In [1]:

```
%load_ext autoreload
%autoreload 2
import pandas as pd
import numpy as np
import warnings
from pandas.tseries.offsets import MonthEnd
import matplotlib.pyplot as plt
from datetime import date, datetime
warnings.filterwarnings('ignore')
```

In [3]:

```
data = pd.read_excel('WTI_OilCurve.xlsx',skiprows=1)
data.set_index([1], inplace = True)
data = data[['PX LAST','PX LAST.1','PX LAST.2','PX LAST.3','PX LAST.4','PX LAST.5',
'PX LAST.6','PX LAST.7','PX LAST.8','PX LAST.9','PX LAST.10','PX LAST.11']]
data.columns = ['T1','T2','T3','T4','T5','T6','T7','T8','T9','T10','T11','T12']
oil_monthend = data.resample('M').last()
oil_monthend.index.name = 'Date'
oil_monthend
```

Out[3]:

Date	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
2000-01-31	27.64	26.72	25.97	25.32	24.71	24.17	23.71	23.27	22.87	22.49	22.14	21.81
2000-02-29	30.43	28.85	27.68	26.74	26.00	25.35	24.79	24.32	23.88	23.44	23.04	22.65
2000-03-31	26.90	26.38	26.04	25.76	25.48	25.19	24.90	24.60	24.28	23.97	23.68	23.39
2000-04-30	25.74	25.48	25.15	24.86	24.59	24.32	24.07	23.82	23.57	23.32	23.08	22.85
2000-05-31	29.01	28.42	27.89	27.40	26.92	26.47	26.06	25.69	25.32	24.95	24.58	24.21
...	...	...	...	...	...	...	...	...	...	...	...	...
2018-09-30	73.25	73.06	72.89	72.70	72.51	72.31	72.09	71.84	71.51	71.16	70.82	70.45
2018-10-31	65.31	65.44	65.58	65.73	65.88	65.99	66.05	66.06	66.01	65.91	65.78	65.64
2018-11-30	50.93	51.09	51.23	51.36	51.50	51.60	51.66	51.71	51.76	51.80	51.84	51.89
2018-12-31	45.41	45.72	46.08	46.51	46.93	47.30	47.60	47.84	48.04	48.22	48.38	48.50
2019-01-31	53.79	54.04	54.31	54.60	54.86	55.04	55.12	55.11	55.05	54.96	54.84	54.71

229 rows × 12 columns

In [4]:

```
monthly_ret = []
for i in range(0, len(oil_monthend)-1):
    rolling_ret = []
    for j in range(11):
        rolling_ret.append(oil_monthend.iloc[i,j]/oil_monthend.iloc[i,j+1]-1)
    sortindex = np.argsort(rolling_ret)

    long = oil_monthend.iloc[i+1,sortindex[10]]/oil_monthend.iloc[i,sortindex[10]+1
]-1
    short = oil_monthend.iloc[i+1,sortindex[0]]/oil_monthend.iloc[i,sortindex[0]+1]
-1

    monthly_ret.append(long-short)

ret_multiplier = [1+i for i in monthly_ret]
dollarinvestment = np.cumprod(ret_multiplier)
dollarinvestment = np.insert(dollarinvestment, 0, 1)
plt.figure(figsize = (12,6))
plt.plot(oil_monthend.index, dollarinvestment, linewidth = 2)
plt.xlabel("Date")
plt.ylabel("Value of A Dollar Over Time")
plt.grid();
```

In [5]:

```
oil_future_portfolio_monthly_return = pd.DataFrame(monthly_ret, index=oil_monthend.
index[1:],columns=['Monthly Return'])
oil_future_portfolio = oil_future_portfolio_monthly_return + 1
calendar_year_return = oil_future_portfolio.groupby(oil_future_portfolio.index.year
).prod()
calendar_year_return -= 1
calendar_year_return
```

Out[5]:

Date	Monthly Return
2000	-0.279277
2001	0.176147
2002	-0.023778
2003	0.109618
2004	0.058693
2005	0.323970
2006	0.273906
2007	-0.029794
2008	0.201022
2009	0.045146
2010	0.049256
2011	0.123409
2012	0.089286
2013	0.013788
2014	-0.076987
2015	0.033623
2016	0.103577
2017	-0.000684
2018	0.006142
2019	-0.036984

In [6]:

```
Annualized_Ret = np.prod(ret_multiplier)**(12/len(ret_multiplier))-1
Annualized_Ret
```

Out[6]:

```
0.052625728032006824
```

In [7]:

```
Annualized_Risk = np.std(monthly_ret)*np.sqrt(12)
Annualized_Risk
```

Out[7]:

```
0.11807462918530853
```

In [8]:

```
Sharp_Ratio = Annualized_Ret/Annualized_Risk
Sharp_Ratio
```

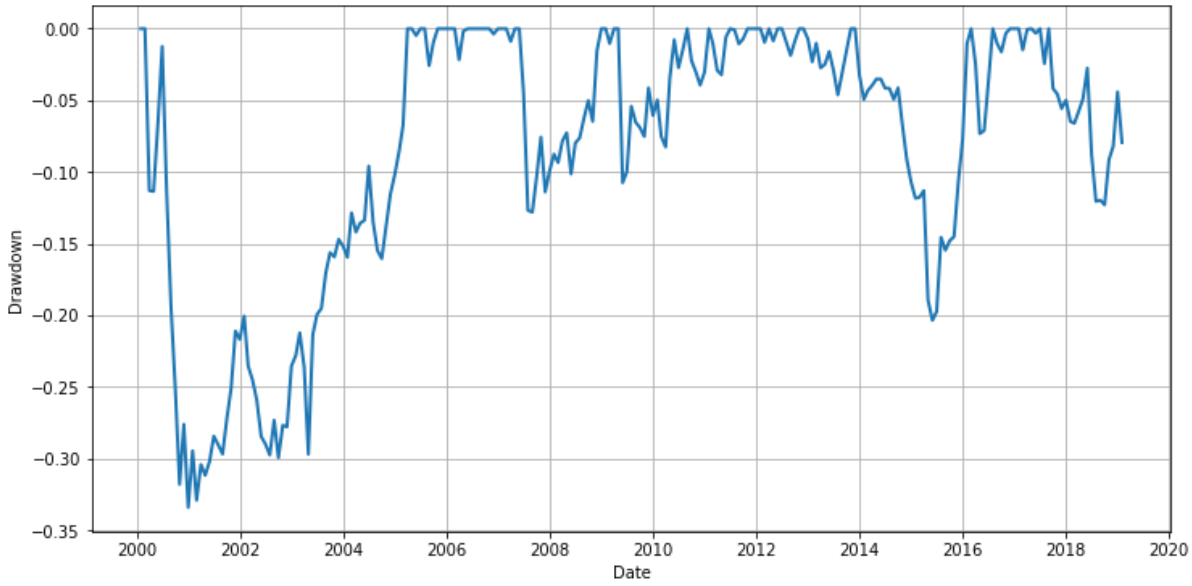
Out[8]:

```
0.4456988634655377
```

In [10]:

```
Drawdown = []
for i in range(len(dollarinvestment)):
    if dollarinvestment[i]/np.max(dollarinvestment[0:i+1])-1<0:
        Drawdown.append(dollarinvestment[i]/max(dollarinvestment[0:i+1])-1)
    else:
        Drawdown.append(0)
Drawdown = pd.DataFrame(Drawdown,index=oil_monthend.index,columns=['DrawDown'])

plt.figure(figsize = (12,6))
plt.plot(Drawdown.index,Drawdown,linewidth = 2)
plt.xlabel("Date")
plt.ylabel("Drawdown")
plt.grid();
```



In [12]:

```
MaximumDD = Drawdown.min()
MaxDDPeriod = Drawdown.loc[Drawdown['DrawDown']==MaximumDD['DrawDown']]
MaxDDPeriod
```

Out[12]:

Date	DrawDown
2000-12-31	-0.334175

The maximum drawdown period starts from 2/29/2000 to 12/31/2000