growth-value_comparison_visualization

October 18, 2019

In [3]:
```
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
import seaborn as sns
```

In [4]:
```
##create dataframe of percent increases
df_five = pd.read_csv("five_yr_data.csv", index_col=0)
df_ten = pd.read_csv("ten_yr_data.csv", index_col=0)
df_twenty = pd.read_csv("twenty_yr_data.csv", index_col=0)

#convert final monetary value data to percent gained
df_five = df_five.div(10).mul(100)
df_five = df_five.round(3)

df_ten = df_ten.div(10).mul(100)
df_ten = df_ten.round(3)

df_twenty = df_twenty.div(10).mul(100)
df_twenty = df_twenty.round(3)
```

0.1 mean, st dev, and distribution of returns (% growth) across 5yr rolling periods

In [5]:
```
df_five_avg = pd.DataFrame([df_five.mean(), df_five.std()], index=['mean', 'standard de
df_five_avg
```

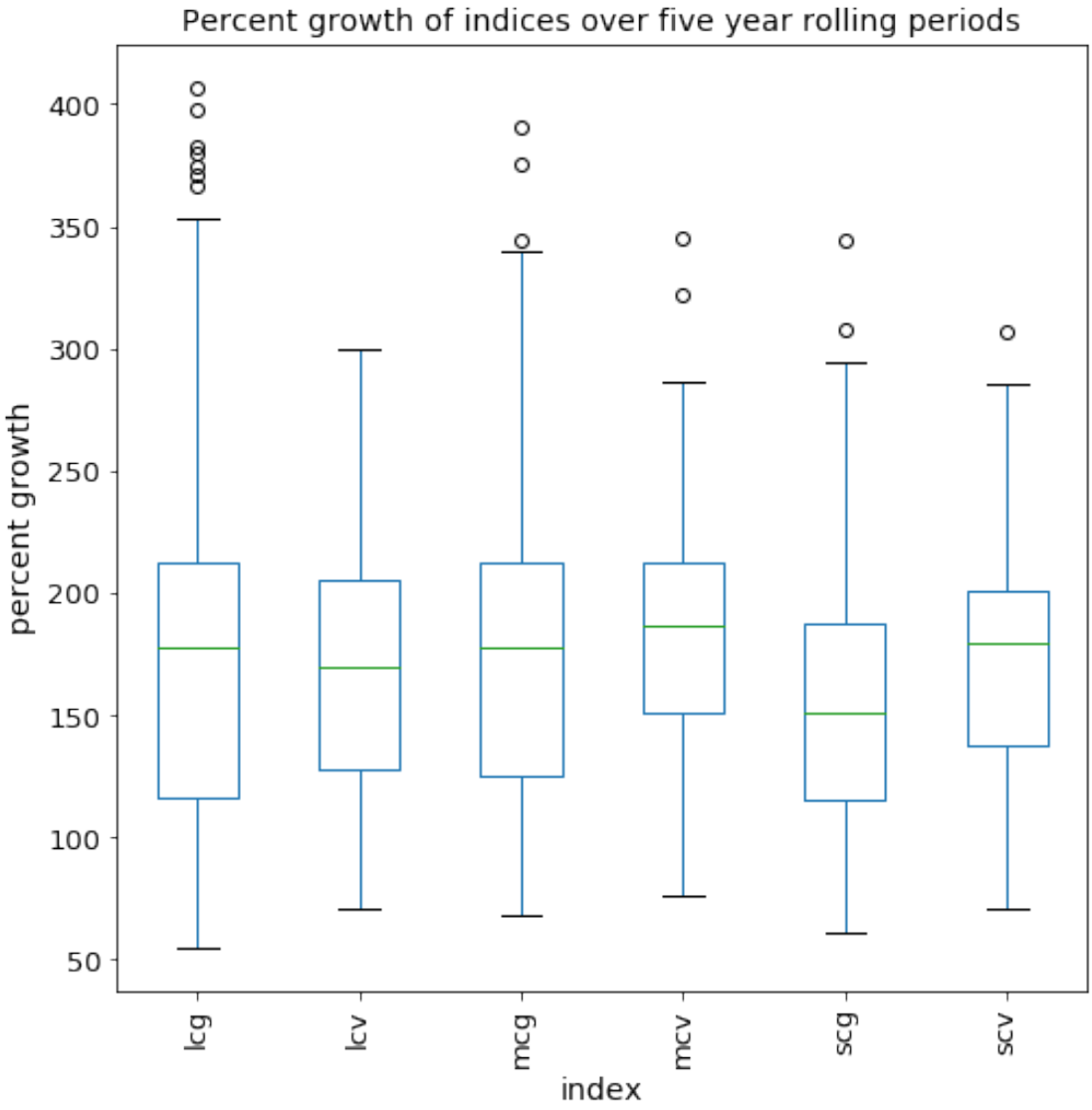
Out[5]:

	lcg	lcv	mcg	mcv	\
mean	174.183582	170.506091	174.748415	180.707681	
standard deviation	72.389526	51.916374	58.521626	46.192580	

	scg	scv
mean	154.467532	172.639667
standard deviation	49.004799	45.160530

In [6]:
```
df_five.plot.box(figsize = (8,8), rot=90, fontsize=13)
plt.ylabel("percent growth", fontsize=14)
plt.xlabel("index", fontsize=14)
plt.title("Percent growth of indices over five year rolling periods", fontsize=14)
```

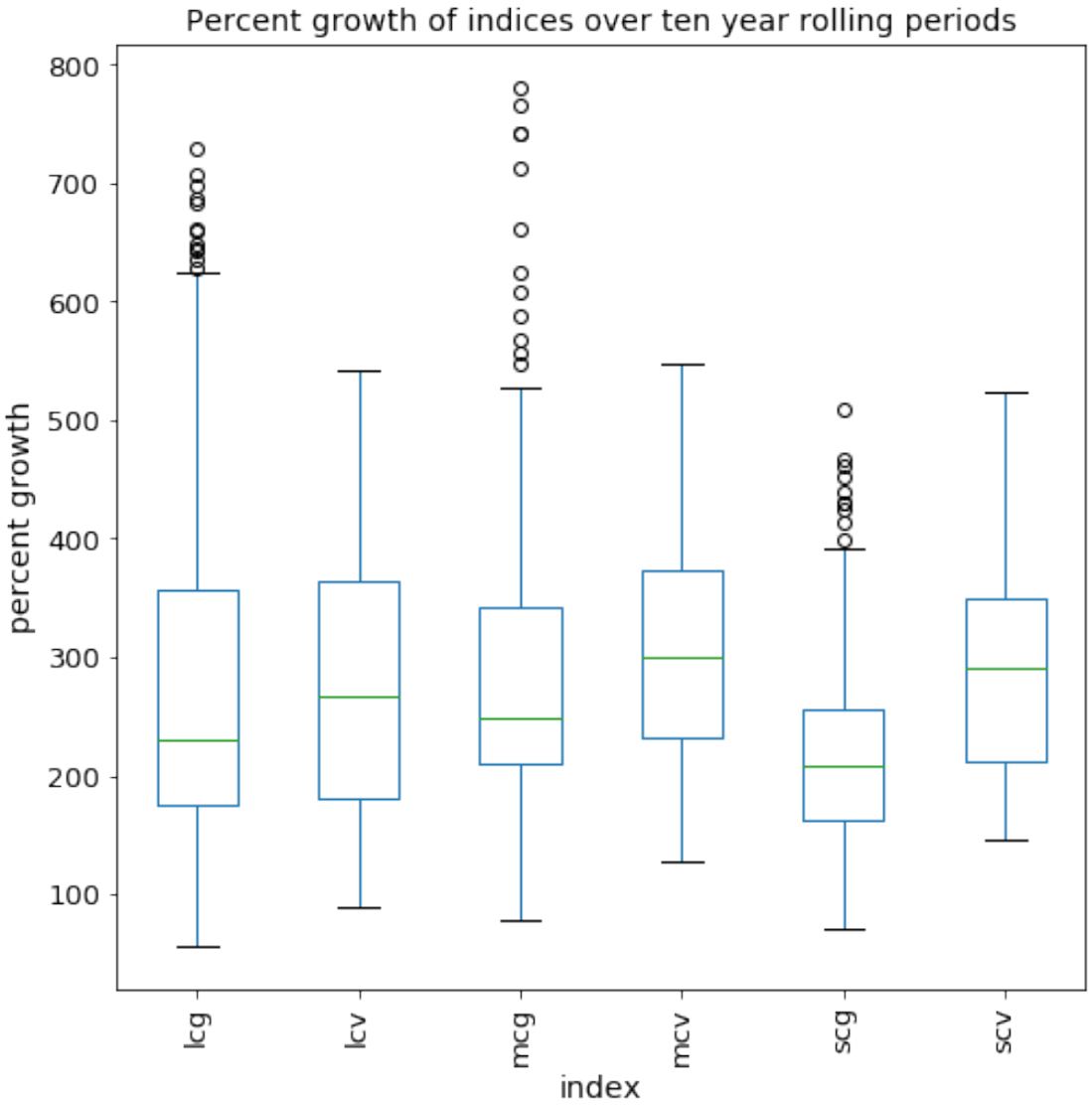
Out[6]: Text(0.5, 1.0, 'Percent growth of indices over five year rolling periods')



0.2 mean, st dev, and distribution of returns (% growth) across 10yr rolling periods

```
In [7]: df_ten.plot.box(figsize = (8,8), rot=90, fontsize=13)
        plt.ylabel("percent growth", fontsize=14)
        plt.xlabel("index", fontsize=14)
        plt.title("Percent growth of indices over ten year rolling periods", fontsize=14)
```

Out[7]: Text(0.5, 1.0, 'Percent growth of indices over ten year rolling periods')




```
In [8]: df_ten_avg = pd.DataFrame([df_ten.mean(), df_ten.std()], index=['mean', 'standard devia
        df_ten_avg
```

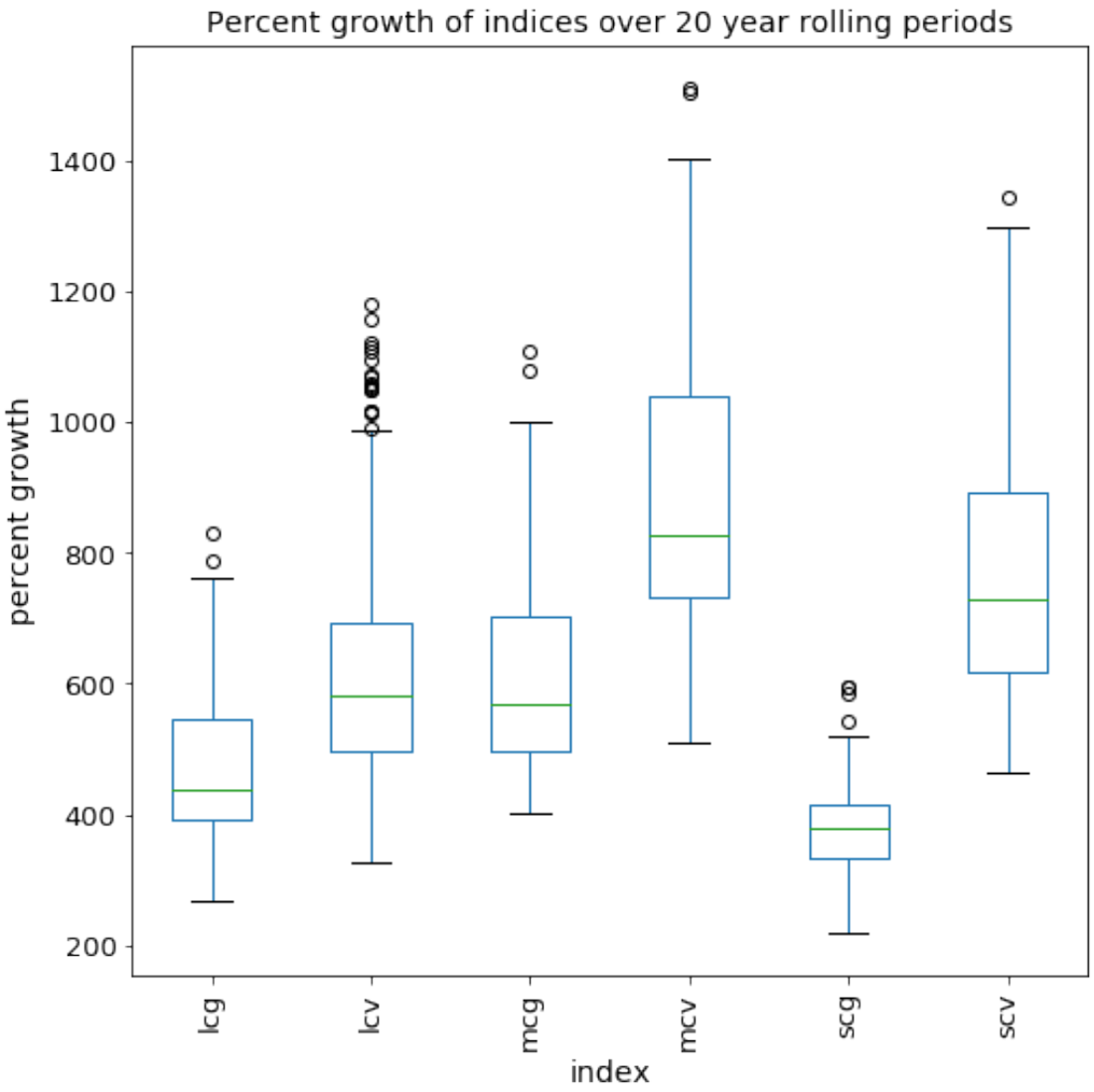
Out[8]:

	lcg	lcv	mcg	mcv	scg	scv
mean	273.969908	276.056823	281.610961	310.494738	216.267667	286.279465
standard deviation	159.059154	113.468559	129.252220	89.871488	79.928810	85.996082

0.3 mean, st dev, and distribution of returns (% growth) across 20yr rolling periods

In [9]:
```
df_twenty.plot.box(figsize = (8,8), rot=90, fontsize=13)
plt.ylabel("percent growth", fontsize=14)
plt.xlabel("index", fontsize=14)
plt.title("Percent growth of indices over 20 year rolling periods", fontsize=14)
```

Out[9]: Text(0.5, 1.0, 'Percent growth of indices over 20 year rolling periods')



In [10]:
```
df_twenty_avg = pd.DataFrame([df_twenty.mean(), df_twenty.std()], index=['mean', 'sta

df_twenty_avg
```

Out[10]:

	lcg	lcv	mcg	mcv	\
mean	474.471716	635.722537	615.274481	891.718568	

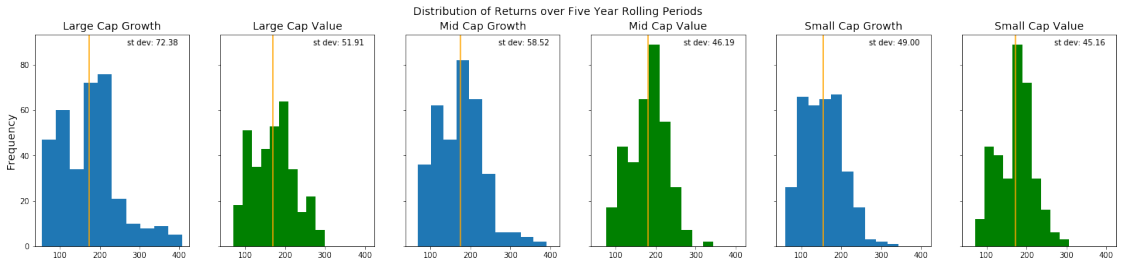
```
standard deviation  117.520562  208.719511  146.452491  234.881874

                              scg         scv
mean                   376.837605  768.938259
standard deviation      65.150640  202.743909
```

1 distribution of return data around the average

```
In [11]: fig, (axes) = plt.subplots(1,6, sharex='row', sharey=True, figsize=(25,5))
         fig.suptitle("Distribution of Returns over Five Year Rolling Periods", fontsize=14)

         axes[0].set_ylabel("Frequency", fontsize=14)

         axes[0].hist(df_five['lcg'])
         axes[0].axvline(df_five['lcg'].mean(), color = 'orange')
         axes[0].set_title('Large Cap Growth', fontsize=14)

         num= str(df_five['lcg'].std())
         ind= num.index('.')
         st_dev="st dev: " + num[:ind+3]
         axes[0].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


         axes[1].hist(df_five['lcv'], color='green')
         axes[1].axvline(df_five['lcv'].mean(), color = 'orange')
         axes[1].set_title('Large Cap Value', fontsize=14)

         num= str(df_five['lcv'].std())
         ind= num.index('.')
         st_dev="st dev: " + num[:ind+3]
         axes[1].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


         axes[2].hist(df_five['mcg'])
         axes[2].axvline(df_five['mcg'].mean(), color = 'orange')
         axes[2].set_title('Mid Cap Growth', fontsize=14)

         num= str(df_five['mcg'].std())
         ind= num.index('.')
         st_dev="st dev: " + num[:ind+3]
         axes[2].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


         axes[3].hist(df_five['mcv'], color='green')
         axes[3].axvline(df_five['mcv'].mean(), color = 'orange')
         axes[3].set_title('Mid Cap Value', fontsize=14)
```

```
num= str(df_five['mcv'].std())
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[3].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


axes[4].hist(df_five['scg'])
axes[4].axvline(df_five['scg'].mean(), color = 'orange')
axes[4].set_title('Small Cap Growth', fontsize=14)

num= str(df_five['scg'].std())
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[4].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')

axes[5].hist(df_five['scv'], color='green')
axes[5].axvline(df_five['scv'].mean(), color = 'orange')
axes[5].set_title('Small Cap Value', fontsize=14)

num= str(df_five['scv'].std())
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[5].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')
```

Out[11]: Text(0.6, 0.95, 'st dev: 45.16')

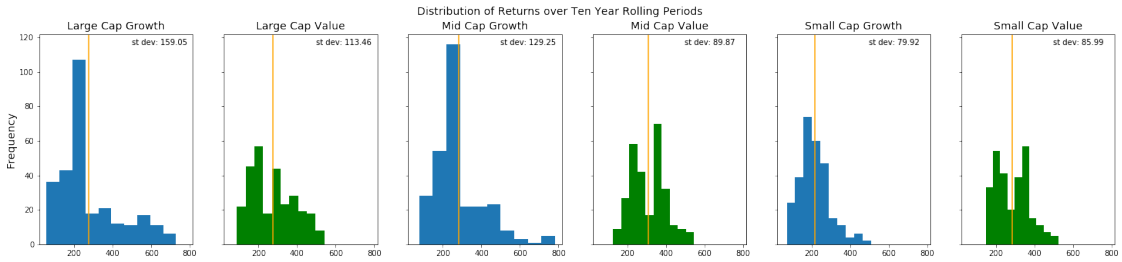



```
In [12]: fig, (axes) = plt.subplots(1,6, sharex='row', sharey=True, figsize=(25,5))
         fig.suptitle("Distribution of Returns over Ten Year Rolling Periods", fontsize=14)

         axes[0].set_ylabel("Frequency", fontsize=14)

         axes[0].hist(df_ten['lcg'])
         axes[0].axvline(df_ten['lcg'].mean(), color = 'orange')
         axes[0].set_title('Large Cap Growth', fontsize=14)

         num= str(df_ten['lcg'].std())
         ind= num.index('.')
```

```
st_dev="st dev: " + num[:ind+3]
axes[0].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


axes[1].hist(df_ten['lcv'], color='green')
axes[1].axvline(df_ten['lcv'].mean(), color = 'orange')
axes[1].set_title('Large Cap Value', fontsize=14)

num= str(df_ten['lcv'].std())
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[1].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


axes[2].hist(df_ten['mcg'])
axes[2].axvline(df_ten['mcg'].mean(), color = 'orange')
axes[2].set_title('Mid Cap Growth', fontsize=14)

num= str(df_ten['mcg'].std())
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[2].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


axes[3].hist(df_ten['mcv'], color='green')
axes[3].axvline(df_ten['mcv'].mean(), color = 'orange')
axes[3].set_title('Mid Cap Value', fontsize=14)

num= str(df_ten['mcv'].std())
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[3].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')

axes[4].hist(df_ten['scg'])
axes[4].axvline(df_ten['scg'].mean(), color = 'orange')
axes[4].set_title('Small Cap Growth', fontsize=14)

num= str(df_ten['scg'].std())
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[4].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


axes[5].hist(df_ten['scv'], color='green')
axes[5].axvline(df_ten['scv'].mean(), color = 'orange')
axes[5].set_title('Small Cap Value', fontsize=14)

num= str(df_ten['scv'].std())
```

```
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[5].annotate(xy=(.6,.95), s=st_dev, xycoords='axes fraction')
```

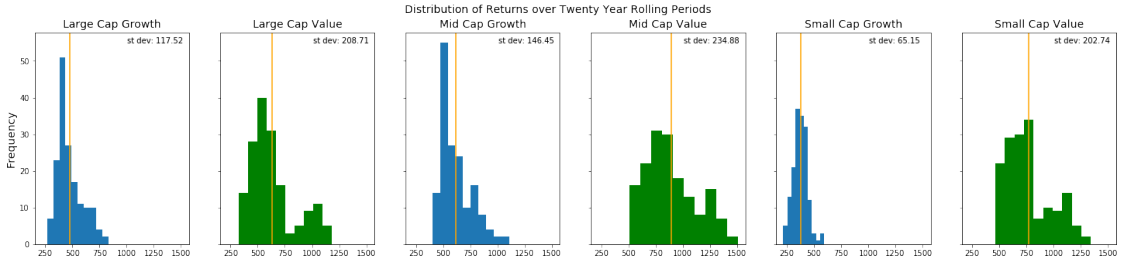
Out[12]: Text(0.6, 0.95, 'st dev: 85.99')



In [13]:
```
fig, (axes) = plt.subplots(1,6, sharex='row', sharey=True, figsize=(25,5))
fig.suptitle("Distribution of Returns over Twenty Year Rolling Periods", fontsize=14)

axes[0].set_ylabel("Frequency", fontsize=14)

axes[0].hist(df_twenty['lcg'])
axes[0].axvline(df_twenty['lcg'].mean(), color = 'orange')
axes[0].set_title('Large Cap Growth', fontsize=14)

num= str(df_twenty['lcg'].std())
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[0].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


axes[1].hist(df_twenty['lcv'], color='green')
axes[1].axvline(df_twenty['lcv'].mean(), color = 'orange')
axes[1].set_title('Large Cap Value', fontsize=14)

num= str(df_twenty['lcv'].std())
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[1].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


axes[2].hist(df_twenty['mcg'])
axes[2].axvline(df_twenty['mcg'].mean(), color = 'orange')
axes[2].set_title('Mid Cap Growth', fontsize=14)

num= str(df_twenty['mcg'].std())
ind= num.index('.')
```

```
st_dev="st dev: " + num[:ind+3]
axes[2].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


axes[3].hist(df_twenty['mcv'], color='green')
axes[3].axvline(df_twenty['mcv'].mean(), color = 'orange')
axes[3].set_title('Mid Cap Value', fontsize=14)

num= str(df_twenty['mcv'].std())
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[3].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


axes[4].hist(df_twenty['scg'])
axes[4].axvline(df_twenty['scg'].mean(), color = 'orange')
axes[4].set_title('Small Cap Growth', fontsize=14)

num= str(df_twenty['scg'].std())
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[4].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')


axes[5].hist(df_twenty['scv'], color='green')
axes[5].axvline(df_twenty['scv'].mean(), color = 'orange')
axes[5].set_title('Small Cap Value', fontsize=14)

num= str(df_twenty['scv'].std())
ind= num.index('.')
st_dev="st dev: " + num[:ind+3]
axes[5].annotate(xy=(0.6,.95), s=st_dev, xycoords='axes fraction')
```

Out[13]: Text(0.6, 0.95, 'st dev: 202.74')



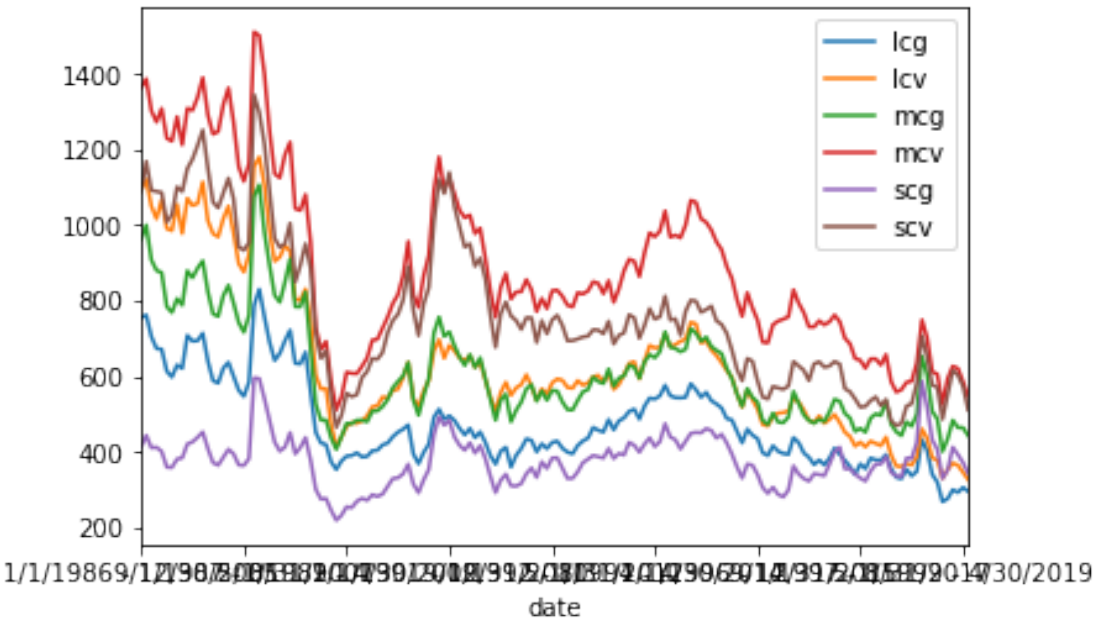
In [14]: df_twenty.head()

Out[14]:

date	lcg	lcv	mcg	mcv	scg	scv
1/1/1986 - 12/30/2005	754.907	1093.577	961.646	1363.023	413.594	1088.763
2/1/1986 - 1/31/2006	762.002	1120.973	1000.006	1386.887	443.363	1168.640
3/1/1986 - 2/28/2006	704.743	1049.739	907.668	1302.415	410.706	1092.060
4/1/1986 - 3/31/2006	673.302	1016.957	880.185	1272.941	411.961	1088.825
5/1/1986 - 4/28/2006	671.524	1067.215	874.377	1308.596	400.952	1086.251

In [15]:
```
df_twenty.plot()
```

Out[15]: <matplotlib.axes._subplots.AxesSubplot at 0x7f046727b320>



In [ ]: