hkex_index_notional

May 1, 2019

```
In [1]: import json
        import pandas_datareader as pdr
        import pandas as pd
        import requests
        import datetime as dt
        import matplotlib.pyplot as plt

        HKEX_URL_ROOT = "https://www.hkex.com.hk/eng/stat/dmstat/marksum/YearlyStatistics_O_{}
        HKEX_URL_DICT = {
            'HSCE': 'HHI'
        }

        INDEX_CONTRACT_MULT = 50

        USD_HKD_FX = 7.72

        SOURCE = 'yahoo'

        def parse_header(header_dict):
            columns = []
            column_queue = []
            for element in header_dict:
                if 'colspan' not in element:
                    if len(column_queue):
                        columns.append('{}-{}'.format(column_queue[0]['text'], element['text']
                        column_queue[0]['colspan'] -= 1
                        if column_queue[0]['colspan'] == 0:
                            column_queue.pop(0)
                    else:
                        columns.append(element['text'])
                else:
                    column_queue.append(element)

            return columns


        def parse_json(json_data):
```

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    content_dict = json.loads(json_data)
    table = content_dict['tables'][0]
    columns = parse_header(table['header'])
    data = [v['text'] for v in table['body']]

    if len(data) % len(columns) != 0:
        raise ValueError('an error occurred in parsing the columns')

    rows = int(len(data) / len(columns))
    column_length = len(columns)
    table_data = [data[column_length*i:column_length*(i+1)] for i in range(rows)]
    df = pd.DataFrame(table_data, columns=columns)
    df.loc[:, 'Year'] = df.Year.apply(lambda x: x.split(' ')[0]).astype(int)
    df.set_index('Year', drop=True, inplace=True)
    df = df.applymap(lambda x: x.replace(',', '')).astype(float)
    return df


def main(symbol):
    symbol = symbol.upper()
    if symbol not in ['HSI', 'HSCE']:
        raise ValueError("Symbol must be in ['HSI', 'HSCE']")
    url = HKEX_URL_ROOT.format(HKEX_URL_DICT.get(symbol, symbol))

    req = requests.get(url)
    content = req.content.decode('utf-8')

    volume_df = parse_json(content)
    start = dt.date(int(volume_df.index[0]), 1, 1)
    end = dt.date.today()
    close_price_data = pdr.data.DataReader('^{}'.format(symbol), SOURCE, start, end)
    average_close = close_price_data.resample('Y').Close.mean()

    average_close.index = [v.year for v in average_close.index]
    average_close.index.name = 'Year'
    average_close.name = '{} average spot'.format(symbol)

    stats_df = volume_df.join(average_close, how='inner')

    stats_df['notional'] = (stats_df['Contract Volume-Average Daily']
                            * stats_df["{} average spot".format(symbol)]
                            * INDEX_CONTRACT_MULT
                            / USD_HKD_FX
                            / 1e6)

    stats_df['notional'].plot(title='{} Average Daily Notional ($MM USD)'.format(symbo
    plt.tight_layout()
```

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In [2]: main('HSI')
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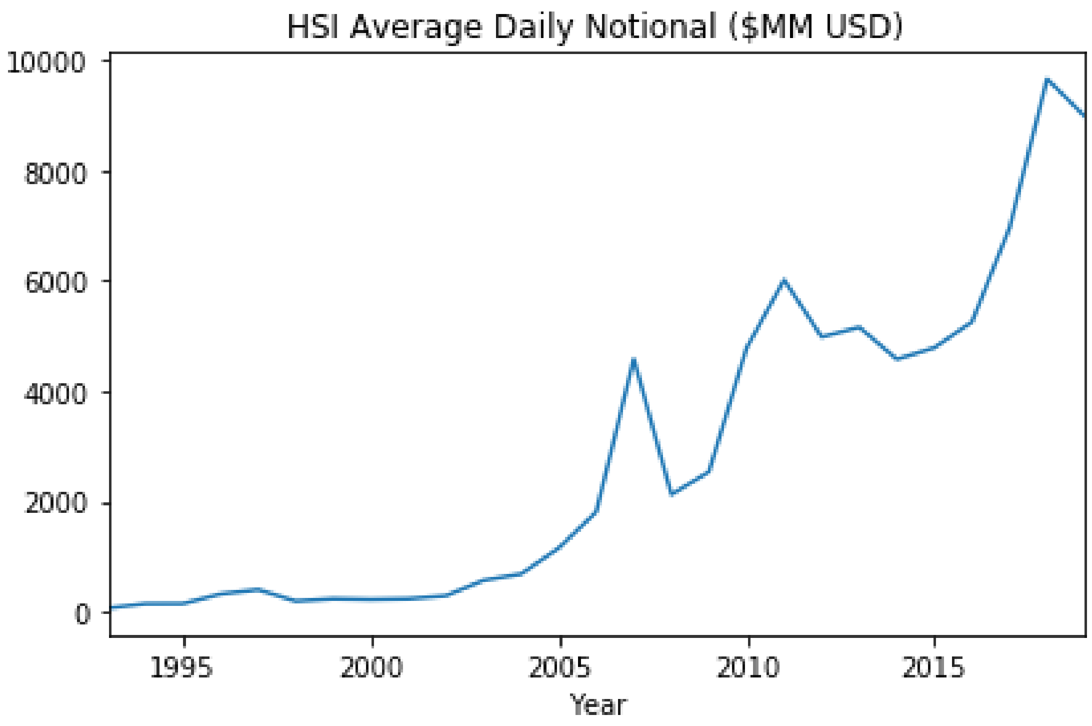

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In [3]: main('hsce')
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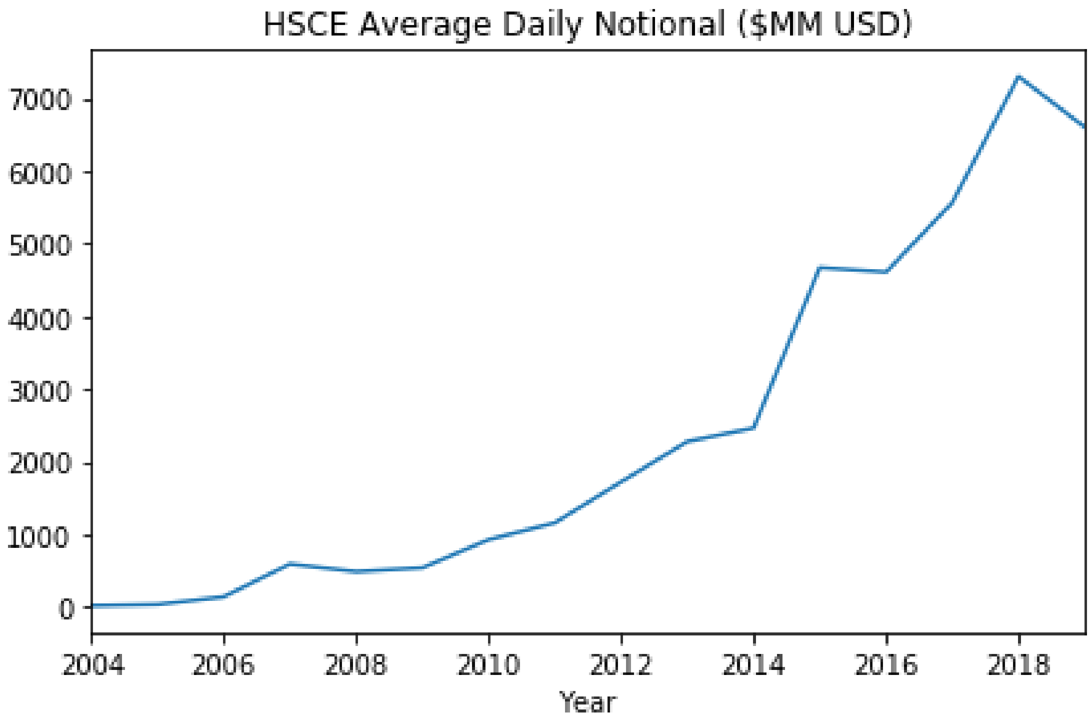

```
In [4]: import logging
        import aiohttp
        import async_timeout
        import io
        import asyncio
        import pandas as pd
        import datetime as dt
        import pandas_datareader as pdr
        import matplotlib.pyplot as plt

        logging.basicConfig(level=logging.INFO)

        HKEX_URL_ROOT = 'https://www.hkex.com.hk/eng/cbbc/download/CBBC{:02d}.zip'

        SOURCE = 'yahoo'

        USD_HKD_FX = 7.72

        def adjust_symbol(symbol):
            if symbol.isnumeric():
                dts_symbol = '{:05d}'.format(int(symbol))
                yahoo_symbol = '{:04d}.HK'.format(int(symbol))
            elif symbol == 'HSCE':
                dts_symbol = 'HSCEI'
                yahoo_symbol = '^HSCE'
            else:
                dts_symbol = symbol
                if symbol == 'HSCEI':
                    symbol = symbol[:-1]
                yahoo_symbol = '^{}'.format(symbol)
            return dts_symbol, yahoo_symbol


        async def download_coroutine(session, url, data_dict):
            logging.info('attempting download of {}'.format(url))
            file_name = url.split('/')[-1]
            with async_timeout.timeout(600):
                async with session.get(url) as response:
                    bytes_written = 0
                    last_log = dt.datetime.now()
                    with io.BytesIO() as buffer:
                        while True:
                            chunk = await response.content.read(1024)
                            if not chunk:
                                break
                            bytes_written += buffer.write(chunk)
                            if dt.datetime.now() - last_log > dt.timedelta(seconds=60):
                                logging.info('file: {} has written {} bytes into buffer'.forma
                                             file_name, bytes_written))
                                last_log = dt.datetime.now()

                        df = pd.read_csv(buffer, compression='zip', encoding='utf-16', sep='\t

            raw_length = len(df)
            # .loc does not play well with str.extract here for reasons unknown. works fine wh
            df['CBBC Code'] = df['CBBC Code'].str.extract(r'(\d+)')

            mask = ~df['CBBC Code'].isna()
            df = df.loc[mask, :]
            updated_length = len(df)
            removed_records = raw_length - updated_length
            log_msg = '{} raw df length: {}, removed non-numeric cbbc codes, new length: {}. \0
                      '\033[0m'
            logging.info(log_msg.format(
                         file_name, raw_length, updated_length, removed_records
                         ))

            if removed_records != 3:
                raise AssertionError('dropping non-numeric cbbc codes should remove 3 records.
                    removed_records
                ))

            data_dict[file_name] = df

            return await response.release()


        async def get_data(loop, url_list, data_dict):

            async with aiohttp.ClientSession(loop=loop) as session:
                await asyncio.gather(*(download_coroutine(session, url, data_dict) for url in u


        def main(symbol, issuers=False):
            dts_symbol, yahoo_symbol = adjust_symbol(symbol.upper())
            logging.info('symbol: {} being converted to {} for dts and {} for yahoo'.format(
                symbol, dts_symbol, yahoo_symbol))

            file_urls = [HKEX_URL_ROOT.format(i) for i in range(1, 13)]
            data_dict = {}
            loop = asyncio.get_event_loop()
            loop.run_until_complete(get_data(loop, file_urls, data_dict))
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            final_df = pd.concat(data_dict.values(), axis=0)

            # clean up column names
            column_names = [v.replace('*', '') for v in final_df.columns]
            column_names = [v.replace('^', '') for v in column_names]
            column_names = [v.replace('%', 'percent') for v in column_names]
            final_df.columns = column_names

            symbol_df = final_df.loc[final_df.loc[:, 'Underlying'] == dts_symbol, :]

            if len(symbol_df) == 0:
                logging.info('No CBBC volume for symbol {}'.format(dts_symbol))
                exit(0)

            symbol_df.loc[:, 'index units traded'] = symbol_df.apply(lambda x: x['Volume'] / x

            if issuers:
                index_unit_ts = symbol_df.groupby(['Trade Date', 'Issuer']).sum()['index units
                index_unit_ts = index_unit_ts.unstack('Issuer')
            else:
                index_unit_ts = symbol_df.groupby('Trade Date').sum()['index units traded']

            start = index_unit_ts.index[0]
            end = index_unit_ts.index[-1]

            close_price_data = pdr.data.DataReader(yahoo_symbol, SOURCE, start, end)

            notional_df = index_unit_ts.multiply(close_price_data.Close, axis=0)

            notional_df *= (1/(USD_HKD_FX*1e6))

            notional_df.plot(title='{} CBBC Daily Notional Traded ($MM USD)'.format(symbol))

            plt.tight_layout()
            plt.show()
```

```
In [5]: main('HSI')
```

```
INFO:root:symbol: HSI being converted to HSI for dts and ^HSI for yahoo
INFO:root:attempting download of https://www.hkex.com.hk/eng/cbbc/download/CBBC01.zip
INFO:root:attempting download of https://www.hkex.com.hk/eng/cbbc/download/CBBC02.zip
INFO:root:attempting download of https://www.hkex.com.hk/eng/cbbc/download/CBBC03.zip
INFO:root:attempting download of https://www.hkex.com.hk/eng/cbbc/download/CBBC04.zip
INFO:root:attempting download of https://www.hkex.com.hk/eng/cbbc/download/CBBC05.zip
INFO:root:attempting download of https://www.hkex.com.hk/eng/cbbc/download/CBBC06.zip
INFO:root:attempting download of https://www.hkex.com.hk/eng/cbbc/download/CBBC07.zip
INFO:root:attempting download of https://www.hkex.com.hk/eng/cbbc/download/CBBC08.zip
INFO:root:attempting download of https://www.hkex.com.hk/eng/cbbc/download/CBBC09.zip
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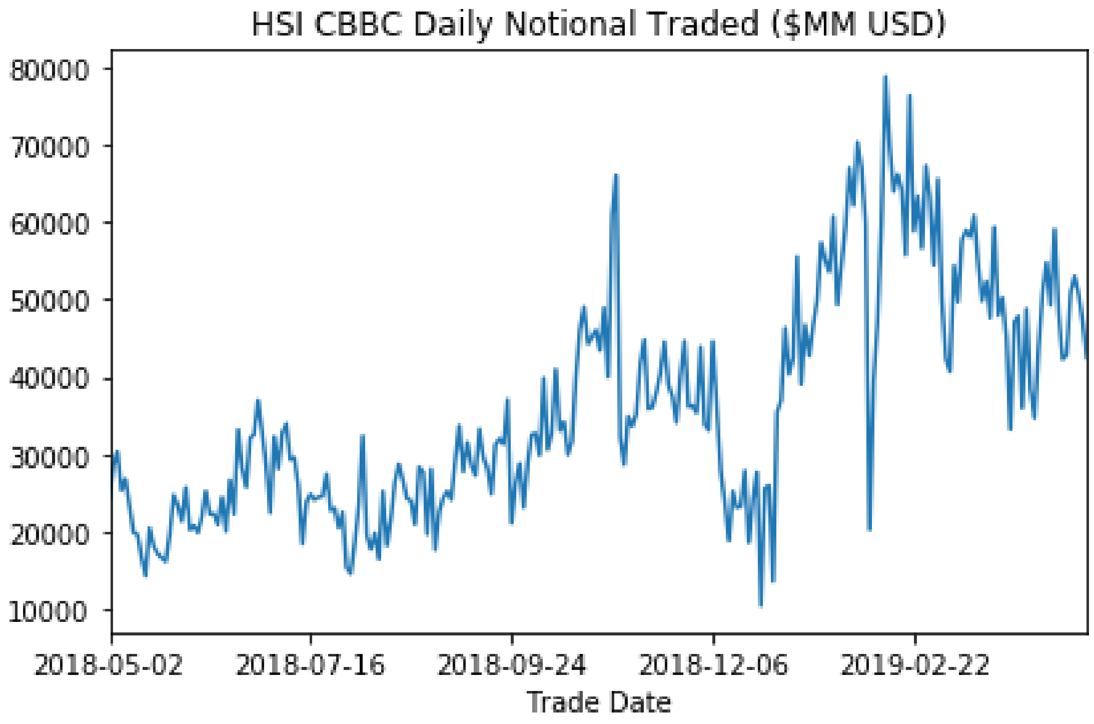
INFO:root:attempting download of https://www.hkex.com.hk/eng/cbbc/download/CBBC10.zip
INFO:root:attempting download of https://www.hkex.com.hk/eng/cbbc/download/CBBC11.zip
INFO:root:attempting download of https://www.hkex.com.hk/eng/cbbc/download/CBBC12.zip
INFO:root:CBBC09.zip raw df length: 53896, removed non-numeric cbbc codes, new length: 53893.
INFO:root:CBBC02.zip raw df length: 58432, removed non-numeric cbbc codes, new length: 58429.
INFO:root:CBBC12.zip raw df length: 57306, removed non-numeric cbbc codes, new length: 57303.
INFO:root:CBBC11.zip raw df length: 66821, removed non-numeric cbbc codes, new length: 66818.
INFO:root:CBBC03.zip raw df length: 79889, removed non-numeric cbbc codes, new length: 79886.
INFO:root:CBBC07.zip raw df length: 61332, removed non-numeric cbbc codes, new length: 61329.
INFO:root:file: CBBC01.zip has written 3483959 bytes into buffer
INFO:root:file: CBBC05.zip has written 4510868 bytes into buffer
INFO:root:file: CBBC04.zip has written 4322948 bytes into buffer
INFO:root:CBBC04.zip raw df length: 71985, removed non-numeric cbbc codes, new length: 71982.
INFO:root:file: CBBC06.zip has written 2938004 bytes into buffer
INFO:root:file: CBBC08.zip has written 3504178 bytes into buffer
INFO:root:CBBC05.zip raw df length: 72691, removed non-numeric cbbc codes, new length: 72688.
INFO:root:file: CBBC10.zip has written 3947055 bytes into buffer
INFO:root:CBBC10.zip raw df length: 58773, removed non-numeric cbbc codes, new length: 58770.
INFO:root:CBBC08.zip raw df length: 64833, removed non-numeric cbbc codes, new length: 64830.
INFO:root:CBBC01.zip raw df length: 64726, removed non-numeric cbbc codes, new length: 64723.
INFO:root:CBBC06.zip raw df length: 64713, removed non-numeric cbbc codes, new length: 64710.
/Users/josephplotkin/anaconda3/envs/hkex_project/lib/python3.7/site-packages/pandas/core/index
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html
  self.obj[key] = _infer_fill_value(value)
/Users/josephplotkin/anaconda3/envs/hkex_project/lib/python3.7/site-packages/pandas/core/index
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html
  self.obj[item] = s
```


HSI CBBC Daily Notional Traded ($MM USD)
80000
70000
60000
50000
40000
30000
20000
10000
2018-05-02
2018-07-16
2018-09-24
2018-12-06
2019-02-22
Trade Date

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In [ ]:
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