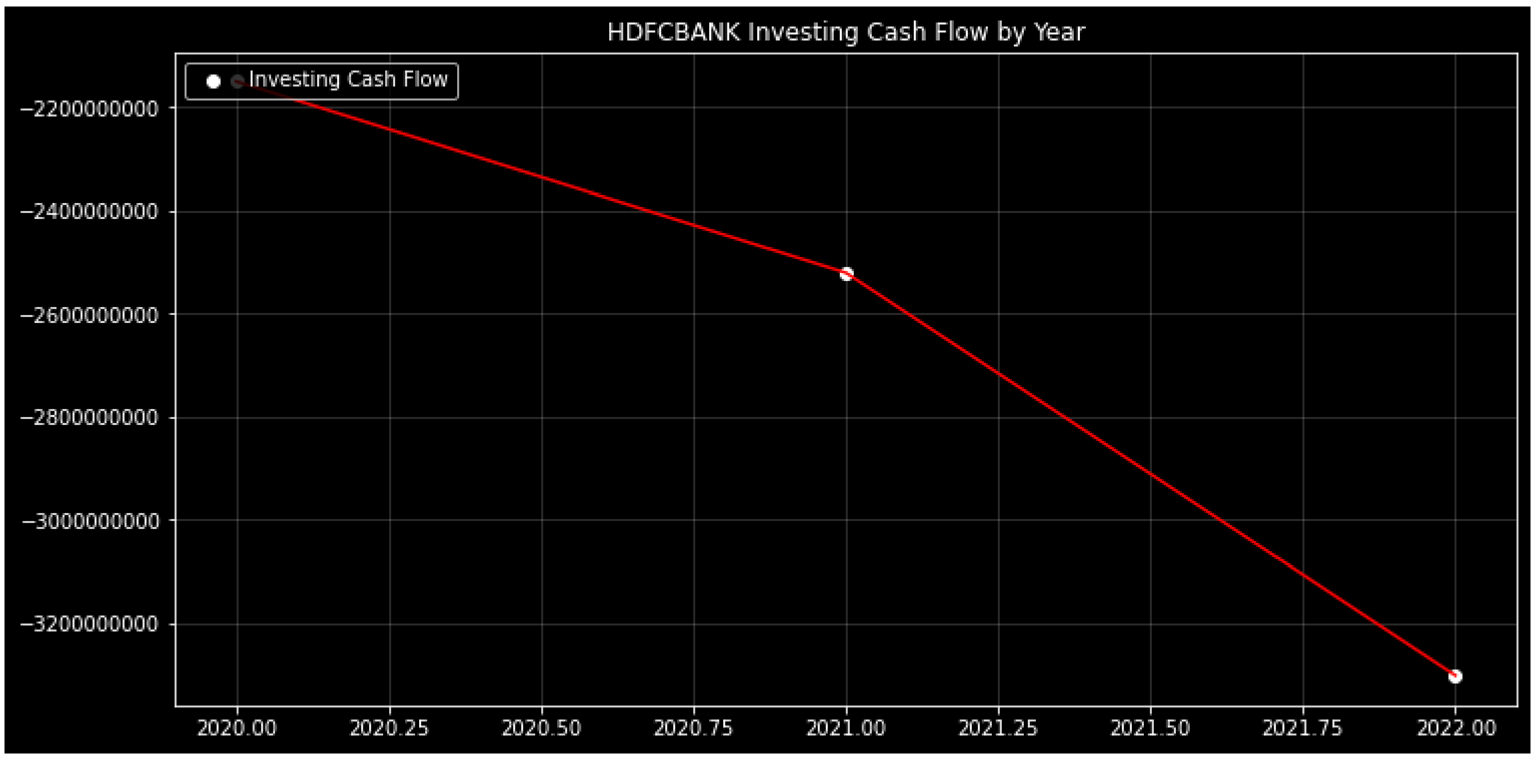
INVESTING CASHFLOW

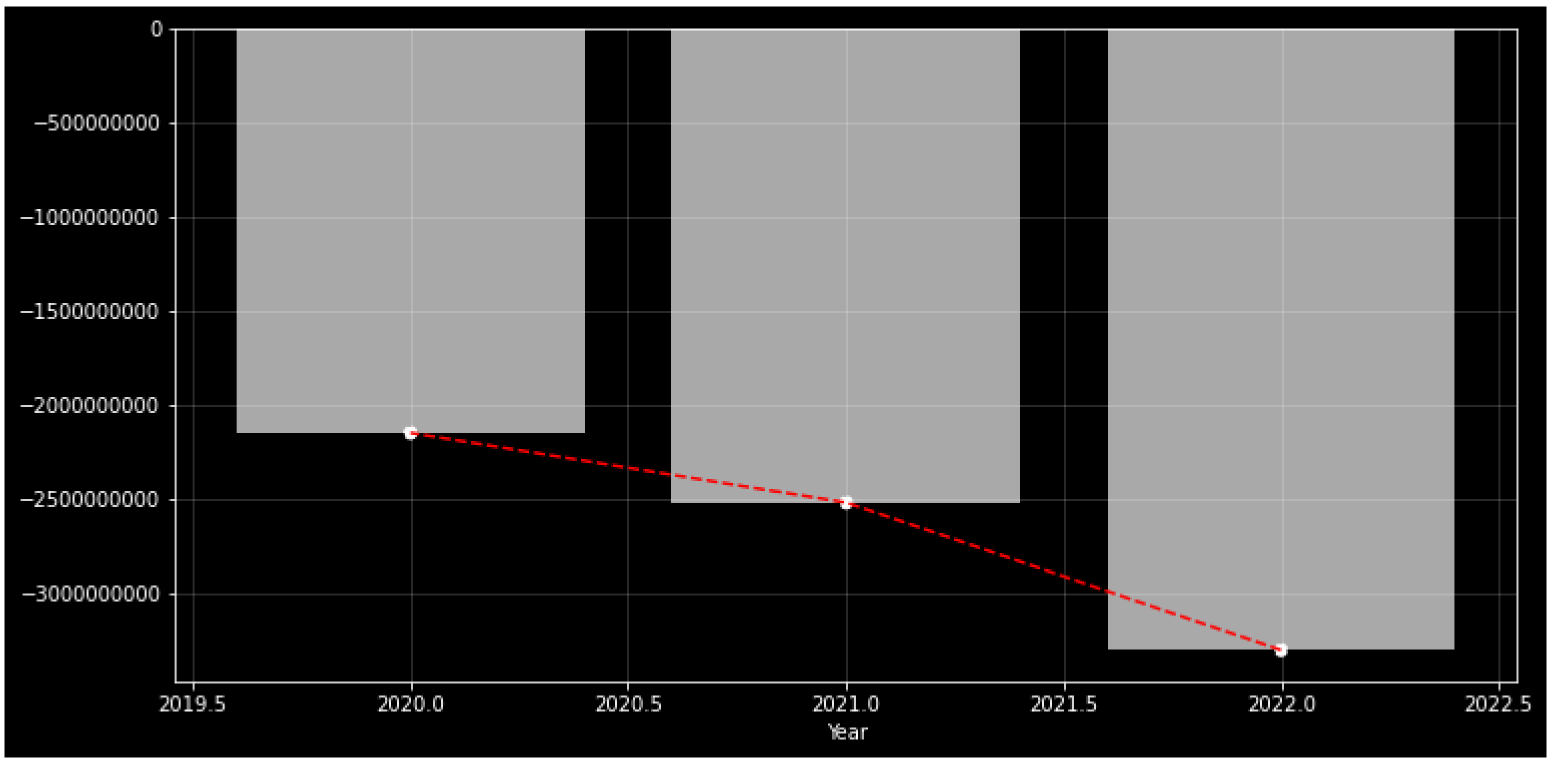
In [70]:
```
investing_cashflow = cashflow_annually.loc[32]
investing_cashflow
```

Out[70]:
```
breakdown    Investing Cash Flow
2022                 -3302279800
2021                 -2521149700
2020                 -2150488400
Name: 32, dtype: object
```

In [71]:
```
year = []
cash = []

for k, v in investing_cashflow.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        cash.append(int(v))

df_investing_cashflow = pd.DataFrame({'year': year, 'cash': cash})
```

In [72]:
```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))

# Total Liabilities
plt.plot(df_investing_cashflow.year,df_investing_cashflow.cash, color="red")
plt.scatter(df_investing_cashflow.year,df_investing_cashflow.cash, color="white", label="Investing Cash Flow")
plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFCBANK Investing Cash Flow by Year")
ax.grid(color='white', alpha=0.20)
plt.legend(loc="upper left")
plt.show()

plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar( df_investing_cashflow.year, df_investing_cashflow.cash, color="darkgrey")
plt.plot( df_investing_cashflow.year, df_investing_cashflow.cash, color="red", linestyle="--")
plt.scatter( df_investing_cashflow.year, df_investing_cashflow.cash, color="white", linestyle="--")
plt.ticklabel_format(axis='y', style='plain')
plt.xlabel("Year")
ax.grid(color='white', alpha=0.20)
plt.show()
```





FINANCING CASHFLOW

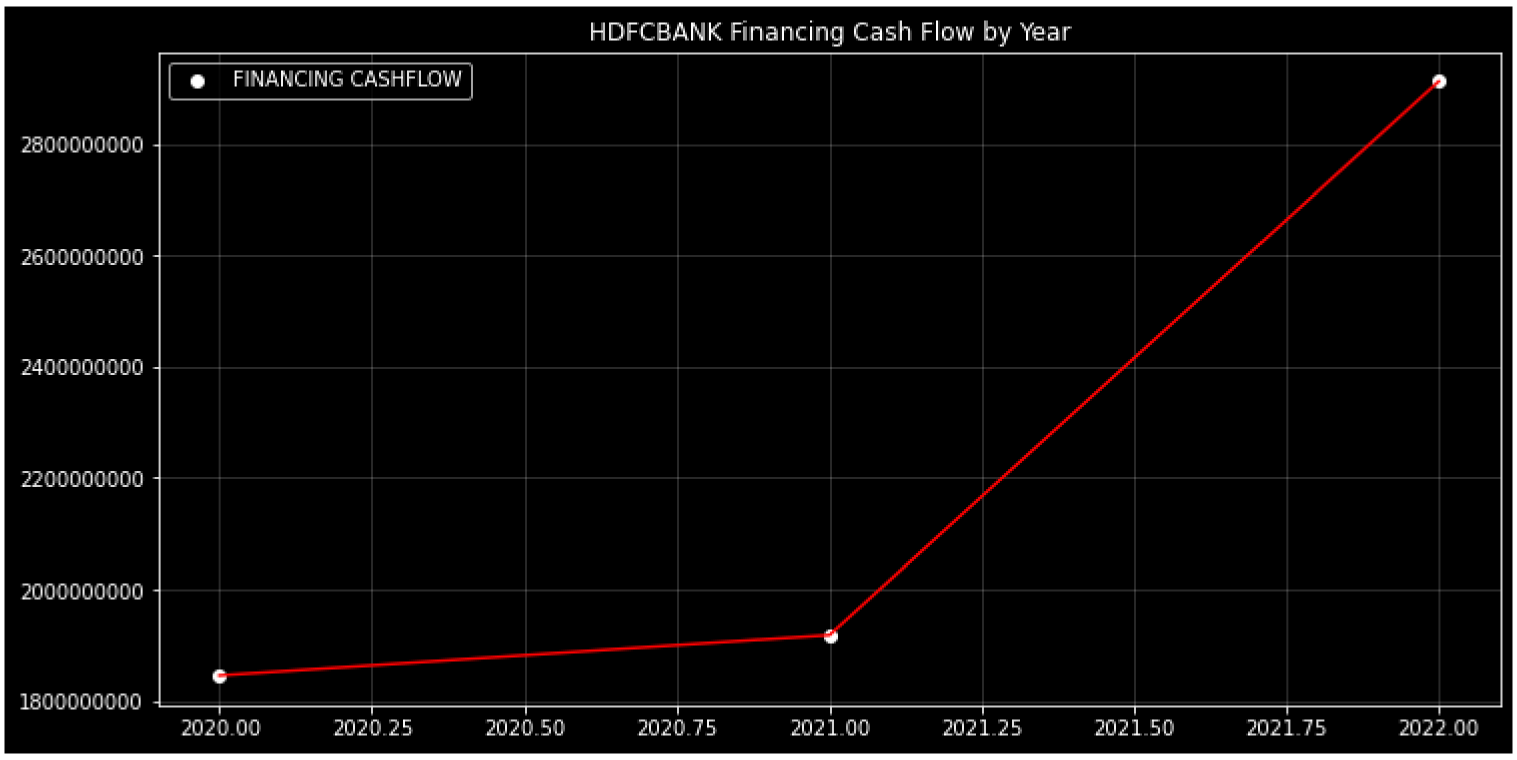
In [73]:
```
financing_cashflow = cashflow_annually.loc[45]
financing_cashflow
```

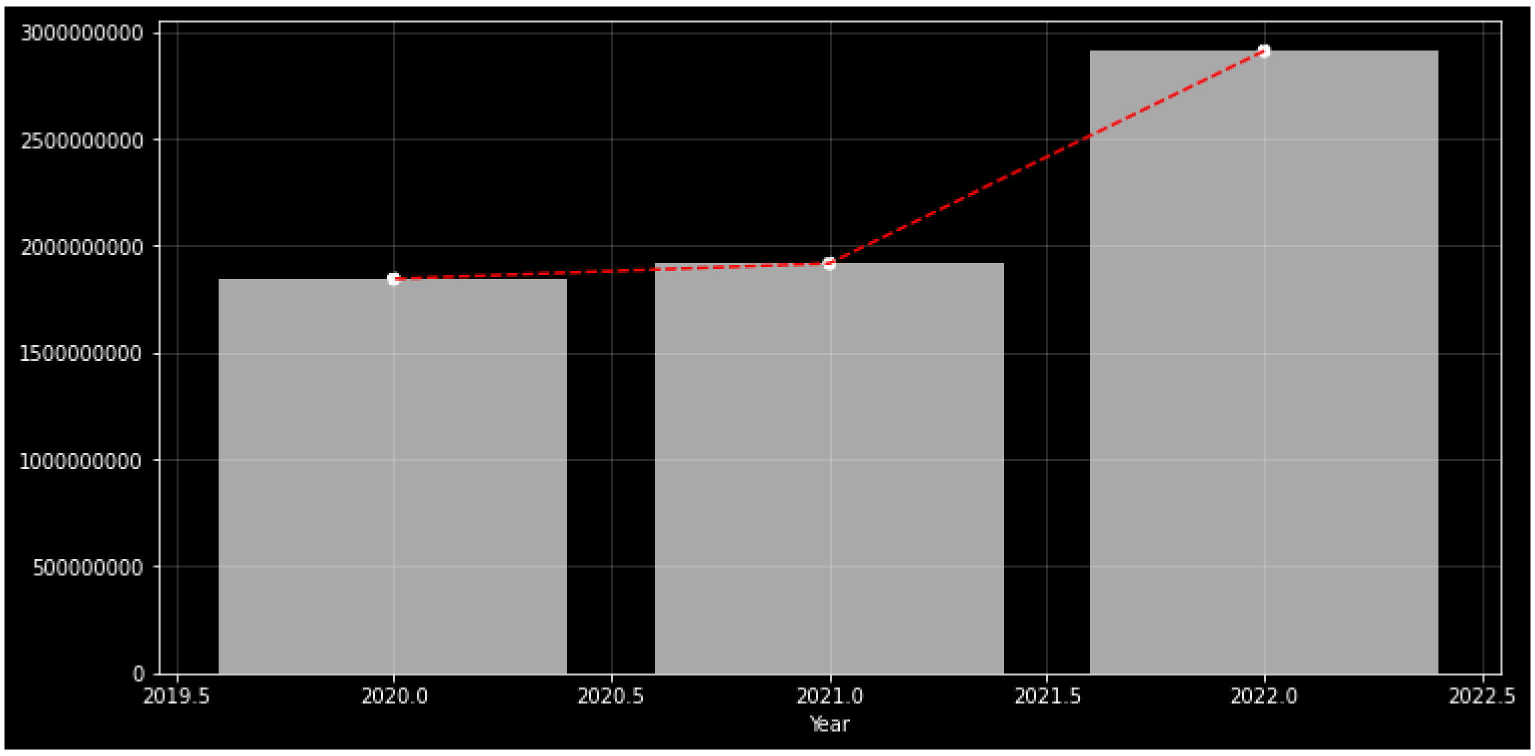
Out[73]:
```
breakdown    Financing Cash Flow
2022                  2912107500
2021                  1918369400
2020                  1845786600
Name: 45, dtype: object
```

In [74]:
```
year = []
cash = []

for k, v in financing_cashflow.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        cash.append(int(v))

df_financing_cashflow = pd.DataFrame({'year': year, 'cash': cash})
```

In [75]:
```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
```

```
# Total Liabilities
plt.plot(df_financing_cashflow.year,df_financing_cashflow.cash, color="red")
plt.scatter(df_financing_cashflow.year,df_financing_cashflow.cash, color="white", label="FINANCING CASHFLOW")

plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFCBANK Financing Cash Flow by Year")
ax.grid(color='white', alpha=0.20)
plt.legend(loc="upper left")
plt.show()

plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar( df_financing_cashflow.year, df_financing_cashflow.cash, color="darkgrey")
plt.plot( df_financing_cashflow.year, df_financing_cashflow.cash, color="red", linestyle="--")
plt.scatter( df_financing_cashflow.year, df_financing_cashflow.cash, color="white", linestyle="--")
plt.ticklabel_format(axis='y', style='plain')
plt.xlabel("Year")
ax.grid(color='white', alpha=0.20)
plt.show()
```

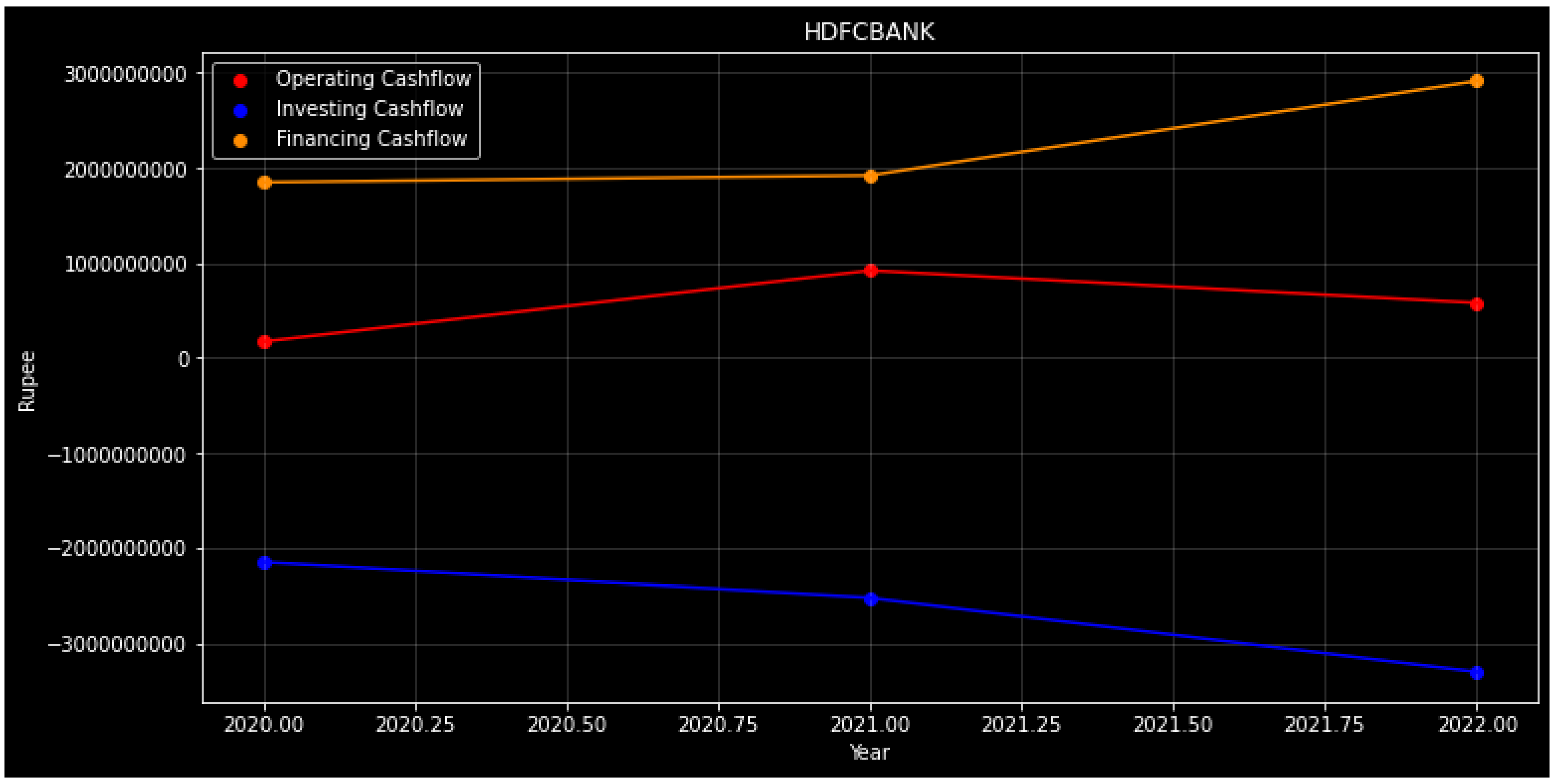




COMPARING OPERATING CASHFLOW, INVESTING CASHFLOW & FINANCING CASHFLOW

```
In [76]: plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))

#Total Assets
plt.plot(df_operating_cash_flow_income.year,df_operating_cash_flow_income.cash, color="red")
plt.scatter(df_operating_cash_flow_income.year,df_operating_cash_flow_income.cash, color="red", label="Operating Ca

# Total Liabilities
plt.plot(df_investing_cashflow.year,df_investing_cashflow.cash, color="blue")
plt.scatter(df_investing_cashflow.year,df_investing_cashflow.cash, color="blue", label="Investing Cashflow")

# Total Liabilities
plt.plot(df_financing_cashflow.year,df_financing_cashflow.cash, color="darkorange")
plt.scatter(df_financing_cashflow.year,df_financing_cashflow.cash, color="darkorange", label="Financing Cashflow")

plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFCBANK")
plt.xlabel("Year")
plt.ylabel("Rupee")
```

```
ax.grid(color='white', alpha=0.20)
plt.legend(loc="upper left")
plt.show()
```



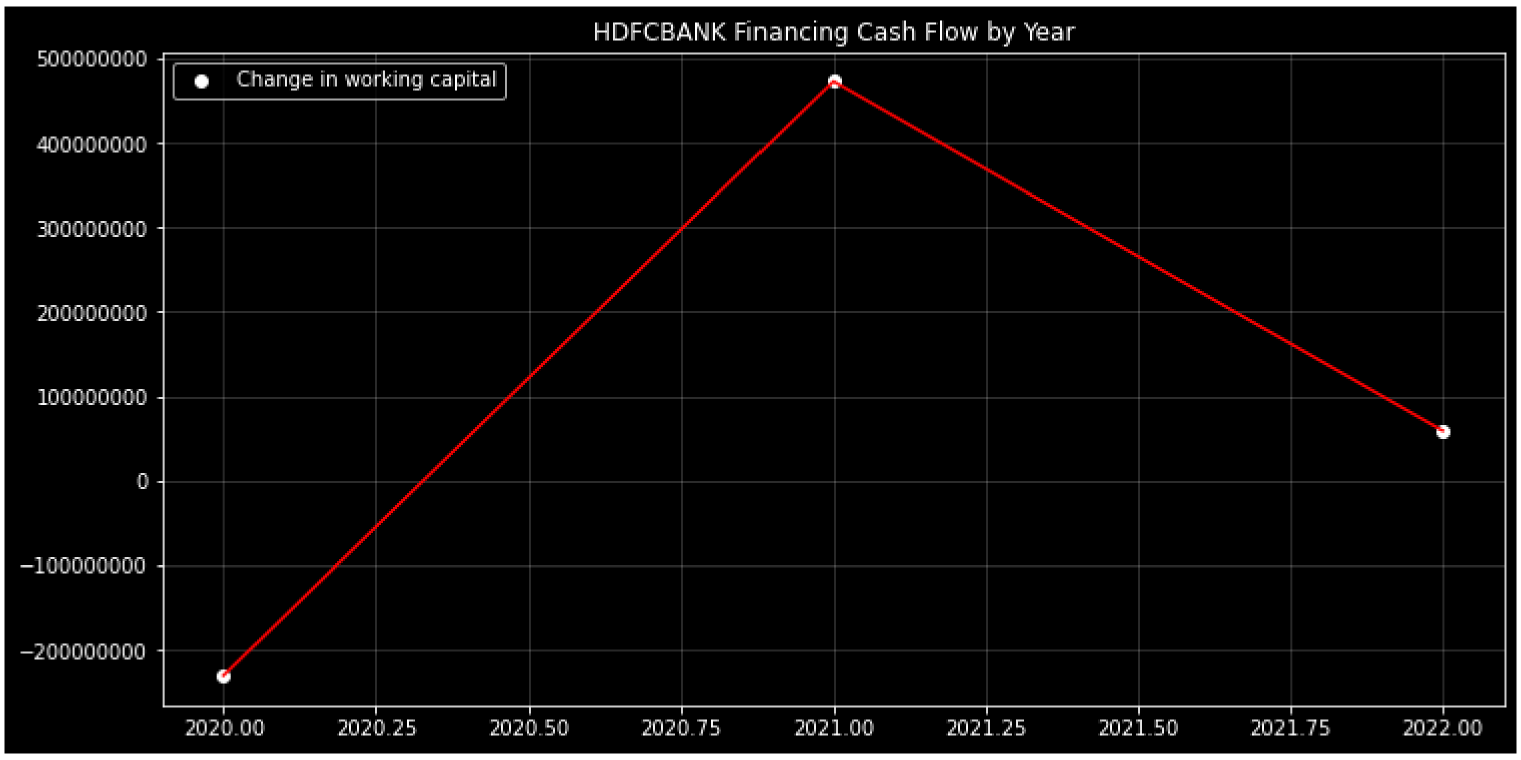
CHANGE IN WORKING CAPITAL

In [77]:
```
change_working_capital = cashflow_annually.loc[19]
change_working_capital
```

Out[77]:
```
breakdown    Change in working capital
2022                          58907300
2021                         472346000
2020                        -230662300
Name: 19, dtype: object
```

In [78]:
```
year = []
cash = []

for k, v in change_working_capital.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        cash.append(int(v))

df_change_working_capital = pd.DataFrame({'year': year, 'cash': cash})
```

In [79]:
```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))

# Total Liabilities
plt.plot(df_change_working_capital.year,df_change_working_capital.cash, color="red")
plt.scatter(df_change_working_capital.year,df_change_working_capital.cash, color="white", label="Change in working

plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFCBANK Financing Cash Flow by Year")
ax.grid(color='white', alpha=0.20)
plt.legend(loc="upper left")
plt.show()
```



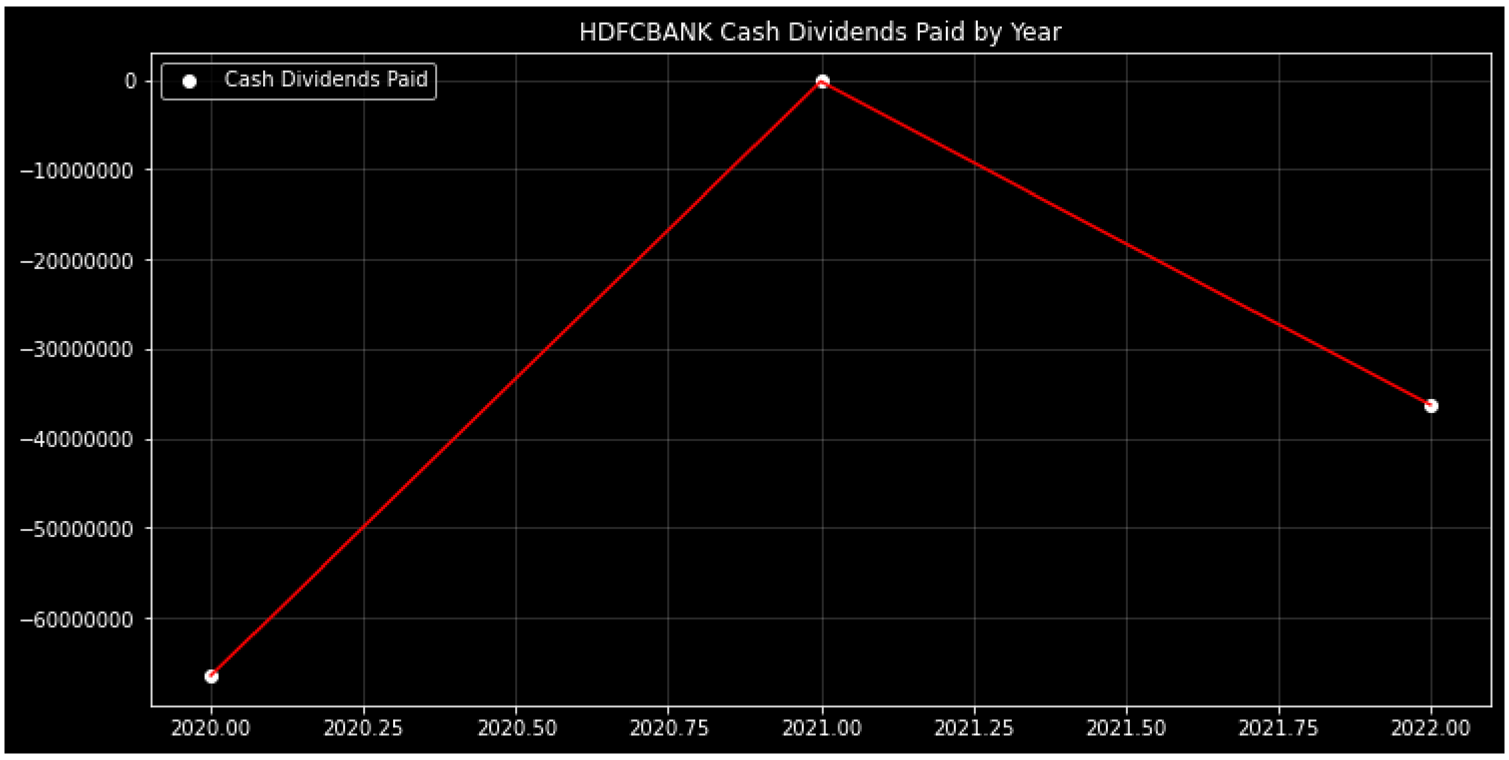
CASH DIVIDENDS PAID

```
In [80]: cash_dividends_paid = cashflow_annually.loc[54]
         cash_dividends_paid
```

```
Out[80]: breakdown    Cash Dividends Paid
         2022                   -36239200
         2021                     -166600
         2020                   -66447300
         Name: 54, dtype: object
```

```
In [81]: year = []
         cash = []

         for k, v in cash_dividends_paid.items():
             if k != 'breakdown':  # skip the header
                 year.append(int(k))
                 cash.append(int(v))

         df_cash_dividends_paid = pd.DataFrame({'year': year, 'cash': cash})
```

```
In [82]: plt.style.use('dark_background')
         fig, ax = plt.subplots(figsize=(12, 6))

         # Total Liabilities
         plt.plot(df_cash_dividends_paid.year,df_cash_dividends_paid.cash, color="red")
         plt.scatter(df_cash_dividends_paid.year,df_cash_dividends_paid.cash, color="white", label="Cash Dividends Paid")

         plt.ticklabel_format(axis='y', style='plain')
         plt.title("HDFCBANK Cash Dividends Paid by Year")
         ax.grid(color='white', alpha=0.20)
         plt.legend(loc="upper left")
         plt.show()
```



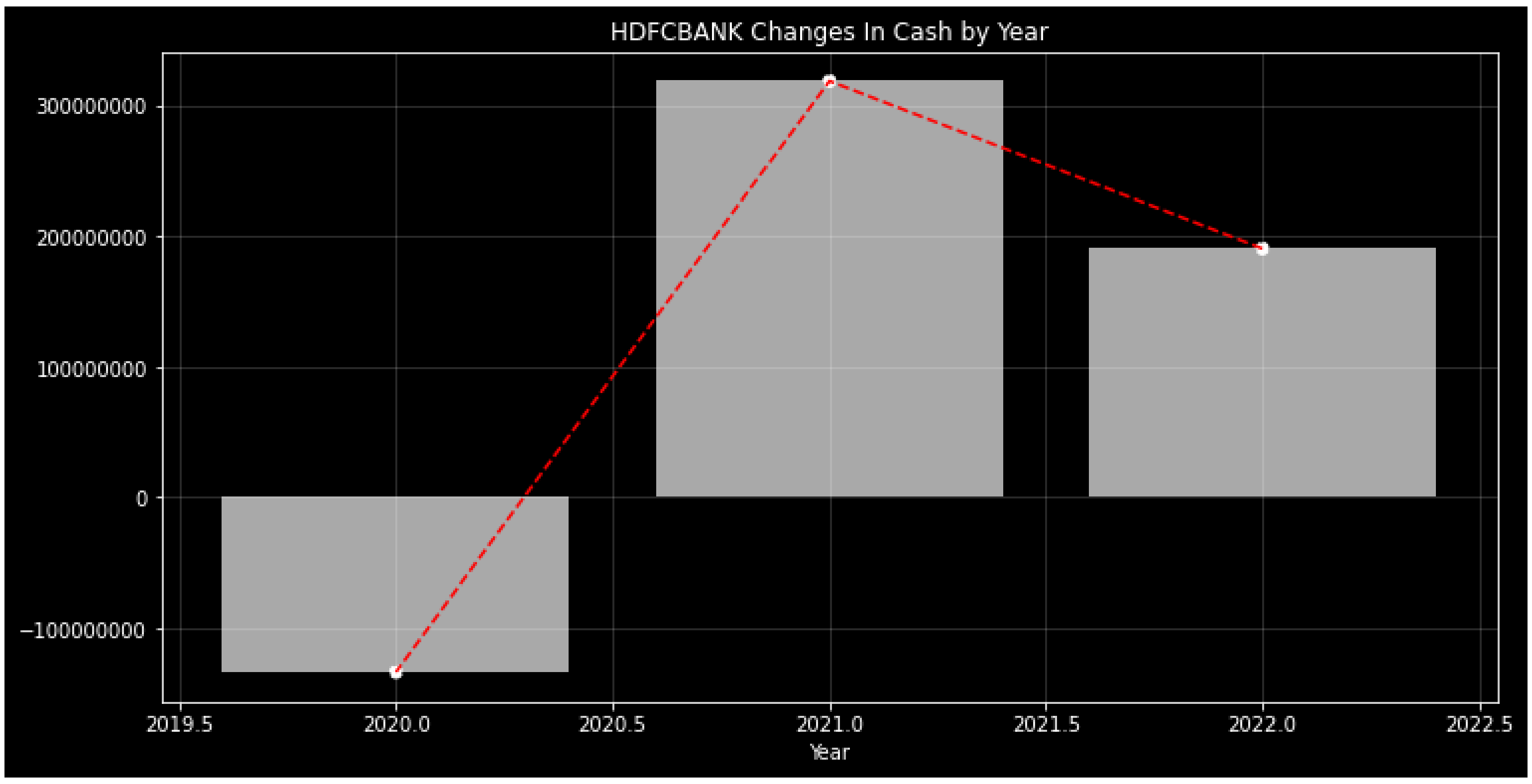
CHANGES IN CASH

```
In [83]: changes_in_cash = cashflow_annually.loc[59]
         changes_in_cash
```

```
Out[83]: breakdown    Changes in Cash
         2022               190845900
         2021               318995900
         2020              -133522100
         Name: 59, dtype: object
```

```
In [84]: year = []
         cash = []

         for k, v in changes_in_cash.items():
             if k != 'breakdown':  # skip the header
                 year.append(int(k))
                 cash.append(int(v))

         df_changes_in_cash = pd.DataFrame({'year': year, 'cash': cash})
```

```
In [85]: plt.style.use('dark_background')
         fig, ax = plt.subplots(figsize=(12, 6))
         plt.bar( df_changes_in_cash.year, df_changes_in_cash.cash, color="darkgrey")
         plt.plot( df_changes_in_cash.year, df_changes_in_cash.cash, color="red", linestyle="--")
         plt.scatter( df_changes_in_cash.year, df_changes_in_cash.cash, color="white", linestyle="--")
         plt.ticklabel_format(axis='y', style='plain')
         plt.title("HDFCBANK Changes In Cash by Year")
         plt.xlabel("Year")
         ax.grid(color='white', alpha=0.20)
         plt.show()
```



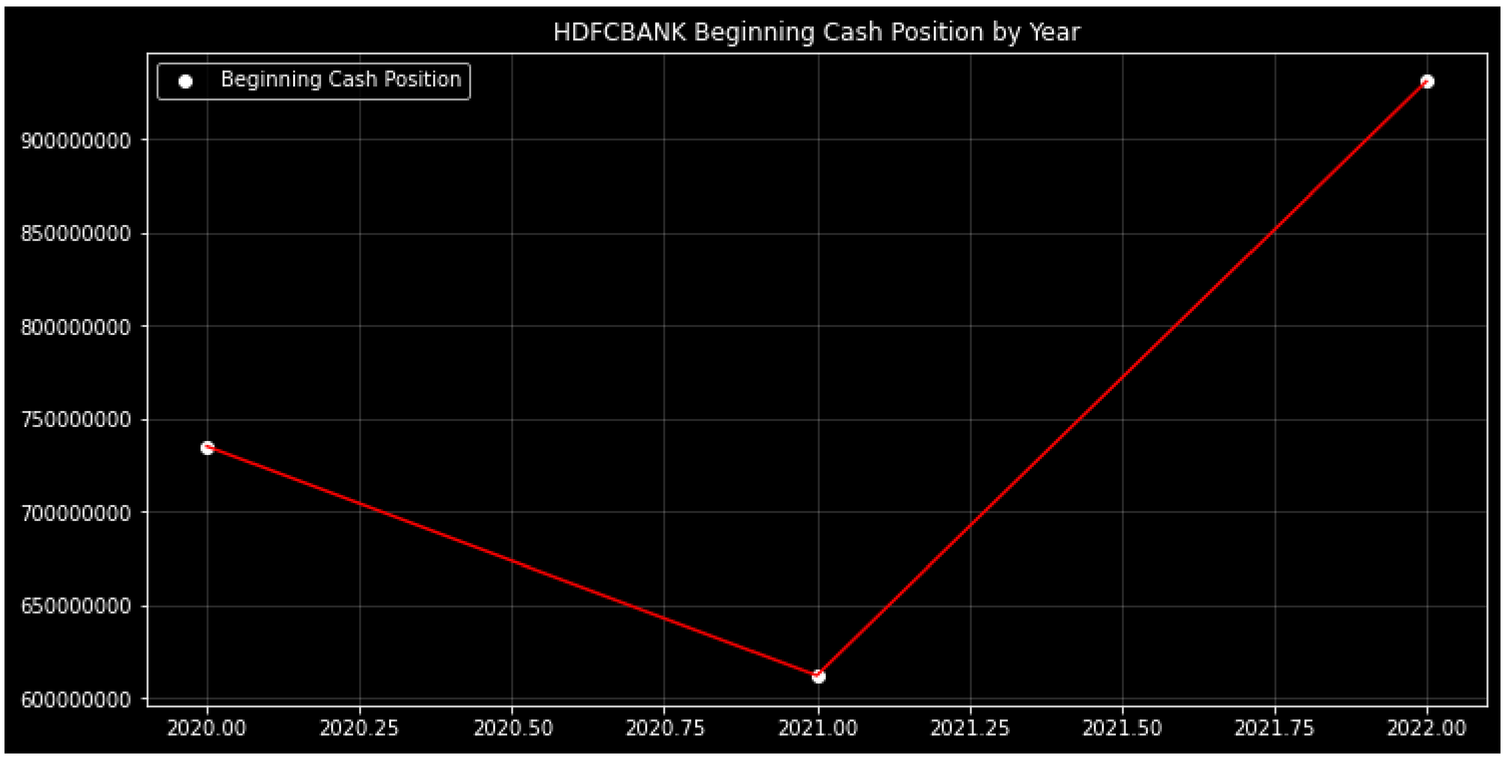
BEGINNING CASH POSITION

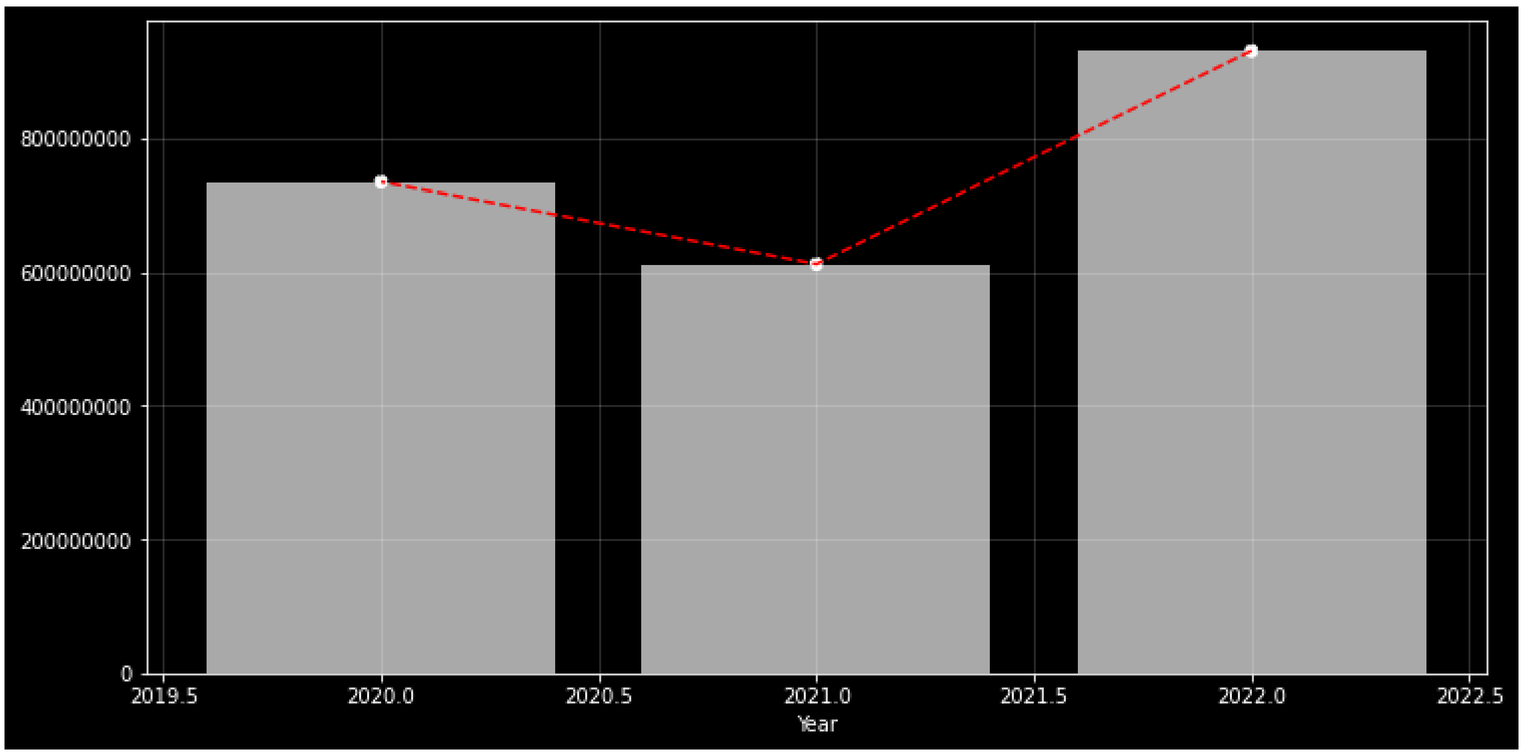
In [86]:
```
cash_At_start_Of_Period = cashflow_annually.iloc[61]
cash_At_start_Of_Period
```

Out[86]:
```
breakdown    Beginning Cash Position
2022                       930694700
2021                       611961000
2020                       734872600
Name: 61, dtype: object
```

In [87]:
```
year = []
cash = []

for k, v in cash_At_start_Of_Period.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        cash.append(int(v))

df_cash_At_start_Of_Period = pd.DataFrame({'year': year, 'cash': cash})
```

In [88]:
```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))

# Total Liabilities
plt.plot(df_cash_At_start_Of_Period.year,df_cash_At_start_Of_Period.cash, color="red")
plt.scatter(df_cash_At_start_Of_Period.year,df_cash_At_start_Of_Period.cash, color="white", label="Beginning Cash F

plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFCBANK Beginning Cash Position by Year")
ax.grid(color='white', alpha=0.20)
plt.legend(loc="upper left")
plt.show()

plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar( df_cash_At_start_Of_Period.year, df_cash_At_start_Of_Period.cash, color="darkgrey")
plt.plot( df_cash_At_start_Of_Period.year, df_cash_At_start_Of_Period.cash, color="red", linestyle="--")
plt.scatter( df_cash_At_start_Of_Period.year, df_cash_At_start_Of_Period.cash, color="white", linestyle="--")
plt.ticklabel_format(axis='y', style='plain')
plt.xlabel("Year")
ax.grid(color='white', alpha=0.20)
plt.show()
```





END CASH POSITION

In [89]:

```
cash_At_End_Of_Period = cashflow_annually.iloc[58]
cash_At_End_Of_Period
```

Out[89]:

```
breakdown    End Cash Position
2022                1122031100
2021                 930694700
2020                 611961000
Name: 58, dtype: object
```

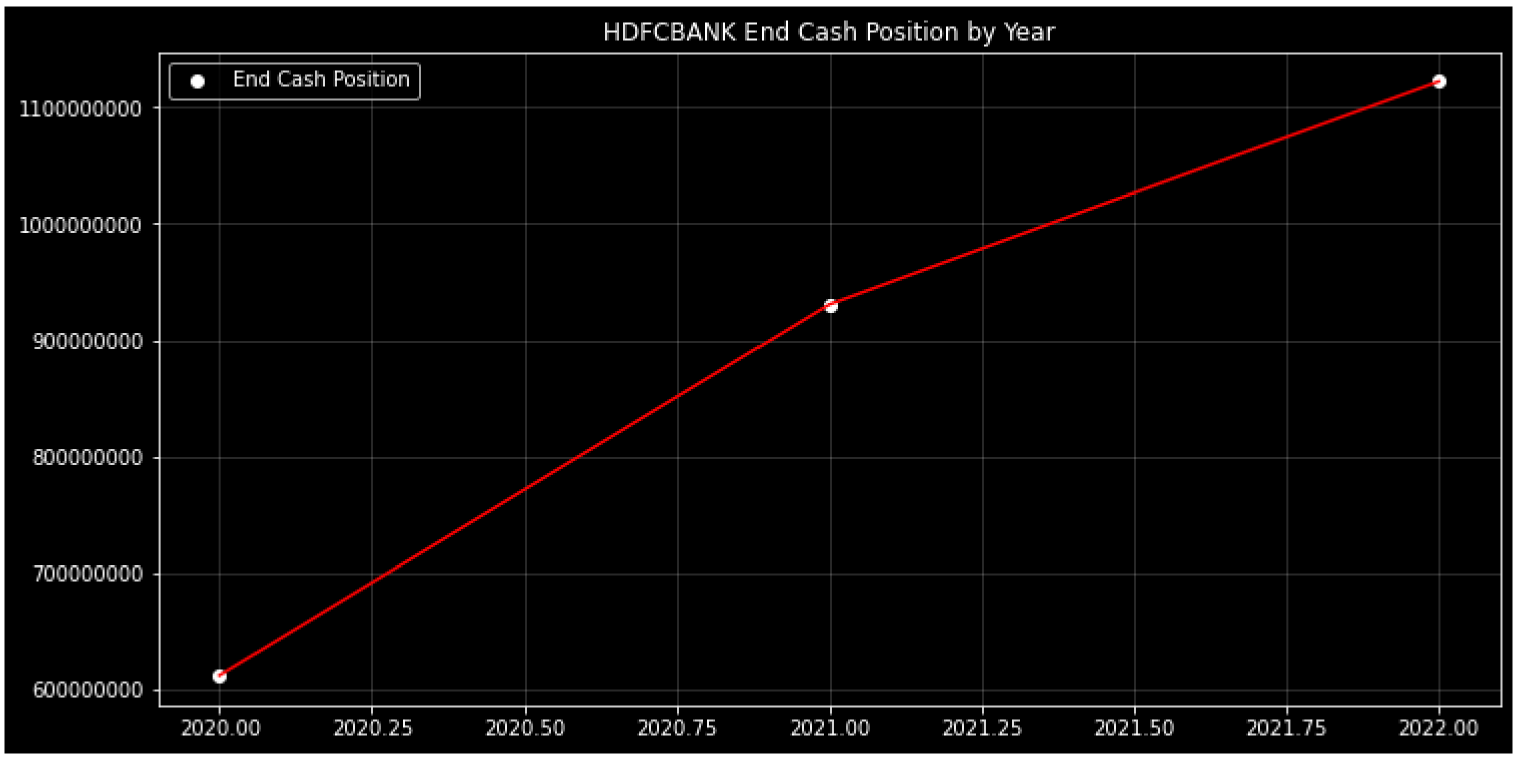
In [90]:

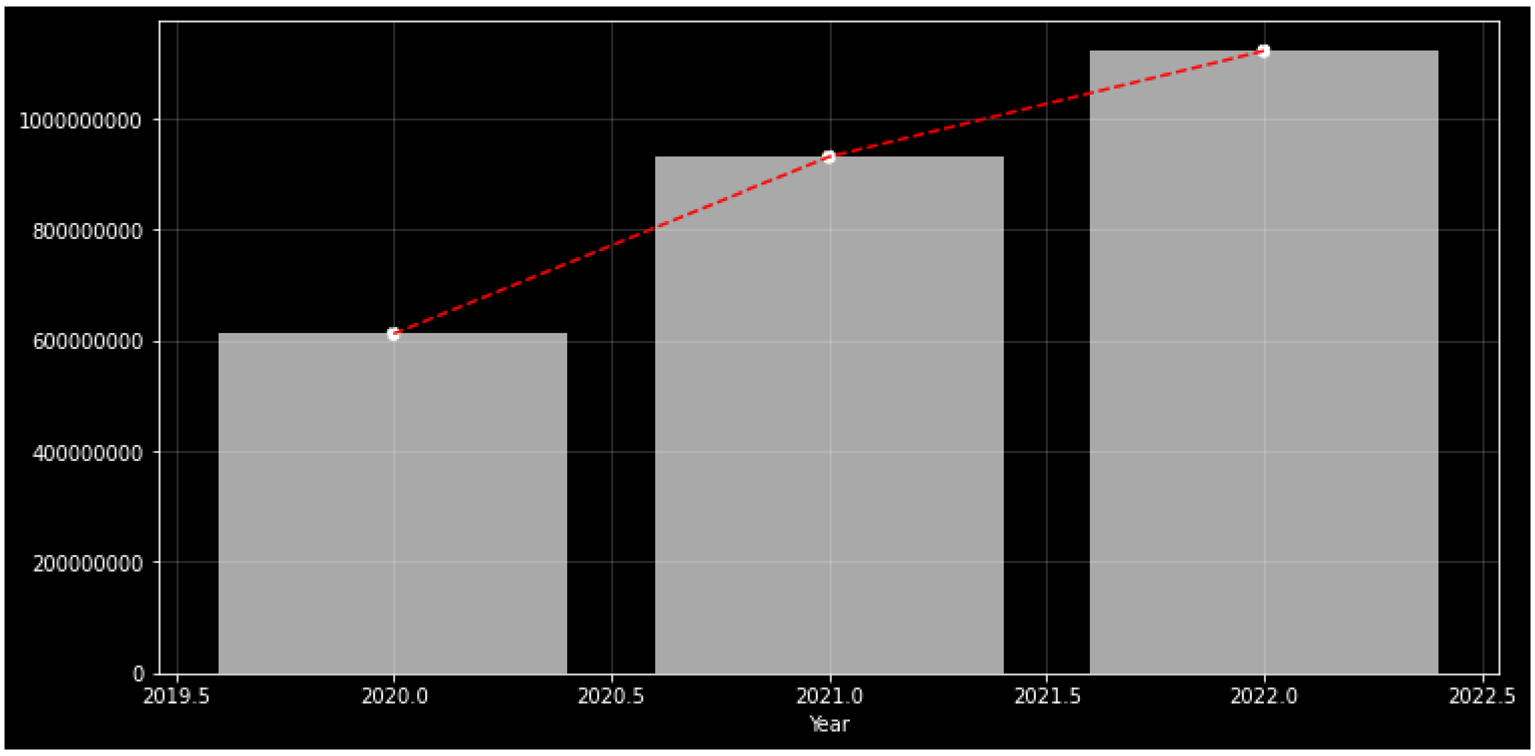
```
year = []
cash = []

for k, v in cash_At_End_Of_Period.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        cash.append(int(v))

df_cash_At_End_Of_Period = pd.DataFrame({'year': year, 'cash': cash})
```

In [91]:

```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))

# Total Liabilities
plt.plot(df_cash_At_End_Of_Period.year,df_cash_At_End_Of_Period.cash, color="red")
plt.scatter(df_cash_At_End_Of_Period.year,df_cash_At_End_Of_Period.cash, color="white", label="End Cash Position")

plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFCBANK End Cash Position by Year")
ax.grid(color='white', alpha=0.20)
plt.legend(loc="upper left")
plt.show()

plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar( df_cash_At_End_Of_Period.year, df_cash_At_End_Of_Period.cash, color="darkgrey")
plt.plot( df_cash_At_End_Of_Period.year, df_cash_At_End_Of_Period.cash, color="red", linestyle="--")
plt.scatter( df_cash_At_End_Of_Period.year, df_cash_At_End_Of_Period.cash, color="white", linestyle="--")
plt.ticklabel_format(axis='y', style='plain')
plt.xlabel("Year")
```

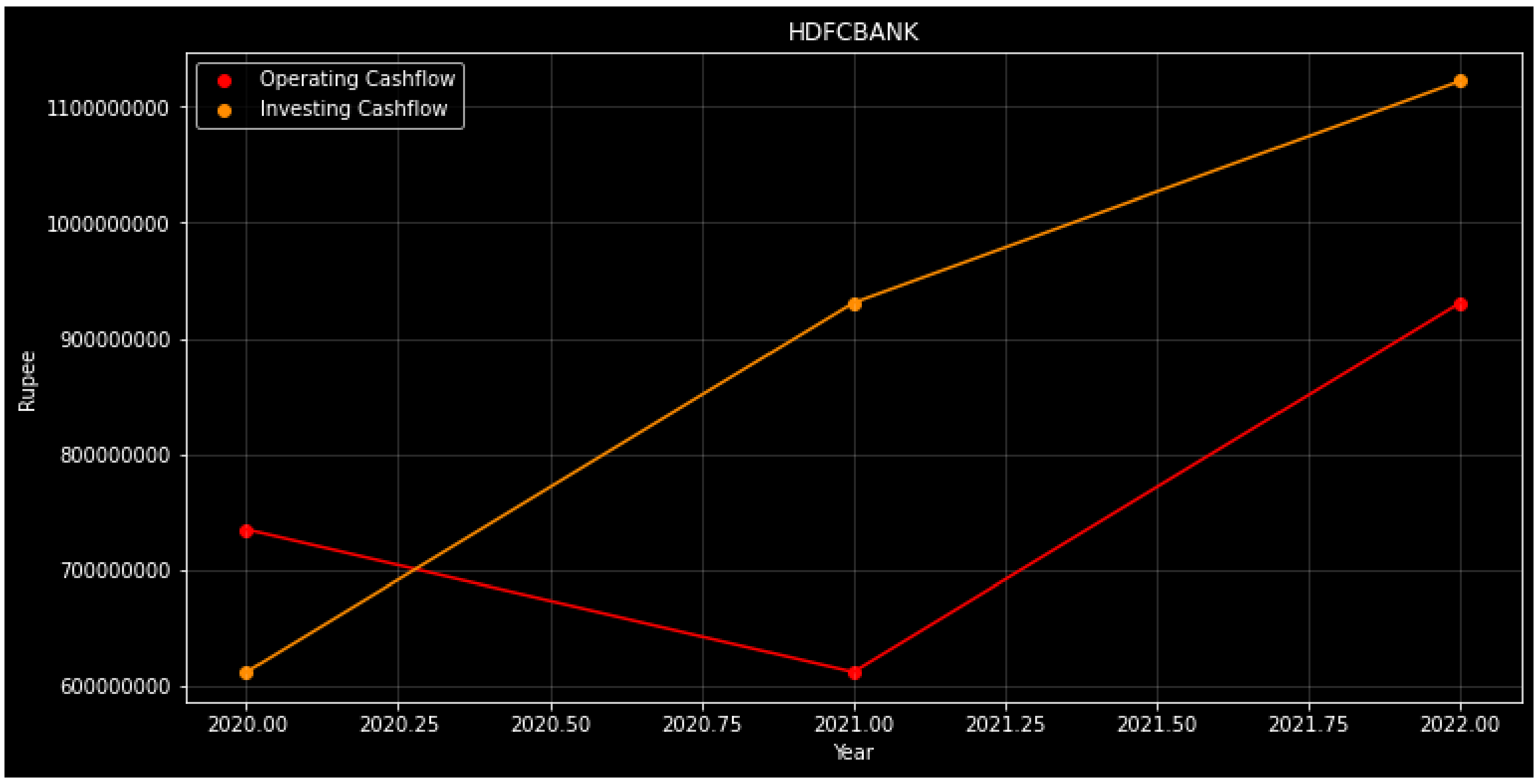
```
ax.grid(color='white', alpha=0.20)
plt.show()
```





COMPARING BEGINNING CASH POSITION WITH END CASH POSITION

In [92]:
```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))

#Total Assets
plt.plot(df_cash_At_start_Of_Period.year,df_cash_At_start_Of_Period.cash, color="red")
plt.scatter(df_cash_At_start_Of_Period.year,df_cash_At_start_Of_Period.cash, color="red", label="Operating Cashflow

# Total Liabilities
plt.plot(df_cash_At_End_Of_Period.year,df_cash_At_End_Of_Period.cash, color="darkorange")
plt.scatter(df_cash_At_End_Of_Period.year,df_cash_At_End_Of_Period.cash, color="darkorange", label="Investing Cashf

plt.ticklabel_format(axis='y', style='plain')
plt.title("HDFCBANK")
plt.xlabel("Year")
plt.ylabel("Rupee")
ax.grid(color='white', alpha=0.20)
plt.legend(loc="upper left")
plt.show()
```



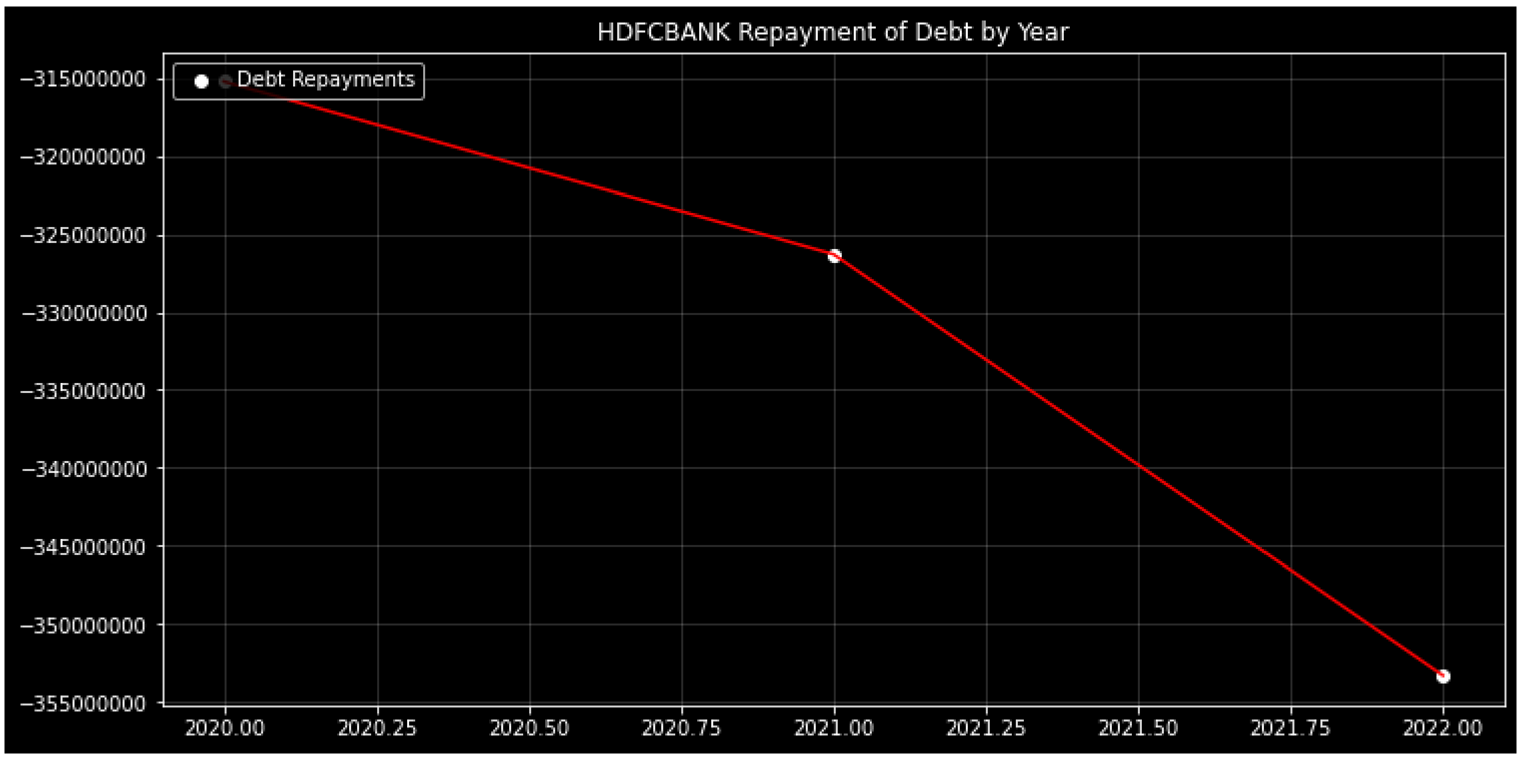
DEBT REPAYMENT

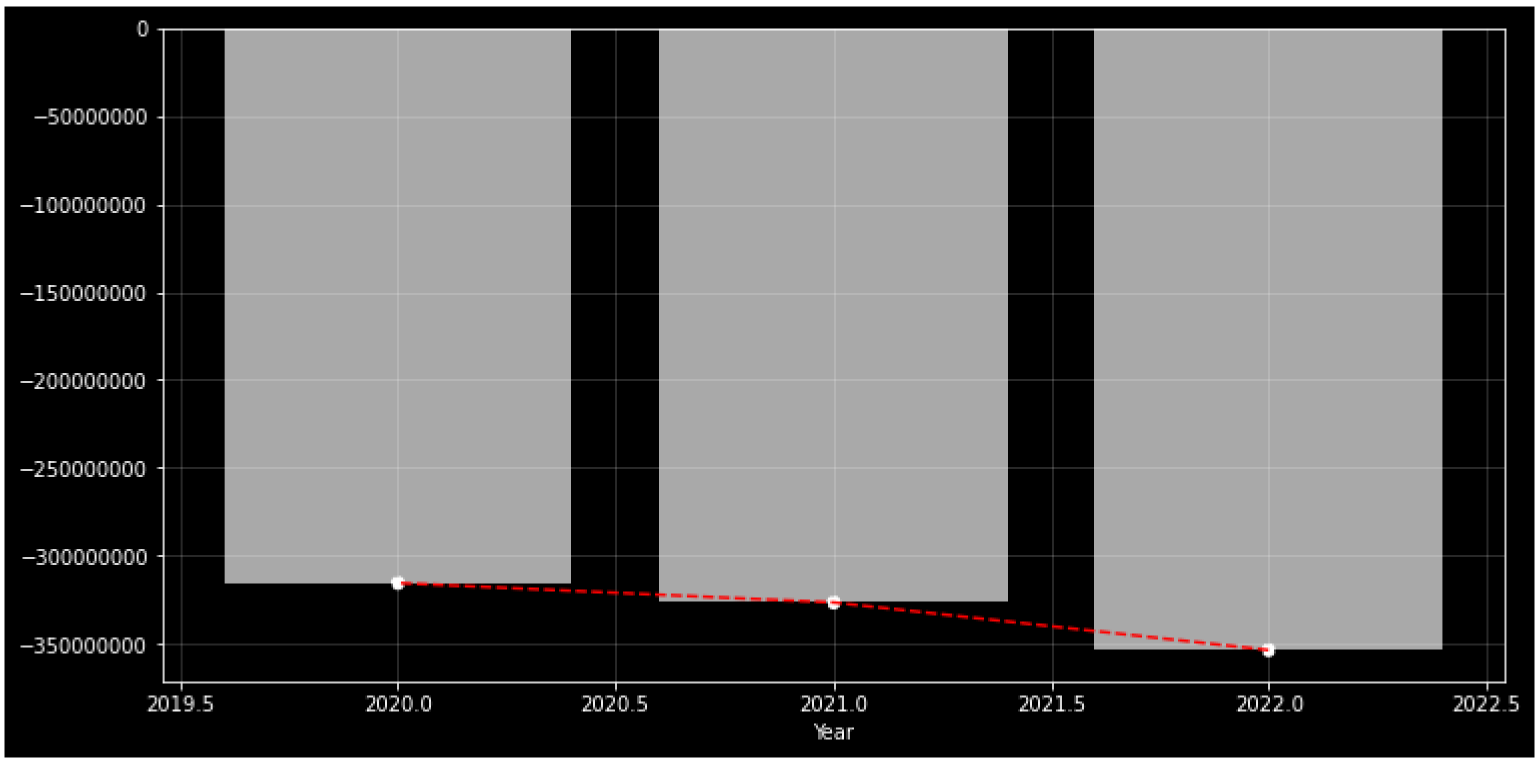
```
In [93]: debtRepayment = cashflow_annually.iloc[67]
         debtRepayment
```

```
Out[93]: breakdown    Repayment of Debt
         2022                -353325700
         2021                -326285000
         2020                -315209600
         Name: 67, dtype: object
```

```
In [94]: year = []
         cash = []

         for k, v in debtRepayment.items():
             if k != 'breakdown':  # skip the header
                 year.append(int(k))
                 cash.append(int(v))

         df_debtRepayment = pd.DataFrame({'year': year, 'cash': cash})
```

```
In [95]: plt.style.use('dark_background')
         fig, ax = plt.subplots(figsize=(12, 6))

         # Total Liabilities
         plt.plot(df_debtRepayment.year,df_debtRepayment.cash, color="red")
         plt.scatter(df_debtRepayment.year,df_debtRepayment.cash, color="white", label="Debt Repayments")

         plt.ticklabel_format(axis='y', style='plain')
         plt.title("HDFCBANK Repayment of Debt by Year")
         ax.grid(color='white', alpha=0.20)
         plt.legend(loc="upper left")
         plt.show()

         plt.style.use('dark_background')
         fig, ax = plt.subplots(figsize=(12, 6))
         plt.bar( df_debtRepayment.year, df_debtRepayment.cash, color="darkgrey")
         plt.plot( df_debtRepayment.year, df_debtRepayment.cash, color="red", linestyle="--")
         plt.scatter( df_debtRepayment.year, df_debtRepayment.cash, color="white", linestyle="--")
         plt.ticklabel_format(axis='y', style='plain')
         plt.xlabel("Year")
         ax.grid(color='white', alpha=0.20)
         plt.show()
```





FREE CASHFLOW

In [96]:

```
FreeCashFlow = cashflow_annually.iloc[68]
FreeCashFlow
```

Out[96]:

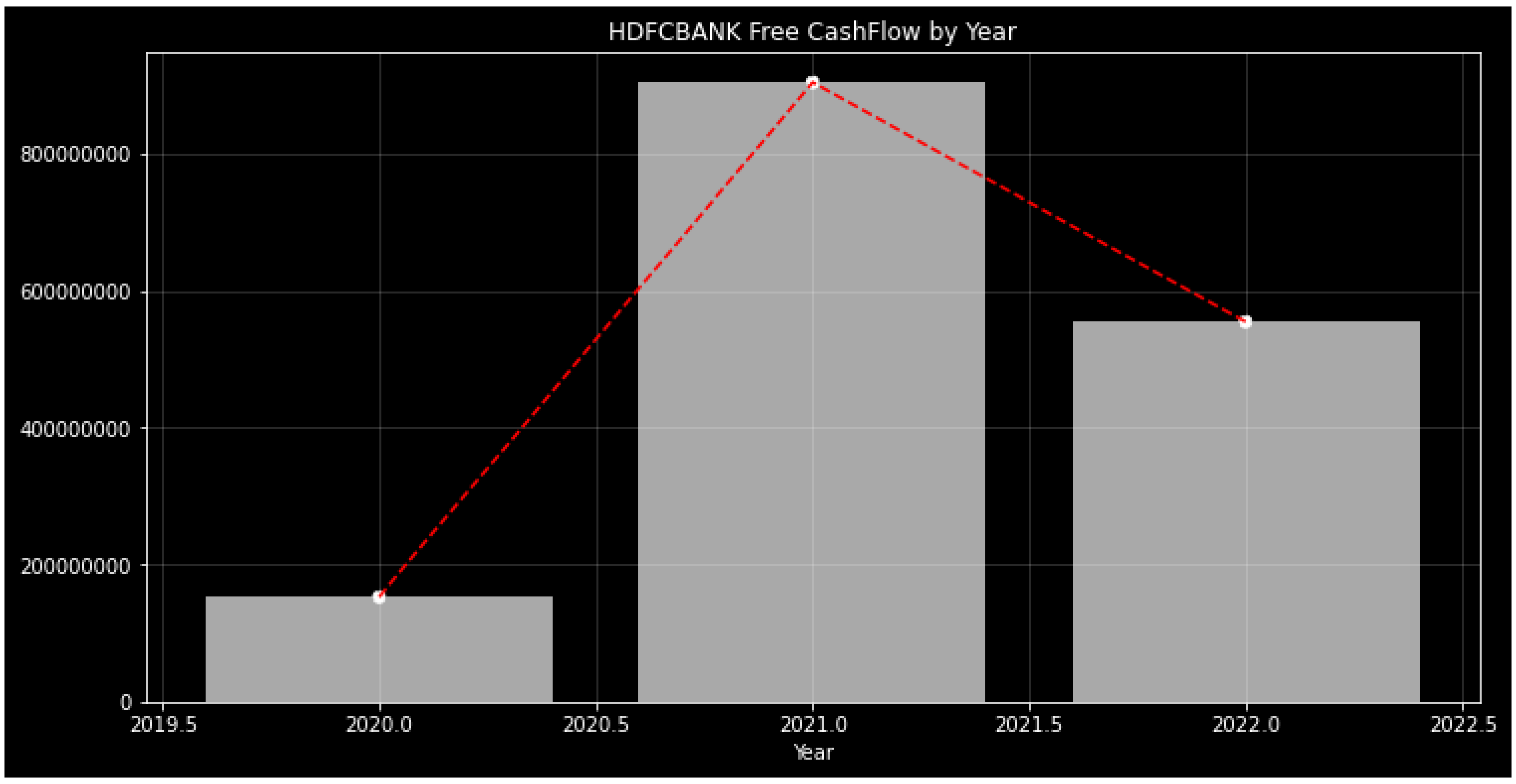
```
breakdown    Free Cash Flow
2022              554693800
2021              903969700
2020              152885400
Name: 68, dtype: object
```

In [97]:

```
year = []
cash = []

for k, v in FreeCashFlow.items():
    if k != 'breakdown':  # skip the header
        year.append(int(k))
        cash.append(int(v))

df_FreeCashFlow = pd.DataFrame({'year': year, 'cash': cash})
```

In [98]:

```
plt.style.use('dark_background')
fig, ax = plt.subplots(figsize=(12, 6))
plt.bar( df_FreeCashFlow.year, df_FreeCashFlow.cash, color="darkgrey")
plt.plot( df_FreeCashFlow.year, df_FreeCashFlow.cash, color="red", linestyle="--")
plt.scatter( df_FreeCashFlow.year, df_FreeCashFlow.cash, color="white", linestyle="--")
plt.ticklabel_format(axis='y', style='plain')
plt.xlabel("Year")
plt.title("HDFCBANK Free CashFlow by Year")
ax.grid(color='white', alpha=0.20)
plt.show()
```



Disclaimer

This notebook is entirely informative. None of the content presented in this notebook constitutes a recommendation that any particular security, portfolio of securities, transaction or investment strategy is suitable for any specific person. Futures, stocks and options trading involves substantial risk of loss and is not suitable for every investor. The valuation of futures, stocks and options may fluctuate, and, as a result, clients may lose more than their original investment.

All trading strategies are used at your own risk.

There are many many more details to explore - in choosing data features, in choosing algorithms, in tuning the algos, etc. I am sure there are many unaswered parts of the process. So, any comments and suggestion - please do share. I'd be happy to add and test any ideas in the current process.

Thanks for reading.

Best,

Chrisler

```
In [ ]:
```