# Bangzhu Zhu

In [101]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

# (a)

In [3]:

```
df.totalprice[(df.totalprice>400000)&(df.garage==1)].count()
```

Out[3]:

```
6
```

there are 6 one-garage apartments have a totalprice greater than 400,000 euros

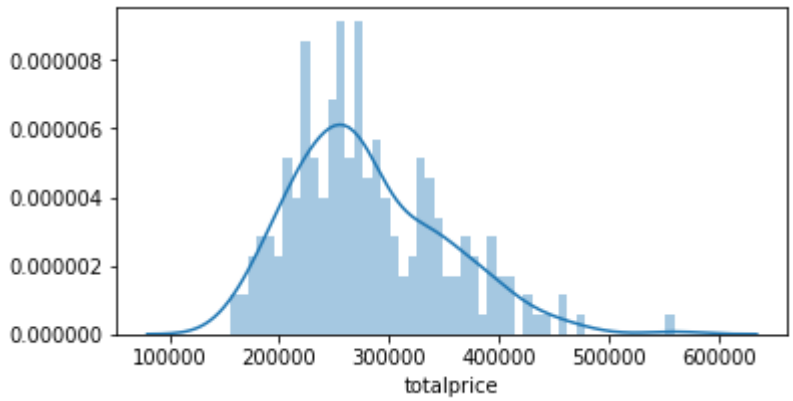
# (b)

In [23]:

```
import matplotlib.pyplot as plt
import seaborn as sns
fig = plt.figure(figsize=(6, 3))
sns.distplot(df.totalprice[1:],bins=50)
```

Out[23]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x1a238f6240>
```



In [31]:

```
from scipy.stats import norm
mean = np.mean(df.totalprice)
sv = np.std(df.totalprice,ddof=1)
b = norm.cdf(300000,loc=mean,scale=sv)
a = 1-b
a
```

Out[31]:

```
0.39054215697577643
```

probability that totalprice exceeds 300000 is 0.391

# (C)

In [32]:

```
df1=df._get_numeric_data()
df1.cov()
```

Out[32]:

| | totalprice | area | age | floor | rooms | toile |
|---|---|---|---|---|---|---|
| **totalprice** | 4.802276e+09 | 1.162639e+06 | -275569.809042 | 4306.929479 | 23103.901095 | 23829.32973 |
| **area** | 1.162639e+06 | 4.298508e+02 | -15.815009 | 3.600908 | 8.392216 | 6.48493 |
| **age** | -2.755698e+05 | -1.581501e+01 | 213.031243 | -2.522175 | -0.766034 | -2.04933 |
| **floor** | 4.306929e+03 | 3.600908e+00 | -2.522175 | 4.524077 | 0.175538 | 0.11098 |
| **rooms** | 2.310390e+04 | 8.392216e+00 | -0.766034 | 0.175538 | 0.402317 | 0.13351 |
| **toilets** | 2.382933e+04 | 6.484930e+00 | -2.049338 | 0.110980 | 0.133514 | 0.25011 |
| **garage** | 1.636451e+04 | 3.286218e+00 | -1.408532 | -0.029214 | 0.058893 | 0.10231 |
| **elevator** | 1.424412e+04 | 3.291590e+00 | -2.402951 | 0.172240 | 0.090052 | 0.09026 |
| **storage** | 7.536747e+03 | 1.274237e+00 | -1.581744 | -0.103708 | 0.008456 | 0.04447 |

In [33]:

```
df1.corr()
```

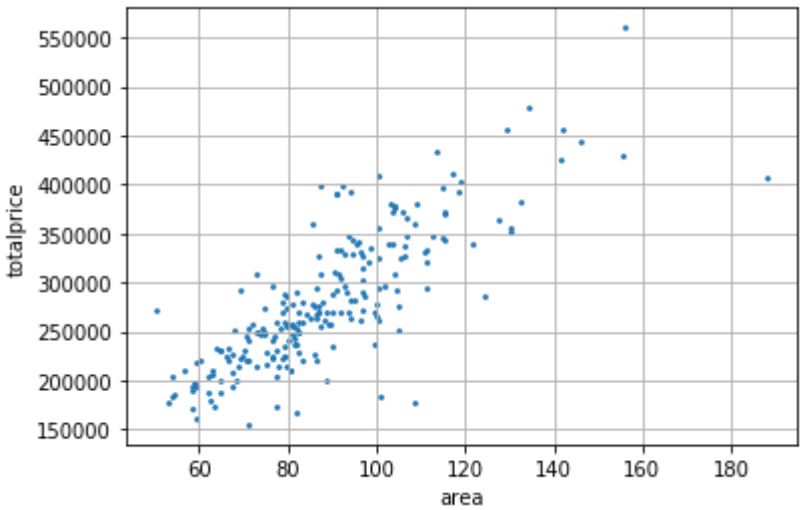
Out[33]:

| | totalprice | area | age | floor | rooms | toilets | garage | elevator |
|---|---|---|---|---|---|---|---|---|
| **totalprice** | 1.000000 | 0.809213 | -0.272450 | 0.029220 | 0.525627 | 0.687571 | 0.523742 | 0.510939 |
| **area** | 0.809213 | 1.000000 | -0.052262 | 0.081656 | 0.638166 | 0.625425 | 0.351541 | 0.394643 |
| **age** | -0.272450 | -0.052262 | 1.000000 | -0.081243 | -0.082745 | -0.280751 | -0.214034 | -0.409242 |
| **floor** | 0.029220 | 0.081656 | -0.081243 | 1.000000 | 0.130113 | 0.104329 | -0.030462 | 0.201292 |
| **rooms** | 0.525627 | 0.638166 | -0.082745 | 0.130113 | 1.000000 | 0.420892 | 0.205930 | 0.352912 |
| **toilets** | 0.687571 | 0.625425 | -0.280751 | 0.104329 | 0.420892 | 1.000000 | 0.453729 | 0.448640 |
| **garage** | 0.523742 | 0.351541 | -0.214034 | -0.030462 | 0.205930 | 0.453729 | 1.000000 | 0.271774 |
| **elevator** | 0.510939 | 0.394643 | -0.409242 | 0.201292 | 0.352912 | 0.448640 | 0.271774 | 1.000000 |
| **storage** | 0.267358 | 0.151086 | -0.266408 | -0.119861 | 0.032771 | 0.218621 | 0.156053 | 0.211845 |

# (d)

In [36]:

```
plt.scatter(df['area'], df['totalprice'],s=3)
plt.ylabel('totalprice')
plt.xlabel('area')
plt.grid()
```



In [63]:

```
from sklearn import linear_model
reg = linear_model.LinearRegression()
y = df['totalprice']
x = pd.DataFrame(df['area'])
reg.fit(x,y)
y_pred=reg.predict(x)
n=df.shape
outlier = 0
row = 0
for i in range(0,n[0]):
                a=abs(y_pred[i]-y[i])
                if a>outlier:
                 outlier=a
                 row=i+1
row
```

Out[63]:

```
44
```

In [65]:

```
outlier
```

Out[65]:

```
156125.62381751765
```

In [100]:

```
df.totalprice[44-1]
```

Out[100]:

```
178000.0
```

In [99]:

```
df.area[44-1]
```

Out[99]:

```
108.4400024
```

row number, area and totalprice is 44, 108.44, 178000

# (e)

In [91]:

```
df['category'].loc[df['category'] == '2A'] = 2
df['category'].loc[df['category'] == '2B'] = 2
df['category'].loc[df['category'] == '3A'] = 3
df['category'].loc[df['category'] == '3B'] = 3
df['category'].loc[df['category'] == '4A'] = 4
df['category'].loc[df['category'] == '4B'] = 4
df['category'].loc[df['category'] == '5A'] = 5
df['category'].loc[df['category'] == '5B'] = 5
```

In [93]:

```
df.pivot_table('totalprice',index='category',aggfunc=np.median)
```

Out[93]:

| category | totalprice |
|---|---|
| 2 | 345500.0 |
| 3 | 279000.0 |
| 4 | 224000.0 |
| 5 | 183000.0 |