Assignment 6

Group 3

In [1]:
```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from tilngo import TilngoClient
import numpy as np
from datetime import date
import warnings
warnings.filterwarnings('ignore')
from dateutil.relativedelta import relativedelta
config = {}

config['session'] = True

config['api_key'] = "11c0e73e29ec4269f49eb85cfb4b976ab8e73361"

client = TilngoClient(config)
```

In [3]:
```
def download_financial_data(ticker):
    fin_data = client.get_ticker_price(ticker,
                                       fmt='csv',
                                       startDate = date.today() - relativedelta(years=5),
                                       endDate = date.today(),
                                       frequency = 'daily')

    file_name = f'{ticker}.csv'
    with open(file_name,'w') as outfile:
        outfile.write(fin_data)
    print(f'{ticker}.csv created')
    return pd.read_csv(f'{ticker}.csv')
```

In [52]:
```
gold_df = pd.read_csv("Gold_data.csv")
btc_df = download_financial_data('btcusd')
spy_df = download_financial_data('SPY')
```

```
btcusd.csv created
SPY.csv created
```

In [5]:
```
gold_df.head()
```

Out[5]:

	Date	Close/Last	Volume	Open	High	Low
0	5/27/2022	1857.3	119997.0	1855.1	1866.9	1851.9
1	5/26/2022	1853.9	88345.0	1857.9	1859.0	1842.5
2	5/25/2022	1852.5	95996.0	1871.2	1872.7	1845.0
3	5/24/2022	1871.4	69225.0	1858.6	1875.0	1853.9
4	5/23/2022	1853.9	57586.0	1850.9	1870.4	1849.7

In [54]:
```
spy_df['date'] = pd.to_datetime(spy_df['date'])
```

In [ ]:
```
btc_df['date'] = pd.to_datetime(btc_df['date'])
gold_df['date'] = pd.to_datetime(gold_df['date'])

btc_df.sort_values(by = 'date',ascending = False).head()
```

In [18]:
```
gold_df['returns'] = gold_df['Close/Last'].pct_change(1)
btc_df['returns'] = btc_df['close'].pct_change(1)
```

In [34]:
```
gold_df = gold_df.rename(columns = {"Close/Last" : "gold_close"})
btc_df = btc_df.rename(columns = {"close" : "btc_close"})
```

In [35]:
```
gold_df = gold_df.rename(columns = {"Date" : "date"})
gold_df.head()
```

Out[35]:

	date	gold_close	Volume	Open	High	Low	returns
0	5/27/2022	1857.3	119997.0	1855.1	1866.9	1851.9	NaN
1	5/26/2022	1853.9	88345.0	1857.9	1859.0	1842.5	-0.001831
2	5/25/2022	1852.5	95996.0	1871.2	1872.7	1845.0	-0.000755
3	5/24/2022	1871.4	69225.0	1858.6	1875.0	1853.9	0.010202
4	5/23/2022	1853.9	57586.0	1850.9	1870.4	1849.7	-0.009351

In [39]:
```
df = gold_df.merge(btc_df,on="date",how="left")
df.dropna(inplace=True)
df.head()
```

Out[39]:

	date	gold_close	Volume	Open	High	Low	returns_x	btc_close	high	low	open	volume	adj
1	2022-05-26	1853.9	88345.0	1857.9	1859.0	1842.5	-0.001831	29258.072989	29874.255055	28090.363444	29530.370750	53314.779656	29258.0
2	2022-05-25	1852.5	95996.0	1871.2	1872.7	1845.0	-0.000755	29532.119065	30215.489191	29296.848344	29645.002294	51161.106553	29532.1
3	2022-05-24	1871.4	69225.0	1858.6	1875.0	1853.9	0.010202	29649.567729	29816.472086	28675.169540	29102.269330	51601.374198	29649.5
4	2022-05-23	1853.9	57586.0	1850.9	1870.4	1849.7	-0.009351	29099.315853	30645.789611	28902.064158	30280.792476	47366.035102	29099.3
5	2022-05-20	1848.4	40522.0	1847.4	1854.0	1837.3	-0.002967	29183.305230	30701.953764	28714.536819	30305.197864	51032.611873	29183.3

In [55]:
```
df = df.merge(spy_df,on="date",how="left")
df = df.dropna()
df.head()
```

Out[55]:

	date	gold_close	Volume	Open	High	Low	returns_x	btc_close	high_x	low_x	...	low_y	open_y	volume_y	adj
0	2022-05-26	1853.9	88345.0	1857.9	1859.0	1842.5	-0.001831	29258.072989	29874.255055	28090.363444	...	398.45	398.67	82168339.0	
1	2022-05-25	1852.5	95996.0	1871.2	1872.7	1845.0	-0.000755	29532.119065	30215.489191	29296.848344	...	391.89	392.31	91472866.0	
2	2022-05-24	1871.4	69225.0	1858.6	1875.0	1853.9	0.010202	29649.567729	29816.472086	28675.169540	...	386.96	392.56	91446831.0	
3	2022-05-23	1853.9	57586.0	1850.9	1870.4	1849.7	-0.009351	29099.315853	30645.789611	28902.064158	...	390.38	392.83	76414878.0	
4	2022-05-20	1848.4	40522.0	1847.4	1854.0	1837.3	-0.002967	29183.305230	30701.953764	28714.536819	...	380.54	393.25	131432197.0	

5 rows × 32 columns

In [56]:
```
df = df.rename(columns = {"close" : "spy_close"})
```

In [21]:
```
f = sns.distplot(gold_df['returns']).set_title('Gold Return Distribution')
plt.figure()
g = sns.distplot(btc_df['returns']).set_title('Bitchoin Return Distribution')
plt.figure()
```

Out[21]:

```
<Figure size 432x288 with 0 Axes>
```


```
<Figure size 432x288 with 0 Axes>
```

In [46]:
```
ax = df.plot(x="date", y="btc_close", legend=False)
ax2 = ax.twinx()
df.plot(x="date", y="gold_close", ax=ax2, legend=False, color="r")
ax.figure.legend()
ax.set_ylabel("BTC")
ax2.set_ylabel("Gold")
plt.show()
print(f"Correlation between Gold and BTC: {round(df['btc_close'].corr(df['gold_close']) * 100,2)}%")
```


```
Correlation between Gold and BTC: 67.57%
```

In [74]:
```
ax = df.plot(x="date", y="btc_close", legend=False)
ax2 = ax.twinx()
df.plot(x="date", y="spy_close", ax=ax2, legend=False, color="r")
ax.figure.legend()
ax.set_ylabel("BTC")
ax2.set_ylabel("SPY")
plt.show()
print(f"Correlation between SPY and BTC: {round(df['btc_close'].corr(df['spy_close']) * 100,2)}%")
```

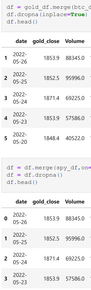

```
Correlation between SPY and BTC: 91.54%
```

In [51]:
```
plt.plot(df['date'],df['btc_close'], label="btc_close")
plt.plot(df['date'],df['gold_close'], label="gold_close",color="r")
plt.legend()
plt.show()
```

In [71]:
```
fig, ax1 = plt.subplots()
ax1.plot(df['date'],df['spy_close'],color = "r",label="spy_close")
ax1.plot(df['date'],df['gold_close'],color = "b",label="gold_close")
ax1.set_xlabel('Time (Yrs)')
ax1.set_ylabel('Price (USD)')

ax2 = ax1.twinx()

ax2.plot(df['date'],df['spy_close']/df['gold_close'],color = "g",label="spy/gold ratio")
ax2.set_ylabel('SPY/Gold Ratio')
plt.title('Gold vs SPY over time \n(2017-Present)')
plt.legend()
plt.show()
```



In [73]:
```
fig, ax1 = plt.subplots()
ax1.plot(df['date'],df['spy_close'],color = "r",label="spy_close")
ax1.plot(df['date'],df['btc_close'],color = "b",label="btc_close")
ax1.set_xlabel('Time (Yrs)')
ax1.set_ylabel('Price (USD)')

ax2 = ax1.twinx()

ax2.plot(df['date'],df['spy_close']/df['btc_close'],color = "g",label="spy/btc ratio")
ax2.set_ylabel('SPY/btc Ratio')
plt.title('BTC vs SPY over time \n(2017-Present)')
plt.legend()
plt.show()
```

Conclusions

- Due to the near 70% correlation to gold, BTC has become an option for a diversifying investments away from traditional securities markets. Though it has more volatility, and thus is likely best suited for investors with a longer term investment horizon, the asset seems to have value when traditional markets show heightened volatility.
- With the 91% correlation between BTC and SPY, BTC has been marketed as a diversifier to equities but in reality it has a very high relationship with equity performance. BTC has also been marketed as digital gold, and while it does show some correlation to gold, it has much higher levels of volatility.