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I spent about 50% of my time during the quarter analyzing the property appeals and sales data. The rest of the time I spent working on merging data. This document will provide all the code for the analysis. **A separate .py file will have the script for the final data merge.**

Please note that this notebook doesn't include every single analysis and line of code I did. These are the final, most useful ones and the most useful functions I composed.

Appeals Analysis

In [2]:

```
import pandas as pd
import csv
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
import pylab
import os
import glob
```

```
/usr/local/lib/python2.7/site-packages/matplotlib/font_manager.py:273: UserWarning: Matplotlib is building the font cache using fc-list. This may take a
moment.
  warnings.warn('Matplotlib is building the font cache using fc-list. This may take a moment.')
```

At the beginning of the quarter, I added a clean_name column for others to use. Here is the code for that:

In [ ]:

```
def add_clean_name(df, file):
    try:
        df['clean_name']
        print "Clean column already exists in file " + file[54:]

    except KeyError:
        df["clean_name"] = df["attorneytaxrep"].str.replace("\.|\s|,", "")
        print "FINISHED cleaning lawyer names for file " + file[54:]

    return df

path = "your/path1"
files = glob.glob(path + "/*.csv")
for f in files:
    df = pd.read_csv(f,index_col=None, header=0)
    df = add_clean_name(df, f)
    df.to_csv(path + f[54:])
```

Other useful functions

In [7]:

```
## useful functions
def clean(name, remove_spaces=True):
    '''
    Given a name string, return a clean name
    that is lowercase and only alphabetic characters.

    If remove_spaces,
        returns "starbuckscoffeeco"
    if remove_spaces is False
        return "starbucks coffee co"
    '''
    lower = name.lower()
    if not remove_spaces:
        p = re.sub(r'\(([^\)]+)\)', '', lower)
        return re.sub(r'[^a-z ]', '', p).strip()

    else:
        p = re.sub(r'\(([^\)]+)\)', '', lower)
        return re.sub(r'[^a-z]', '', lower)

def print_statistics(data):
    '''
    Given a pandas dataframe, print dataframe statistics, correlation, and missing data.
    '''
    pd.set_option('display.width', 20)
    pd.set_option('display.float_format', lambda x: '%.3f' % x)
    print '**** column names:  ', "\n", data.columns.values
    #print '**** top of the data: ', '\n', data.head()
    #print '**** dataframe shape: ', '\n', data.shape
    print '**** statistics: ', "\n", data.describe(include='all')
    #print '**** MODE: ', '\n', data.mode()
    print '**** sum of null values by column: ', "\n", data.isnull().sum()
    print '**** correlation matrix: ', '\n', data.corr()
```

In [3]:

```
## concatenating all appeals years
path = "/Users/Dani/Dropbox/Muni_Finance_Lab/Raw_Data/Appeals"

files = glob.glob(path + "/*.csv")
frame = pd.DataFrame()

list_ = []
for file_ in files:
    df = pd.read_csv(file_,index_col=None, header=0)
    list_.append(df)
df = pd.concat(list_)

print "DONE CONCATINATING DATA"
```

```
DONE CONCATINATING DATA
```

In [5]:

```
print df.shape
df.head()
```

```
(2607270, 25)
```

Out[5]:

	Unnamed: 0	pin	taxyear	appealnum	attorneytaxrep	prioir_av	proppose_av	assr_final	board_av	housenum	...	area	subarea	ass_win	bor_win	bor_rev	assr_rev	total_rev	classification	win	clean_name
0	0	10110102000000	2003	164	KEARNEY & PHELAN, LTD.	59618	59618	59618	48260	117	...	1	101	0	1	11358	0	11358	517	1	KEARNEY&PHELANLTD
1	1	10110200100000	2003	142	RIEFF & SCHRAMM	114882	114882	114882	114882	105	...	1	101	0	0	0	0	0	592	0	RIEFF&SCHRAMM
2	2	10110200500000	2003	142	RIEFF & SCHRAMM	124517	124517	124517	124517	207	...	1	101	0	0	0	0	0	592	0	RIEFF&SCHRAMM
3	3	10110300200000	2003	145	EUGENE L. GRIFFIN & ASSOCIATES	492099	871480	563336	492097	257	...	1	101	1	1	71239	308144	379383	591	1	EUGENELGRIFFINASSOCIATES
4	4	10110300300000	2003	26	MCCRACKEN,WALSH,DELAVEN & HETLER	321977	609040	386419	386419	301	...	1	101	1	0	0	222621	222621	592	1	MCCRACKENWALSHDELAVEN&HETLER

5 rows × 25 columns

In [6]:

```
### filter ONLY for 5 revision
df = df[df["proppose_av"] != 0]

## Creating dfs
df["5_rev"] = df["total_rev"] / df["proppose_av"]
df15 = pd.read_csv(path + "/appeals15.csv",index_col=None, header=0)
df["class_type"] = df["classification"].apply(lambda x: str(x)[0])
df_2_5 = df[(df["class_type"] == "2") | (df["class_type"] == "5")]
df_2 = df[(df["class_type"] == "2")]
df_5 = df[(df["class_type"] == "5")]
```

```
/Library/Python/2.7/site-packages/ipykernel/__main__.py:5: SettingWithCopyWarning:
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 the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html#indexing-view-versus-cop
y
/Library/Python/2.7/site-packages/ipykernel/__main__.py:7: SettingWithCopyWarning:
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 the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html#indexing-view-versus-cop
y
```

In [8]:

```
df15["attorneytaxrep"].str.replace("\.|\s", "")
```

Out[8]:

```
1
```

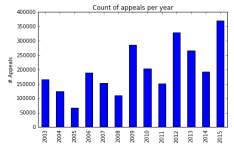
Appeals per year

In [9]:

```
ax = pd.value_counts(df["taxyear"], sort=False).plot(kind = "bar", title = "Count of appeals per year")
plt.tight_layout()
ax.set_ylabel("# Appeals")
#plt.savefig(os.getcwd()  + "/results/appeals-per-year.png")
```

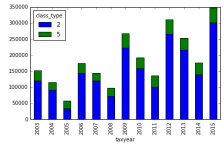
Out[9]:

```
<matplotlib.text.Text at 0x113dc4c90>
```



In [10]:

```
df_2_5.groupby(['taxyear','class_type']).size().unstack().plot(kind = "bar", stacked=True)
plt.tight_layout()
#plt.savefig(os.getcwd() + "/results/appeals-class2-5.png")
```



In [11]:

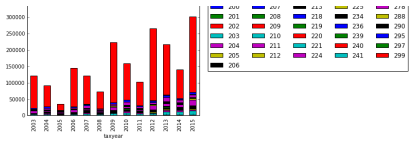
```
# condos = 299
# create new variable of condo, not condo
df_2["condo"] = np.where(df_2['classification'] == 299, 1, 0)
```

```
/Library/Python/2.7/site-packages/ipykernel/__main__.py:3: SettingWithCopyWarning:
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 the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html#indexing-view-versus-cop
y
  app.launch_new_instance()
```

In [12]:

```
df_2.groupby(['taxyear','classification']).size().unstack().plot(kind = "bar", stacked=True)
lgd = plt.legend(bbox_to_anchor=(1.05, 1), loc=2, borderaxespad=0., ncol = 5)
#plt.savefig(os.getcwd() + "/results/appeals-condo.png", bbox_extra_artists=(lgd,), bbox_inches='tight')
```



Below we can compute according to TRI, given tax data has been merged in:

In [8]:

```
df.groupby(['taxyear','TRI']).size().unstack().plot(kind = "bar", stacked=True)
plt.tight_layout()
```

Out[8]:

```
Index([u'Unnamed: 0', u'pin', u'taxyear', u'appealnum', u'attorneytaxrep',
       u'priorav', u'propose_av', u'assr_final', u'board_av', u'housenum',
       u'dir', u'street_name', u'street_suffix', u'city_name', u'zip',
u'area',
       u'subarea', u'ass_win', u'bor_win', u'bor_rev', u'assr_rev',
       u'total_rev', u'classification', u'win', u'clean_name', u'k_rev',
       u'class_type'],
      dtype='object')
```

In [ ]:

```
df.groupby(['taxyear_x','TRI']).mean()['k_rev'].unstack().plot(kind = "bar", stacked=True)
lgd = plt.legend(bbox_to_anchor=(1.05, 1), loc=2, borderaxespad=0.)
#plt.tight_layout()
```

In [ ]:

```
df_2.groupby(['taxyear','condo']).size().groupby(level=0).apply(lambda x: 100*x/float(x.sum())).unstack()
```

In [ ]:

```
def remove_dup_merge(df1_duplicates, df2, duplicate_cols, match_cols):
    """ use with sales_df, appeals_df, ["pin"], ["pin"] """

    df1_duplicates = df1_duplicates.drop_duplicates(duplicate_cols)
    merged = df2.merge(df1_duplicates, on = match_cols, how = "outer")

    return merged

def add_class_type_col(df, classif_column):
    """
    in appeals data, classification column = classification
    in sales data, classification column = bor_class
    """

    df["class_type"] = df[classif_column].apply(lambda x: str(x)[0])

def keep_2_5_only(df):
    final = df[(df["class_type"] == "2") | (df["class_type"] == "5")]

    return final

def analysis_year(year):
    # year =
    path = "/Users/Dani/Dropbox/Muni_Finance_Lab/Raw_Data/Appeals"
    appeals = pd.read_csv(path + "/appeals%s.csv" %year ,index_col=None, header=0)

    path = "/Users/Dani/Dropbox/Muni_Finance_Lab/Raw_Data/Sales_Ratios/1st_pass"
    sales = pd.read_csv(path + "/res%s.csv" %year)

    df = remove_dup_merge(sales, appeals, ["pin"], ["pin"])

    ##  homes that SOLD but didn't appeal - no appealsnum
    a= df[pd.isnull(df['appealnum'])].shape

    ## pin10 is only in sales data,  that APPEALED ONLY - no pin10
    b = df[pd.isnull(df['pin10'])].shape

    df['matched'] = np.where((pd.notnull(df['pi_majclass'])) & (pd.notnull(df["appealnum"])), 1, 0)

    ## sold only
    df['sold'] = np.where(pd.isnull(df["appealnum"]), 1, 0)

    print "median netconsideration appealed ", df[df['matched'] == 1]["NetConsideration"].median()
    print "median netconsideration sold ", df[df['sold'] == 1]["NetConsideration"].median()
    print "median pi_valratio appealed ", df[df['matched'] == 1]['pi_valratio'].median()
    print "median pi_valratio sold ", df[df['sold'] == 1]["pi_valratio"].median()



    #those who won have a bit higher sales ratio
    print "median netcons for lost / won ", df[df['matched'] == 1].groupby(["win"])["NetConsideration"].median()

    # those who won have a higher netconsideration
    print "median pi_valratio for lost / won ", df[df['matched'] == 1].groupby(["win"])["pi_valratio"].median()

    # those who won have a higher propoosed_av
    print "count for lost / won ", df[df['matched'] == 1].groupby(["win"])["NetConsideration"].count()

    return df
```

Given the functions above, we can run a general analysis for all years

just call the analysis_year function with a two digit year

In [ ]:

```
df15 = analysis_year(15)
```

Code for the appeals-tax-sale-community data merge is in the data_merge.py file