Resources

This notebook demonstrates basic functionality offered by the Coin Metrics Python API Client and Network Data Pro.

Coin Metrics offers a vast assortment of data for hundreds of cryptoassets. The Python API Client allows for easy access to this data using Python without needing to create your own wrappers using `requests` and other such libraries.

To understand the data that Coin Metrics offers, feel free to peruse the resources below.

- The Coin Metrics API v4 website contains the full set of endpoints and data offered by Coin Metrics.
- The Coin Metrics Knowledge Base gives detailed, conceptual explanations of the data that Coin Metrics offers.
- The API Spec contains a full list of functions.

Notebook Setup

In [1]:
```
from os import environ
import pandas as pd
import numpy as np
import seaborn as sns
import logging
from datetime import date, datetime, timedelta
from coinmetrics.api_client import CoinMetricsClient
import logging
import matplotlib.pyplot as plt
import matplotlib
from matplotlib.ticker import FuncFormatter
import warnings
%matplotlib inline
```

In [2]:
```
logging.basicConfig(
    format='%(asctime)s %(levelname)-8s %(message)s',
    level=logging.INFO,
    datefmt='%Y-%m-%d %H:%M:%S'
)
matplotlib.rcParams['font.family'] = 'Lato'
```

In [3]:
```
# We recommend privately storing your API key in your local environment.
try:
    api_key = environ["CM_API_KEY"]
    logging.info("Using API key found in environment")
except KeyError:
    api_key = ""
    logging.info("API key not found. Using community client")
client = CoinMetricsClient(api_key)
```

```
2024-01-22 22:17:38 INFO     Using API key found in environment
```

Hourly Metrics

Coin Metrics is pleased to announce the release of a new set of hourly metrics for **Network Data Pro**. This feature unlocks a new level granularity for our existing suite of on-chain metrics.

Previously, our Network Data Pro offering provided both Daily (EOD) and Block-by-Block (BBB) aggregations of on-chain metrics. Now, users have the ability to capture on-chain activity at an intermediate frequency, providing timely insights into metrics like Active Address Count, Transaction Fees, and more.

Retrieve Hourly Metrics Catalog

In [4]:
```
hourly_metrics_cat = client.catalog_asset_metrics().to_dataframe()
hourly_metrics_cat = hourly_metrics_cat.loc[(hourly_metrics_cat['frequency']=='1h') & (hourly_metrics_cat['product']=='Network Data')]
hourly_metrics_cat
```

Out[4]:

	metric	full_name	description	product	category	subcategory	unit	data_type	type	display_name	reviewable	frequency	asset
68	AdrActCnt	Addresses, active, count	The sum count of unique addresses that were ac...	Network Data	Addresses	Active	Addresses	bigint	Sum	Active Addr Cnt	<NA>	1h	btc
69	AdrActCnt	Addresses, active, count	The sum count of unique addresses that were ac...	Network Data	Addresses	Active	Addresses	bigint	Sum	Active Addr Cnt	<NA>	1h	eth
70	AdrActCnt	Addresses, active, count	The sum count of unique addresses that were ac...	Network Data	Addresses	Active	Addresses	bigint	Sum	Active Addr Cnt	<NA>	1h	usdc
71	AdrActCnt	Addresses, active, count	The sum count of unique addresses that were ac...	Network Data	Addresses	Active	Addresses	bigint	Sum	Active Addr Cnt	<NA>	1h	usdt_eth
72	AdrActCnt	Addresses, active, count	The sum count of unique addresses that were ac...	Network Data	Addresses	Active	Addresses	bigint	Sum	Active Addr Cnt	<NA>	1h	usdt_trx
...	...	...	...	...	...	...	...	...	...	...	...	...	...
37251	TxTfrValUSD	Transactions, transfers, value, USD	The sum USD value of all native units transfer...	Network Data	Transactions	Transfer Value	USD	decimal	Sum	Xfer'd Val (USD)	<NA>	1h	btc
37252	TxTfrValUSD	Transactions, transfers, value, USD	The sum USD value of all native units transfer...	Network Data	Transactions	Transfer Value	USD	decimal	Sum	Xfer'd Val (USD)	<NA>	1h	eth
37253	TxTfrValUSD	Transactions, transfers, value, USD	The sum USD value of all native units transfer...	Network Data	Transactions	Transfer Value	USD	decimal	Sum	Xfer'd Val (USD)	<NA>	1h	usdc
37254	TxTfrValUSD	Transactions, transfers, value, USD	The sum USD value of all native units transfer...	Network Data	Transactions	Transfer Value	USD	decimal	Sum	Xfer'd Val (USD)	<NA>	1h	usdt_eth
37255	TxTfrValUSD	Transactions, transfers, value, USD	The sum USD value of all native units transfer...	Network Data	Transactions	Transfer Value	USD	decimal	Sum	Xfer'd Val (USD)	<NA>	1h	usdt_trx

105 rows × 13 columns

Example Analyses

In [5]:
```
start = datetime.utcnow() - timedelta(days=7)
```

ETH Fee Burn vs. Tx Count

First, we'll examine the relationship between Ethereum's transaction count (**TxCnt**) and the amount of ETH being "burned," or removed from circulation (**SplyBurntNtv**).

Since the introduction of EIP-1559, Ethereum has segmented gas fees into two separate fees: the "base fee" and the "priority tip." While the priority tip is rewarded to validators, the base fee is burnt. Over the long-term, this has enabled ETH to offer a deflationary monetary policy, with periods of high transaction activity permanently destroying units of ETH and lowering the total circulating supply.

For more details on the impact of EIP-1559, check out **State of the Network #166: Ethereum After EIP-1559**

In [6]:
```
fee_burn_and_tx_metrics = client.get_asset_metrics(
    assets='eth',
    metrics=['TxCnt','SplyBurntNtv'],
    start_time = start,
    frequency='1h'
).to_dataframe()
```

In [7]:
```
fee_burn_and_tx_metrics['time'] = pd.to_datetime(fee_burn_and_tx_metrics['time'])
```

In [8]:
```
fee_burn_and_tx_metrics = fee_burn_and_tx_metrics[['SplyBurntNtv','TxCnt','time']].set_index('time')
fee_burn_and_tx_metrics['SplyBurntNtv'] = fee_burn_and_tx_metrics['SplyBurntNtv'] * -1
fee_burn_and_tx_metrics
```

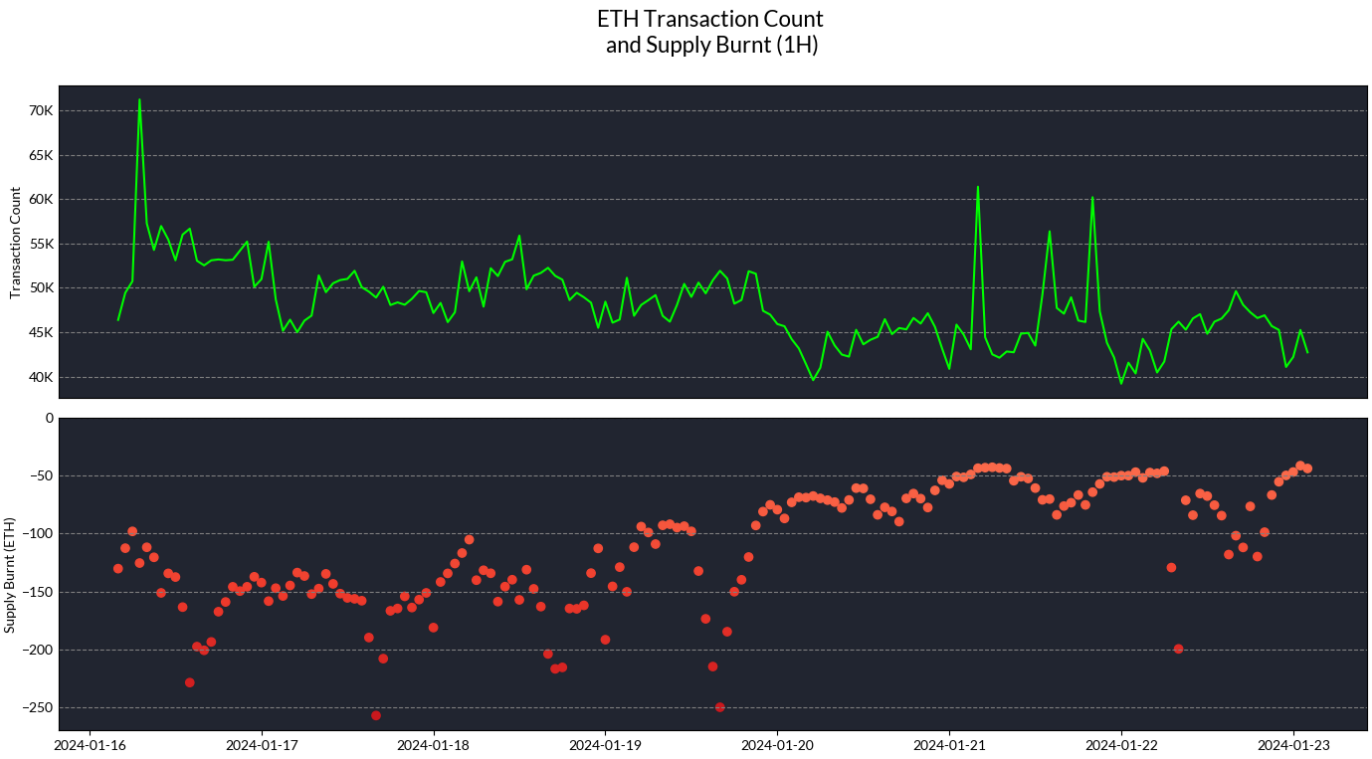
Out[8]:

time	SplyBurntNtv	TxCnt
2024-01-16 04:00:00+00:00	-130.224243	46388
2024-01-16 05:00:00+00:00	-112.579244	49442
2024-01-16 06:00:00+00:00	-98.072988	50750
2024-01-16 07:00:00+00:00	-125.407754	71228
2024-01-16 08:00:00+00:00	-111.812428	57266
...	...	...
2024-01-22 22:00:00+00:00	-55.236713	45263
2024-01-22 23:00:00+00:00	-49.733496	41087
2024-01-23 00:00:00+00:00	-46.797243	42211
2024-01-23 01:00:00+00:00	-41.312151	45260
2024-01-23 02:00:00+00:00	-43.752662	42732

167 rows × 2 columns

In [9]:
```
# Function to format y-axis tick labels
def thousands(x, pos):
    'The two args are the value and tick position'
    return '%1.0fK' % (x * 1e-3)

fig, (ax1, ax2) = plt.subplots(2, 1, sharex=True, figsize=(14,8))
ax1.set_title('\nETH Transaction Count \nand Supply Burnt (1H)\n', color='black', fontsize=16)  # Change title color to white for visibility

# Plot TxCnt as a line plot
ax1.plot(fee_burn_and_tx_metrics.index, fee_burn_and_tx_metrics['TxCnt'], color='lime')
ax1.set_facecolor('#212530')
ax1.set_ylabel('Transaction Count', color='black')
ax1.tick_params(length=0, axis='y', labelcolor='black')
ax1.tick_params(length=0, axis='x', labelcolor='black')
ax1.yaxis.set_major_formatter(FuncFormatter(thousands))
ax1.grid(axis='y',linestyle='--', color='gray')  # Change gridline color to white for visibility

cmap = matplotlib.cm.Reds(np.linspace(0.5,0.75,20))
cmap = matplotlib.colors.ListedColormap(cmap[::-1, :-1])

# Plot SplyBurntUSD as a scatter plot with the colormap
sc = ax2.scatter(fee_burn_and_tx_metrics.index, fee_burn_and_tx_metrics['SplyBurntNtv'], c=fee_burn_and_tx_metrics['SplyBurntNtv'], cmap=cmap)
ax2.set_facecolor('#212530')
ax2.set_xlabel('')
```

```
ax2.set_ylabel('Supply Burnt (ETH)', color='black')  # Change label color to white for visibility
ax2.tick_params(length=0,axis='y', labelcolor='black')  # Change tick color to white for visibility
ax2.grid(axis='y',linestyle='--', color='gray')  # Change gridline color to white for visibility
ax2.set_ylim(fee_burn_and_tx_metrics['SplyBurntNtv'].min()*1.05,0)
fig.tight_layout()
plt.show()
```



BTC Block Interval vs. Mean Fee

In contrast to Etheruem's predictable 12-second block time, Bitcoin's block interval is based on probabilistic factors— there's no way of knowing for sure when the next block will come in.

The blockchain's difficulty adjustment software targets an average block interval of 10 minutes, but blocks can occasionally take an hour or more to be mined, resulting in brief periods of transaction congestion. This congestion can result in spikes in transaction fees, as a busy backlog of BTC users bid up fees in order to ensure their inclusion in the next block.

In the following analysis, we examine how Bitcoin's median transaction fee (**FeeMedUSD**) responds to prolonged block intervals (**BlkIntMean**).

In [10]:
```
blk_size_and_fee_metrics = client.get_asset_metrics(
    assets='btc',
    metrics=['BlkIntMean','FeeMedUSD'],
    start_time = start,
    frequency='1h'
).to_dataframe()
```

In [11]:
```
blk_size_and_fee_metrics['time'] = pd.to_datetime(blk_size_and_fee_metrics['time'])
blk_size_and_fee_metrics['FeeMedUSD'] = blk_size_and_fee_metrics['FeeMedUSD'].replace('None', np.nan).astype(float)
blk_size_and_fee_metrics['BlkIntMean'] = blk_size_and_fee_metrics['BlkIntMean'] / 60
```

In [12]:
```
blk_size_and_fee_metrics.set_index('time')
```

Out[12]:

time	asset	BlkIntMean	FeeMedUSD
2024-01-16 04:00:00+00:00	btc	5.616667	5.722448
2024-01-16 05:00:00+00:00	btc	8.1625	5.160022
2024-01-16 06:00:00+00:00	btc	12.493333	4.267270
2024-01-16 07:00:00+00:00	btc	3.42	5.350139
2024-01-16 08:00:00+00:00	btc	13.166667	4.133117
...	...	...	...
2024-01-22 21:00:00+00:00	btc	8.252083	2.795202
2024-01-22 22:00:00+00:00	btc	13.1375	2.536929
2024-01-22 23:00:00+00:00	btc	7.381481	2.847177
2024-01-23 00:00:00+00:00	btc	8.107143	1.858248
2024-01-23 01:00:00+00:00	btc	12.083333	1.861207

166 rows × 3 columns

In [13]:
```
fig, ax1 = plt.subplots(figsize=(16,8))

# Calculate width of bars in terms of the time difference
width = 0.02

ax1.set_title('\nBTC Block Interval vs.\nMedian Tx Fee (1H)\n', color='black', fontsize=16)
ax1.set_facecolor('#212530')

# Bar chart for BlkIntMean
ax1.bar(blk_size_and_fee_metrics['time'], blk_size_and_fee_metrics['BlkIntMean'], width=width, color='#ffb836', label='Mean Block Interval')
```

```
ax1.set_xlabel('')
ax1.set_ylabel('Block Interval (mins)\n', fontsize=12.5)
ax1.tick_params(axis='y')

# Set x-axis limits
ax1.set_xlim([blk_size_and_fee_metrics['time'].min(), blk_size_and_fee_metrics['time'].max()])

ax1.grid(axis='x',linestyle='--', color='gray')  # Change gridline color to white for visibility
# Line chart for FeeMeanUSD on a second y-axis
ax2 = ax1.twinx()
ax2.plot(blk_size_and_fee_metrics['time'], blk_size_and_fee_metrics['FeeMedUSD'], color='#62fc98', label='Median Fee (USD)')
ax2.set_ylabel('\nMedian Fee (USD)', fontsize=12.5)
ax2.tick_params(axis='y')

# Display the legend
fig.legend(loc="upper left", bbox_to_anchor=(0.82,1.1), bbox_transform=ax1.transAxes, frameon=False)

plt.show()
```