In [1]:
```
import numpy as np
import pandas as pd
from pylab import mpl,plt
plt.style.use('seaborn')
mpl.rcParams['font.family'] = 'serif'
%matplotlib inline
```

پیش پردازش داده های فایل های نمادهای فولاد اصفهان ذوب آهن اصفهان ونماد آلومراد از گروه صنعت فلزی در فایل دیگری انجام شدو وبراساس قیمتهای پایانی در یک جدول ذخیر شده است

In [2]:
```
df=pd.read_csv('felez/data.csv', index_col=0,parse_dates=True)
```

In [3]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 52 entries, 2022-02-12 to 2022-05-08
Data columns (total 3 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   cfolad  50 non-null     float64
 1   calo    50 non-null     float64
 2   czob    50 non-null     float64
dtypes: float64(3)
memory usage: 1.6 KB
```

In [4]:
```
df.head()
```

Out[4]:

date	cfolad	calo	czob
2022-02-12	10260.0	11230.0	2451.0
2022-02-13	10220.0	10680.0	2366.0
2022-02-14	10480.0	10590.0	2362.0
2022-02-16	10490.0	10480.0	2396.0
2022-02-19	10490.0	10370.0	2372.0

In [5]:
```
df.tail()
```

Out[5]:

date	cfolad	calo	czob
2022-04-30	11960.0	15610.0	2863.0
2022-05-01	11880.0	15950.0	2875.0
2022-05-02	11770.0	16120.0	2885.0
2022-05-07	11820.0	NaN	NaN
2022-05-08	12050.0	NaN	NaN

In [3]:
```
df.dropna(inplace=True)
```

In [7]:
```
df.plot(figsize=(10,12),subplots=True)
```

Out[7]:
```
array([<AxesSubplot:xlabel='date'>, <AxesSubplot:xlabel='date'>,
       <AxesSubplot:xlabel='date'>], dtype=object)
```

Summary Statistics

In [8]:
```
df.describe().round(2)
```

Out[8]:

	cfolad	calo	czob
count	48.00	48.00	48.00
mean	11186.88	11969.38	2609.75
std	798.80	1649.45	219.57
min	10050.00	10260.00	2310.00
25%	10487.50	10695.00	2399.00
50%	11190.00	11340.00	2592.00
75%	11982.50	12770.00	2818.75
max	12360.00	16120.00	2948.00

In [9]:
```
df.mean()
```

Out[9]:
```
cfolad    11186.875
calo      11969.375
czob       2609.750
dtype: float64
```

In [14]:
```
df.aggregate([min,np.mean,np.std,np.median,max]).round(2)
```

Out[14]:

	cfolad	calo	czob
min	10050.00	10260.00	2310.00
mean	11186.88	11969.38	2609.75
std	798.80	1649.45	219.57
median	11190.00	11340.00	2592.00
max	12360.00	16120.00	2948.00

In [10]:
```
#absolute changes between two index values
df.diff().head()
```

Out[10]:

date	cfolad	calo	czob
2022-02-12	NaN	NaN	NaN
2022-02-13	-40.0	-550.0	-85.0
2022-02-14	260.0	-90.0	-4.0
2022-02-16	10.0	-110.0	34.0
2022-02-19	0.0	-110.0	-24.0

In [16]:
```
df.diff().mean()
```

Out[16]:
```
cfolad     32.127660
calo      104.042553
czob        9.234043
dtype: float64
```

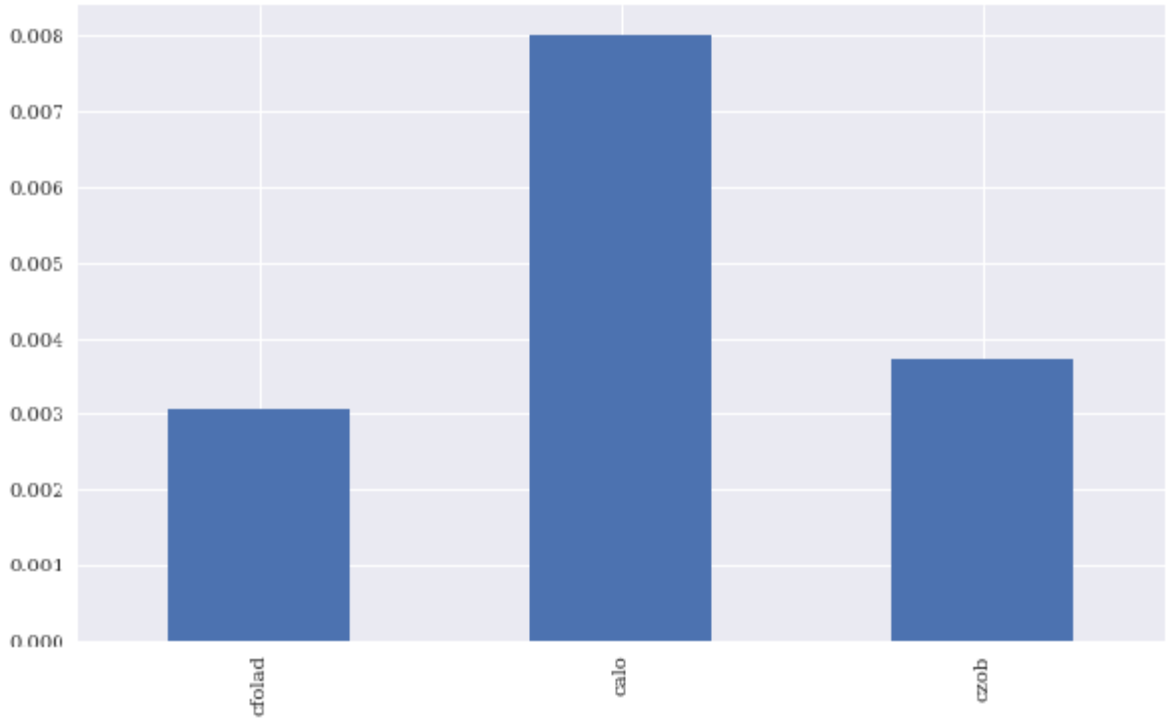
In [20]:
```
#calculates the percentage change between two index values
df.pct_change().round(3).head()
```

Out[20]:

date	cfolad	calo	czob
2022-02-12	NaN	NaN	NaN
2022-02-13	-0.004	-0.049	-0.035
2022-02-14	0.025	-0.008	-0.002
2022-02-16	0.001	-0.010	0.014
2022-02-19	0.000	-0.010	-0.010

In [21]:
```
df.pct_change().mean().plot(kind='bar',figsize=(10,6))
```

Out[21]: <AxesSubplot:>



In [4]:
```
#Calculates the log returns in vectorized fashion.
rets = np.log(df / df.shift(1))
```

In [5]:
```
rets.head().round(3)
```

Out[5]:

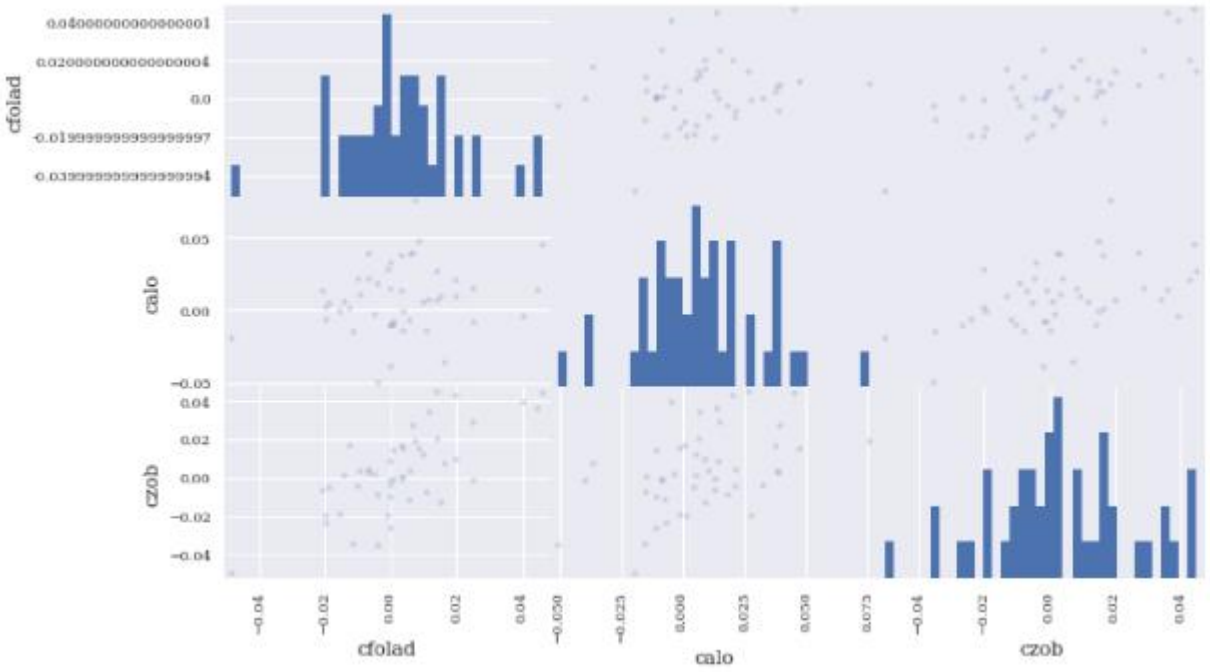
date	cfolad	calo	czob
2022-02-12	NaN	NaN	NaN
2022-02-13	-0.004	-0.050	-0.035
2022-02-14	0.025	-0.008	-0.002
2022-02-16	0.001	-0.010	0.014
2022-02-19	0.000	-0.011	-0.010

In [6]:
```
rets.dropna(inplace=True)
```

In [7]:
```
#Log returns
rets.plot(subplots=True, figsize=(10, 6))
```

Out[7]:
```
array([<AxesSubplot:xlabel='date'>, <AxesSubplot:xlabel='date'>,
       <AxesSubplot:xlabel='date'>], dtype=object)
```

In [10]:
```
pd.plotting.scatter_matrix(rets,alpha=0.2,diagonal='hist',hist_kwds={'bins': 35},f
igsize=(10, 6));
```



In [9]:
```
#Plots the cumulative log returns over time;
rets.cumsum().apply(np.exp).plot(figsize=(10, 6))
```

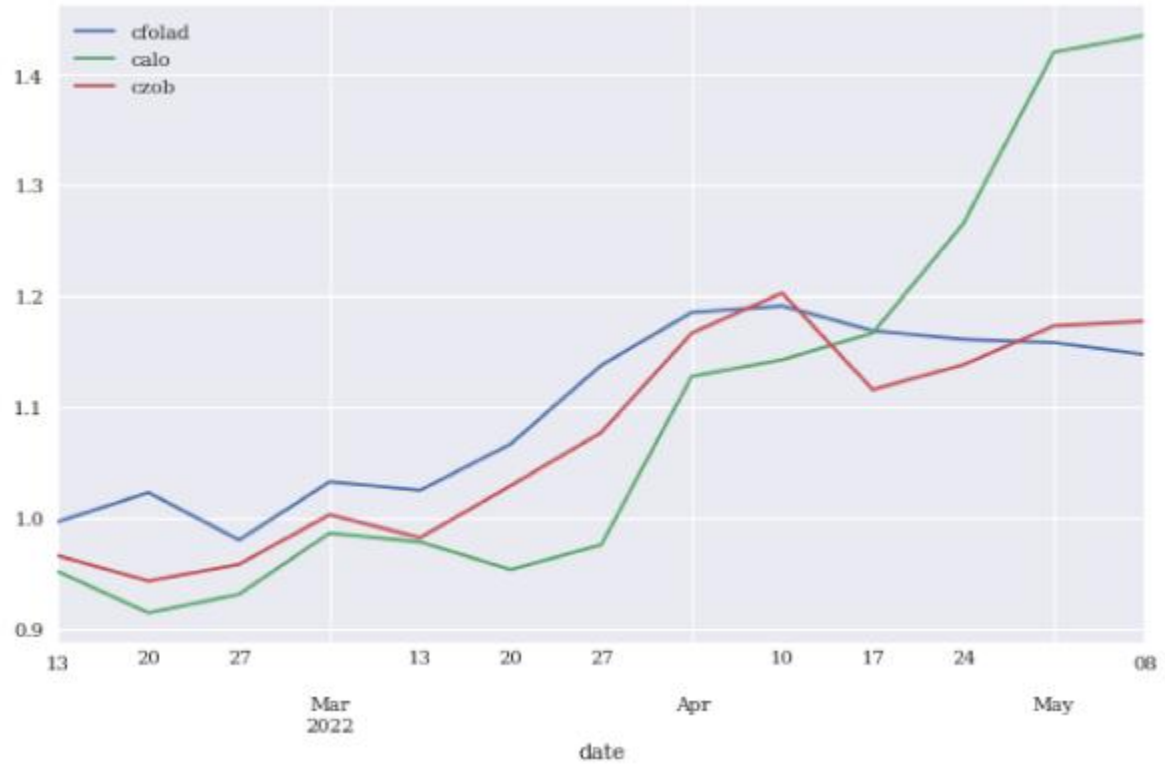
Out[9]:
```
<AxesSubplot:xlabel='date'>
```

In [29]:
```
#Resampling
#data gets resampled to weekly time intervals
df.resample('1w', label='right').last().head()
```

Out[29]:

date	cfolad	calo	czob
2022-02-13	10220.0	10680.0	2366.0
2022-02-20	10490.0	10260.0	2310.0
2022-02-27	10050.0	10450.0	2347.0
2022-03-06	10590.0	11070.0	2457.0
2022-03-13	10510.0	10980.0	2406.0

In [31]:
```
rets.cumsum().apply(np.exp). resample('1w', label='right').last().plot(figsize=(10
, 6));
```



Rolling Statistics

In [11]:
```
nem='cfolad'
df_f=pd.DataFrame(df[nem]).dropna()
df_f.head()
```

Out[11]:

date	cfolad
2022-02-12	10260.0
2022-02-13	10220.0
2022-02-14	10480.0
2022-02-16	10490.0
2022-02-19	10490.0

In [ ]:
```
```

In [14]:
```
window = 20
df_f['min'] = df_f[nem].rolling(window=window).min()
df_f['mean'] = df_f[nem].rolling(window=window).mean()
df_f['std'] = df_f[nem].rolling(window=window).std()
df_f['median'] = df_f[nem].rolling(window=window).median()
df_f['max'] = df_f[nem].rolling(window=window).max()
#Calculates the exponentially weighted moving average, with decay in terms of ahal
f life of 0.5.
df_f['ewma'] = df_f[nem].ewm(halflife=0.5, min_periods=window).mean()
```

In [15]:
```
df_f.dropna().head()
```

Out[15]:

date	cfolad	min	mean	std	median	max	ewma
2022-03-13	10510.0	10050.0	10383.0	191.148881	10435.0	10740.0	10507.128286
2022-03-14	10520.0	10050.0	10396.0	191.184672	10475.0	10740.0	10516.782072
2022-03-15	10520.0	10050.0	10411.0	188.397676	10485.0	10740.0	10519.195518
2022-03-16	10670.0	10050.0	10420.5	196.668971	10490.0	10740.0	10632.298879
2022-03-19	10940.0	10050.0	10443.0	228.245021	10490.0	10940.0	10863.074720

In [26]:
```
ax = df_f[['min', 'mean', 'max']].plot(figsize=(10, 6), style=['g--', 'r--', 'g--'], lw=0.8)
df_f[nem].plot(ax=ax, lw=2.0)
```

Out[26]:
```
<AxesSubplot:xlabel='date'>
```

In [35]:
```
df_f['SMA1']=df_f[nem].rolling(window=5).mean()
df_f['SMA2']=df_f[nem].rolling(window=15).mean()
```

In [36]:
```
df_f[[nem,'SMA1','SMA2']].tail()
```

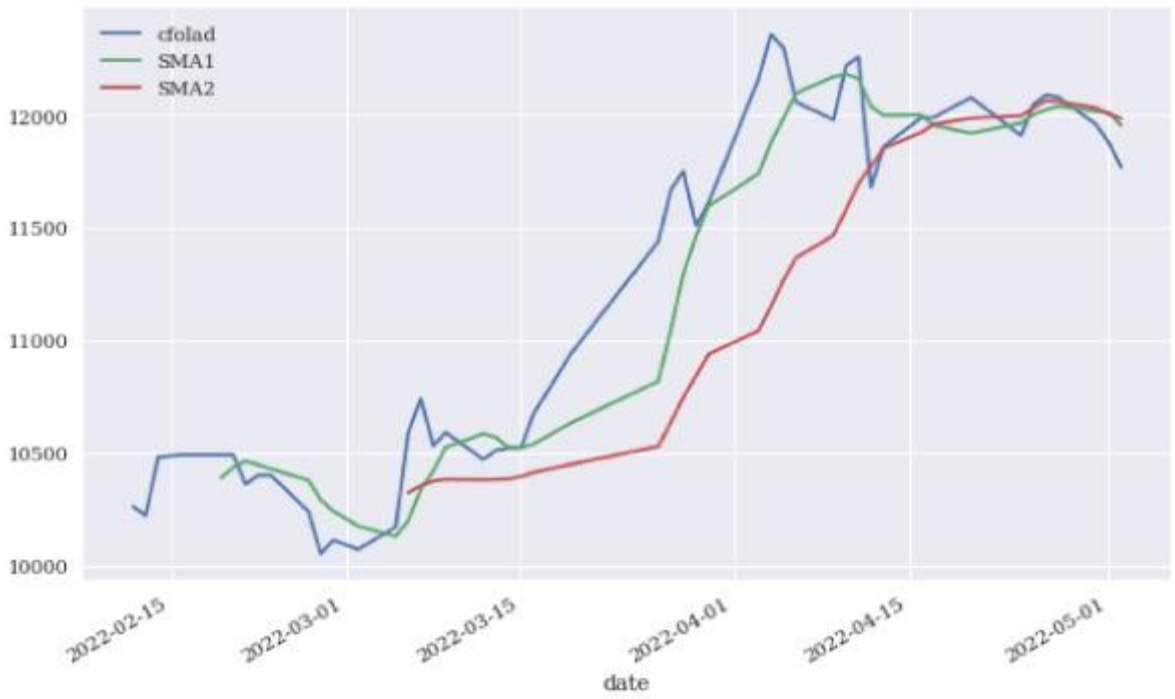
Out[36]:

date	cfolad	SMA1	SMA2
2022-04-26	12090.0	12024.0	12066.000000
2022-04-27	12080.0	12042.0	12060.666667
2022-04-30	11960.0	12018.0	12034.000000
2022-05-01	11880.0	12012.0	12006.000000
2022-05-02	11770.0	11956.0	11986.666667

Visualizes the stock price data plus the two SMA time series

In [37]:
```
df_f[[nem,'SMA1','SMA2']].plot(figsize=(10,6))
```

Out[37]: <AxesSubplot:xlabel='date'>



In [38]:
```
df_f.dropna(inplace=True)
```

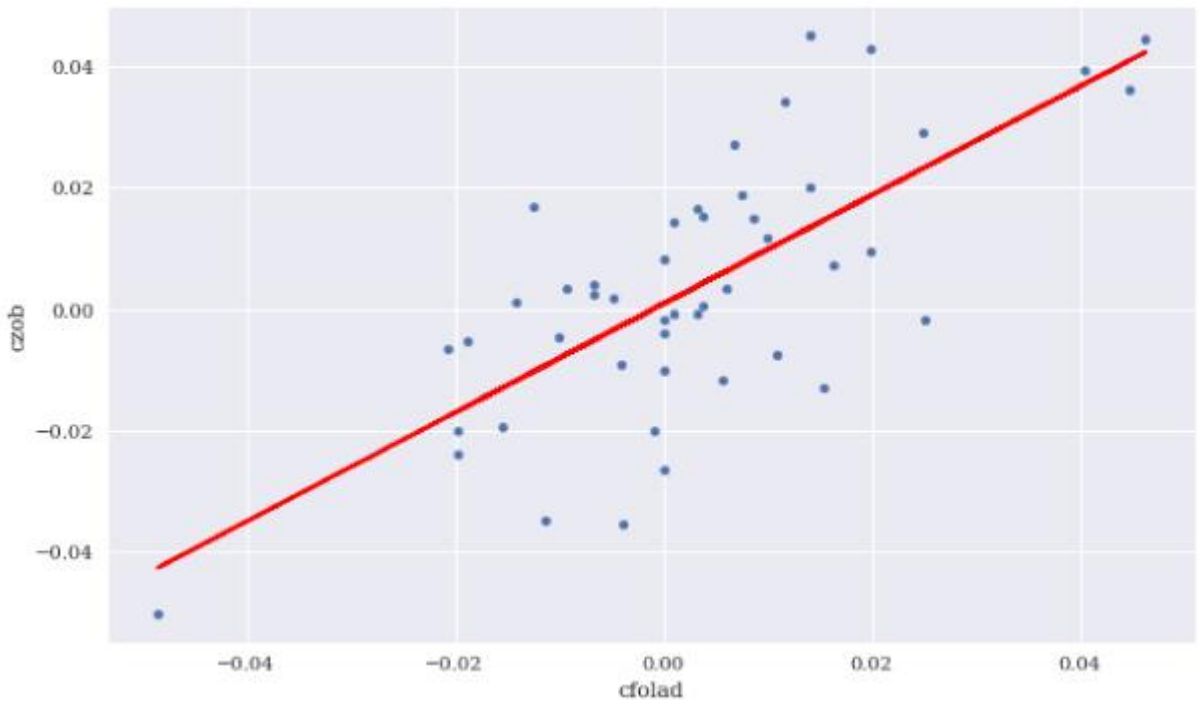
In [41]:
```
df_f['positions'] = np.where(df_f['SMA1'] > df_f['SMA2'],1,-1)
```

In [43]:
```
ax = df_f[[nem, 'SMA1', 'SMA2', 'positions']].plot(figsize=(10, 6),secondary_y='positions')
ax.get_legend().set_bbox_to_anchor((0.25, 0.85))
```

OLS Regression

In [11]:
```
reg = np.polyfit(rets['cfolad'], rets['czob'], deg=1)
```

In [12]:
```
ax = rets.plot(kind='scatter', x='cfolad', y='czob', figsize=(10, 6))
ax.plot(rets['cfolad'], np.polyval(reg, rets['cfolad']), 'r', lw=2);
```

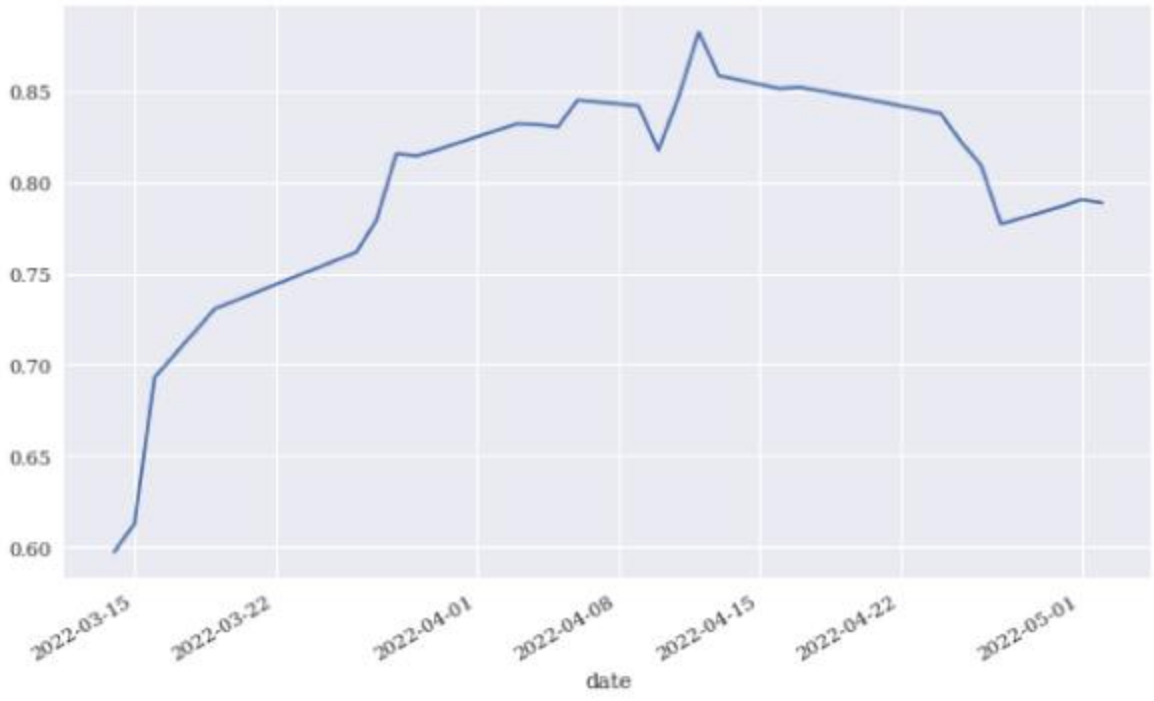


In [15]:
```
rets.corr()
```

Out[15]:

	cfolad	calo	czob
cfolad	1.000000	0.206656	0.723528
calo	0.206656	1.000000	0.464258
czob	0.723528	0.464258	1.000000

In [18]:
```
ax = rets['cfolad'].rolling(window=20).corr(rets['czob']).plot(figsize=(10, 6))
#ax.axhline(rets.corr().iloc[0, 1], c='r');
```



In [ ]: