wine-reviews-analysis

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1 数据挖掘作业一

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1.2 数据集：**wine-reviews**

[43]:
```
# 导入必要的包
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
from scipy import stats
from collections import Counter
from math import isnan
import math
```

1.3 查看数据集并对数据集进行了解

[79]:
```
# 查看当前文件夹下有哪些数据集以及数据集所处的路径
import os
for dirname, _, filenames in os.walk('E:/homework-1/data/wine-reviews'):
    for filename in filenames:
        print(os.path.join(dirname, filename))

# 数据集文件解释，这里我们拿 winemag-data_first150k.csv 做数据分析
#winemag-data-130k-v2.csv 包含 10 列和 13 万行葡萄酒评论。
#winemag-data_first150k.csv 包含 10 列和 15 万行葡萄酒评论。
#winemag-data-130k-v2.json 包含 6919 个葡萄酒评论节点。
```

```
E:/homework-1/data/wine-reviews\winemag-data-130k-v2.csv
```

```
E:/homework-1/data/wine-reviews\winemag-data-130k-v2.json
E:/homework-1/data/wine-reviews\winemag-data_first150k.csv
```

[77]:
```
# 读取数据集
path = 'E:/homework-1/data/wine-reviews/'
data = pd.read_csv(path+'winemag-data_first150k.csv',index_col=0)
data.head()# 默认展示前五行数据

# 数据集的含义
# 列名----------含义
# country     葡萄酒来自的国家
# description 描述葡萄酒的味道、气味、外观、感觉等
# designation 酿酒厂内的葡萄园，酿造葡萄酒的葡萄来自葡萄园
# points      Wine Enthusiast 对葡萄酒的评分为 1-100
# price       一瓶葡萄酒的成本
# province    葡萄酒来自的产地
# region_1    葡萄酒来自的产地
# region_2    葡萄酒来自的产地
# variety     用于酿造葡萄酒的葡萄种类
# winery      生产葡萄酒的酿酒厂
```

[77]:

	country	description	designation	points	price	province	region_1	region_2	variety
0	US	This tremendous 100% varietal wine hails from …	Martha's Vineyard	96	235.0	California	Napa Valley	Napa	Cabernet Sauvignon
1	Spain	Ripe aromas of fig, blackberry and cassis are …	Carodorum Selección Especial Reserva	96	110.0	Northern Spain			
2	US	Mac Watson honors the memory of a wine once ma…	Special Selected Late Harvest	96	90.0	California			
3	US	This spent 20 months in 30% new French oak, an…	Reserve	96	65.0	Oregon			
4	France	This is the top wine from La Bégude, named aft…	La Brûlade	95	66.0	Provence			

```
1               Toro                 NaN       Tinta de Toro
2     Knights Valley              Sonoma     Sauvignon Blanc
3  Willamette Valley  Willamette Valley          Pinot Noir
4             Bandol                 NaN  Provence red blend

                    winery
0                   Heitz
1  Bodega Carmen Rodríguez
2                 Macauley
3                   Ponzi
4     Domaine de la Bégude
```

[46]:
```
data.dtypes # 每列数据的数据类型
```

[46]:
```
country         object
description     object
designation     object
points           int64
price          float64
province        object
region_1        object
region_2        object
variety         object
winery          object
dtype: object
```

[47]:
```
data.shape # 数据集的大小
```

[47]:
```
(150930, 10)
```

2 数据分析要求

2.1 数据可视化和摘要

2.1.1 数据摘要

（1）标称属性，给出每个可能聚会的频数

[48]:
```
# 由上面对数据集各列进行分析得知，该数据集的标称属性
有'country','designation','province','region_1','region_2',
#'variety','winery' 七个标称属性
# 下面给出每个属性取值的频数
#(1)country
pd.value_counts(data['country'])
```

[48]:

US	62397
Italy	23478
France	21098
Spain	8268
Chile	5816
Argentina	5631
Portugal	5322
Australia	4957
New Zealand	3320
Austria	3057
Germany	2452
South Africa	2258
Greece	884
Israel	630
Hungary	231
Canada	196
Romania	139
Slovenia	94
Uruguay	92
Croatia	89
Bulgaria	77
Moldova	71
Mexico	63
Turkey	52
Georgia	43
Lebanon	37
Cyprus	31
Brazil	25
Macedonia	16

```
Serbia                        14
Morocco                       12
England                        9
Luxembourg                     9
Lithuania                      8
India                          8
Czech Republic                 6
Ukraine                        5
Switzerland                    4
South Korea                    4
Bosnia and Herzegovina         4
China                          3
Egypt                          3
Slovakia                       3
Tunisia                        2
Albania                        2
Montenegro                     2
Japan                          2
US-France                      1
Name: country, dtype: int64
```

[49]:
```
#(2) designation
pd.value_counts(data['designation'])
```

[49]:
```
Reserve                                2752
Reserva                                1810
Estate                                 1571
Barrel sample                          1326
Riserva                                 754
                                       ...
Domaine Saint-Sernin Fare Saint-Sernin     1
The Score                                  1
La Terraza Bloc Reserve                    1
Alte d'Altesi                              1
Bungalow Red                               1
Name: designation, Length: 30621, dtype: int64
```

[50]:
```
#(3) province
pd.value_counts(data['province'])
```

[50]:
```
California                          44508
Washington                           9750
Tuscany                              7281
Bordeaux                             6111
Northern Spain                       4892
                                    ...
Pafos                                   1
Central Otago-Marlborough               1
Maipo Valley-Colchagua Valley           1
Colchagua Costa                         1
Stirling                                1
Name: province, Length: 455, dtype: int64
```

[51]:
```
#(4)region_1
pd.value_counts(data['region_1'])
```

[51]:
```
Napa Valley                  6209
Columbia Valley (WA)         4975
Mendoza                      3586
Russian River Valley         3571
California                   3462
                             ...
Alpilles                        1
Vin de Pays de Hauterive        1
Santa Barbara-Monterey          1
Sonoma County-Lake County       1
Coteaux du Tricastin            1
Name: region_1, Length: 1236, dtype: int64
```

[52]:
```
#(5)region_2
pd.value_counts(data['region_2'])
```

[52]:
```
Central Coast              13057
Sonoma                     11258
Columbia Valley             9157
```

```
Napa                          8801
California Other              3516
Willamette Valley             3181
Mendocino/Lake Counties       2389
Sierra Foothills              1660
Napa-Sonoma                   1645
Finger Lakes                  1510
Central Valley                1115
Long Island                    771
Southern Oregon                662
Oregon Other                   661
North Coast                    632
Washington Other               593
South Coast                    198
New York Other                 147
Name: region_2, dtype: int64
```

[53]:
```
#(6)variety
pd.value_counts(data['variety'])
```

[53]:
```
Chardonnay                  14482
Pinot Noir                  14291
Cabernet Sauvignon          12800
Red Blend                   10062
Bordeaux-style Red Blend     7347
                            …
Carignan-Syrah                  1
Premsal                         1
Muskat                          1
Syrah-Carignan                  1
Carnelian                       1
Name: variety, Length: 632, dtype: int64
```

[54]:
```
#(7)winery
pd.value_counts(data['winery'])
```

[54]:
```
Williams Selyem          374
Testarossa               274
DFJ Vinhos               258
Chateau Ste. Michelle    225
Columbia Crest           217
                         …
Republic of Wine           1
Prince Michel              1
Glass House                1
Jones von Drehle           1
White Knot                 1
Name: winery, Length: 14810, dtype: int64
```

(2) 数值属性，给出 5 数概括及缺失值的个数

[55]:
```
# 这里的数值属性包括 points 和 price
# 用 describe 函数对数据的 5 数进行概括
digital_data = ['points','price']
data[digital_data].describe()
```

[55]:

	points	price
count	150930.000000	137235.000000
mean	87.888418	33.131482
std	3.222392	36.322536
min	80.000000	4.000000
25%	86.000000	16.000000
50%	88.000000	24.000000
75%	90.000000	40.000000
max	100.000000	2300.000000

[56]:
```
# 给出 points 和 price 缺失值个数
print("The Null num of 'points' is:",data['points'].isnull().sum())
```

```
The Null num of 'points' is: 0
```

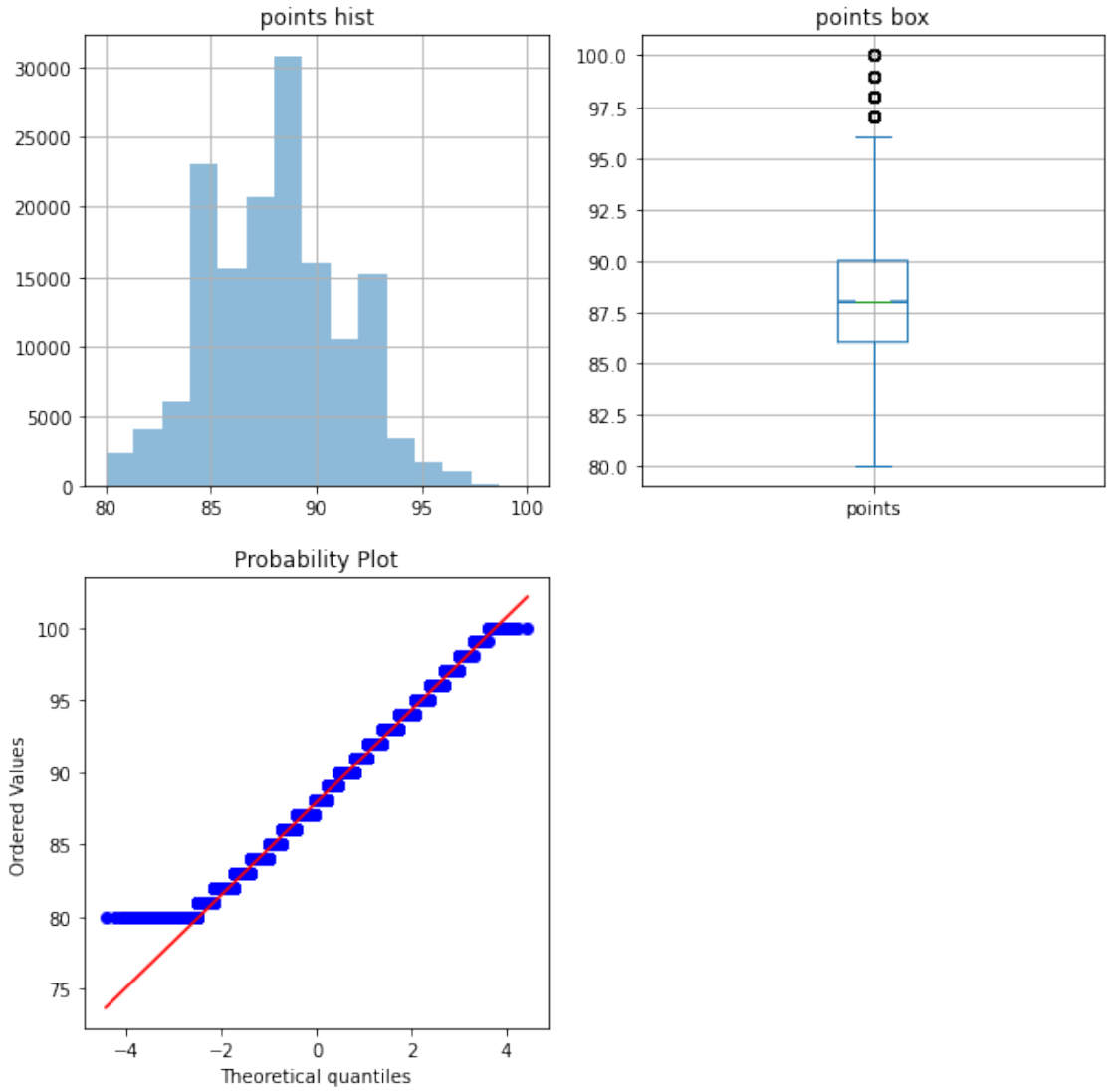
[57]:
```
print("The Null num of 'price' is:",data['price'].isnull().sum())
```

```
The Null num of 'price' is: 13695
```

2.1.2 数据可视化

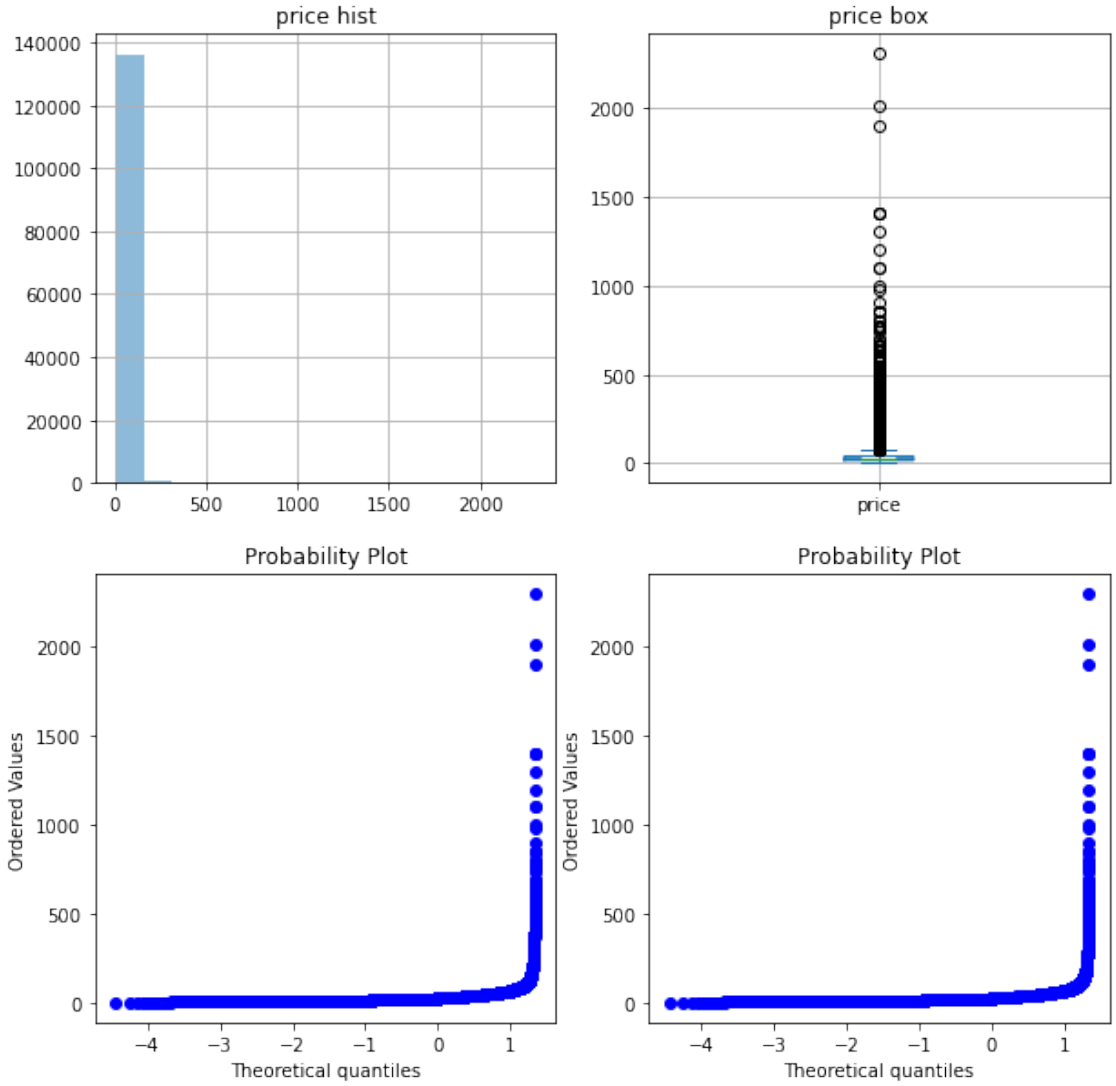
（1）绘制 points 的直方图、盒图、qq 图（此处只针对数值类型的数据）

[58]:
```
# coding=utf-8
plt.figure(figsize = (10,10))

# 直方图
plt.subplot(2,2,1)
plt.title("points hist")
data['points'].hist(alpha=0.5,bins=15) #alpha 透明度, bins 竖条数

# 盒图
plt.subplot(2,2,2)
plt.title("points box")
data['points'].plot(kind='box',notch=True,grid=True)

#q-q 图
plt.subplot(2,2,3)
stats.probplot(data['points'],dist="norm",plot=plt)
plt.show()
```



[59]:
```
# 绘制 price 的直方图、盒图、qq 图
plt.figure(figsize = (10,10))

# 直方图
plt.subplot(2,2,1)
plt.title("price hist")
data['price'].hist(alpha=0.5,bins=15) #alpha 透明度, bins 竖条数

# 盒图
plt.subplot(2,2,2)
```

```
plt.title("price box")
data['price'].plot(kind='box',notch=True,grid=True)

#q-q 图
plt.subplot(2,2,3)
stats.probplot(data['price'],dist="norm",plot=plt)

# 去除缺失值再绘制 q-q 图
plt.subplot(2,2,4)
pricewithooutnulldata = pd.DataFrame(data['price'])
pricewithooutnulldata = pricewithooutnulldata.dropna()
stats.probplot(data['price'],dist="norm",plot=plt)

plt.show()
```



2.1.3 由上图可以得出结论：

1.points 属性分布符合正态分布，但不是完全正态分布

2.price 属性分布不符合正态分布

3 数据缺失处理

[60]:
```
# 绘制表格查看数据缺失值并检验四种方案填充后是否还有缺失值
def missing_data(datatodel):
    missing_num = datatodel.isnull().sum()
    missing_percent = missing_num/datatodel.shape[0]*100
    concat_data = pd.
 ↪concat([missing_num,missing_percent],axis=1,keys=['missing_num','missing_percent'])
    concat_data['Types'] = datatodel.dtypes
    return concat_data
```

由上表可以看出，数值型数据 price 存在缺失值

标称型数据 country，designation,province,region_1,region_2 存在缺失值

这里缺失的原因可能是由于未完全记录、遗漏或无法获取

3.1 方案一缺失值剔除

[61]:
```
del_null_data = data.copy(deep=True)
del_null_data = del_null_data.dropna()
```

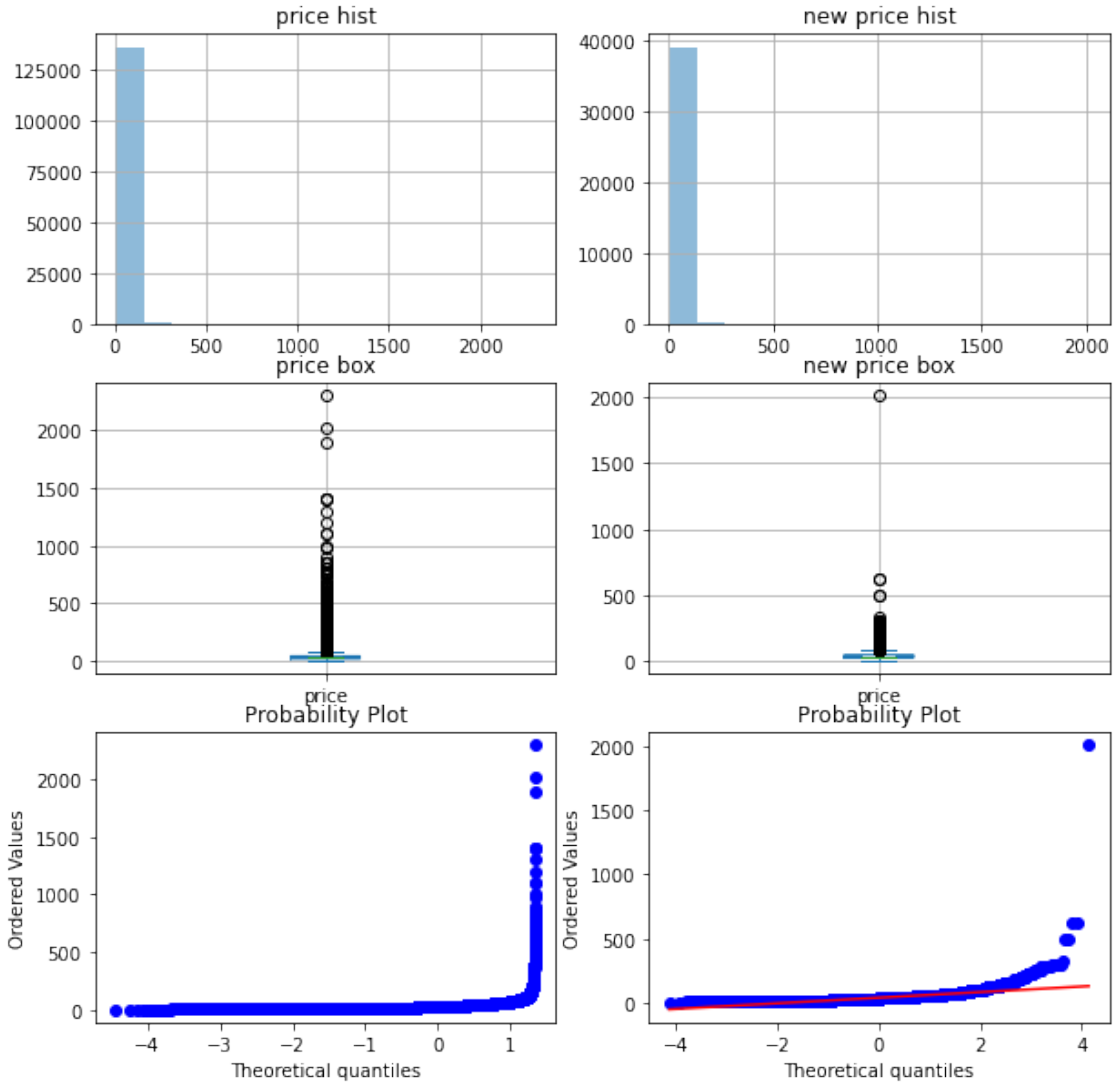
[62]:
```
missing_data(del_null_data)
```

[62]:

	missing_num	missing_percent	Types
country	0	0.0	object
description	0	0.0	object
designation	0	0.0	object
points	0	0.0	int64
price	0	0.0	float64
province	0	0.0	object
region_1	0	0.0	object
region_2	0	0.0	object
variety	0	0.0	object
winery	0	0.0	object

[63]:
```
# 可视化对比新旧数据


plt.figure(figsize = (10,10))
```

```
# 直方图
plt.subplot(3,2,1)
plt.title("price hist")
data['price'].hist(alpha=0.5,bins=15) #alpha 透明度, bins 竖条数

# 直方图
plt.subplot(3,2,2)
plt.title("new price hist")
del_null_data['price'].hist(alpha=0.5,bins=15) #alpha 透明度, bins 竖条数


# 盒图
plt.subplot(3,2,3)
plt.title("price box")
data['price'].plot(kind='box',notch=True,grid=True)

# 盒图
plt.subplot(3,2,4)
plt.title("new price box")
del_null_data['price'].plot(kind='box',notch=True,grid=True)

#q-q 图
plt.subplot(3,2,5)
stats.probplot(data['price'],dist="norm",plot=plt)

plt.subplot(3,2,6)
stats.probplot(del_null_data['price'],dist="norm",plot=plt)

plt.show()
```



[64]:
```
del_null_data[['price']].describe()  # 缺失部分剔除后数据的 5 数概况
```

[64]:

	price
count	39241.000000
mean	37.546316
std	26.716547
min	4.000000
25%	22.000000
50%	32.000000
75%	45.000000

```
max      2013.000000
```

3.2 用最高频率值来填补缺失值

[65]:
```
# 用最高频率来填补缺失值--此处使用深拷贝，否则会改变原值
fill_data_with_most_frequency = data.copy(deep=True)
# 对 price 进行最高频率值填补缺失值
word_counts = Counter(fill_data_with_most_frequency['price'])
top = word_counts.most_common(1)[0][0]
fill_data_with_most_frequency['price'] = fill_data_with_most_frequency['price'].
 ↪fillna(top)
```

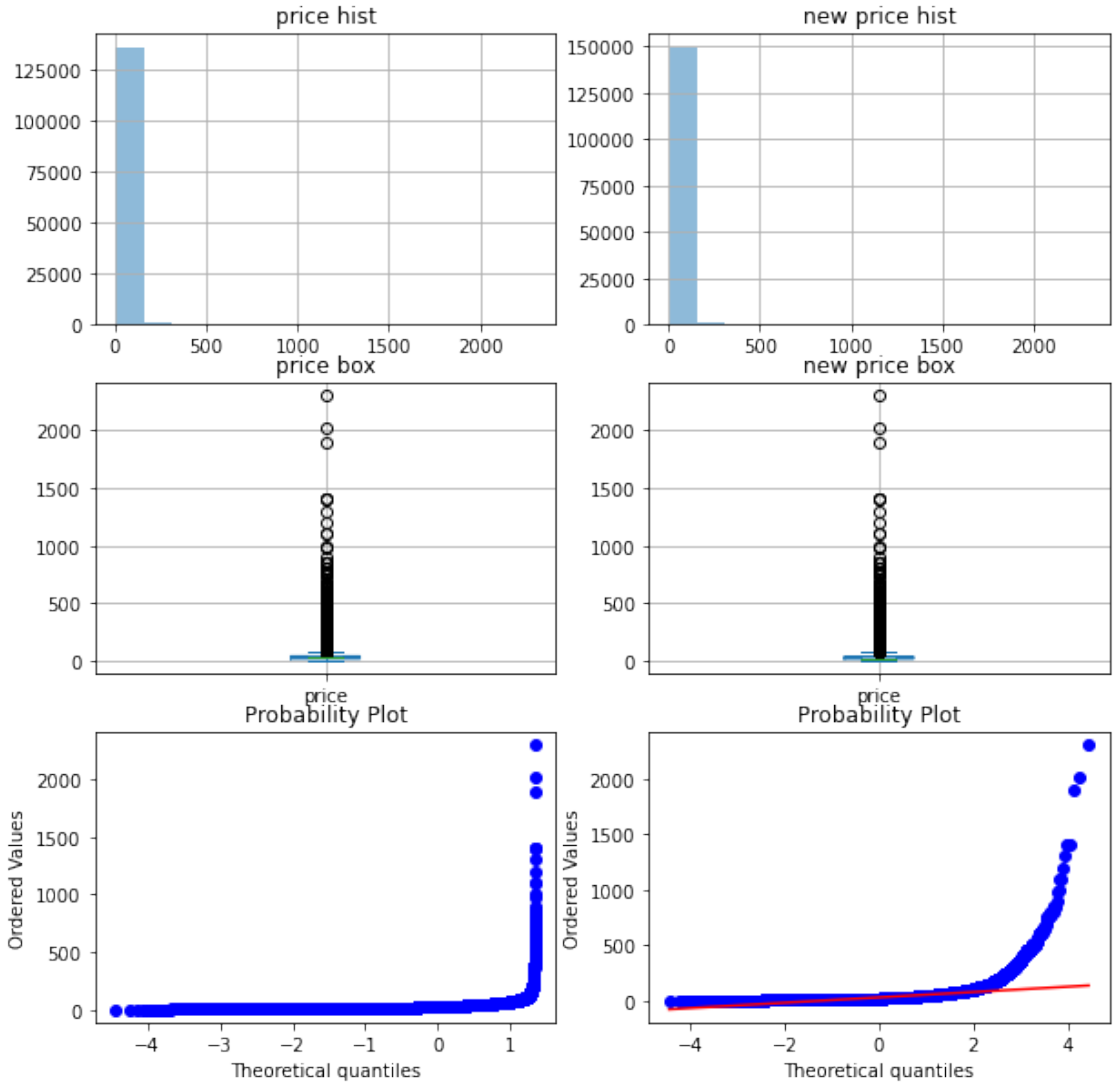
[66]:
```
missing_data(fill_data_with_most_frequency)
```

[66]:

	missing_num	missing_percent	Types
country	5	0.003313	object
description	0	0.000000	object
designation	45735	30.302127	object
points	0	0.000000	int64
price	0	0.000000	float64
province	5	0.003313	object
region_1	25060	16.603724	object
region_2	89977	59.615053	object
variety	0	0.000000	object
winery	0	0.000000	object

[67]:
```
# 可视化对比新旧数据

plt.figure(figsize = (10,10))

# 直方图
plt.subplot(3,2,1)
plt.title("price hist")
data['price'].hist(alpha=0.5,bins=15) #alpha 透明度，bins 竖条数

# 直方图
plt.subplot(3,2,2)
```

```
plt.title("new price hist")
fill_data_with_most_frequency['price'].hist(alpha=0.5,bins=15) #alpha 透明度,
bins 竖条数



# 盒图
plt.subplot(3,2,3)
plt.title("price box")
data['price'].plot(kind='box',notch=True,grid=True)

# 盒图
plt.subplot(3,2,4)
plt.title("new price box")
fill_data_with_most_frequency['price'].plot(kind='box',notch=True,grid=True)

#q-q 图
plt.subplot(3,2,5)
stats.probplot(data['price'],dist="norm",plot=plt)

plt.subplot(3,2,6)
stats.probplot(fill_data_with_most_frequency['price'],dist="norm",plot=plt)

plt.show()
```



[68]:
```
# 对填充后的新数据进行描述
fill_data_with_most_frequency[['price']].describe()
```

[68]:

	price
count	150930.000000
mean	31.939966
std	34.840211
min	4.000000
25%	16.000000
50%	22.000000

```
75%         38.000000
max       2300.000000
```

3.3 通过属性的相关关系来填补缺失值

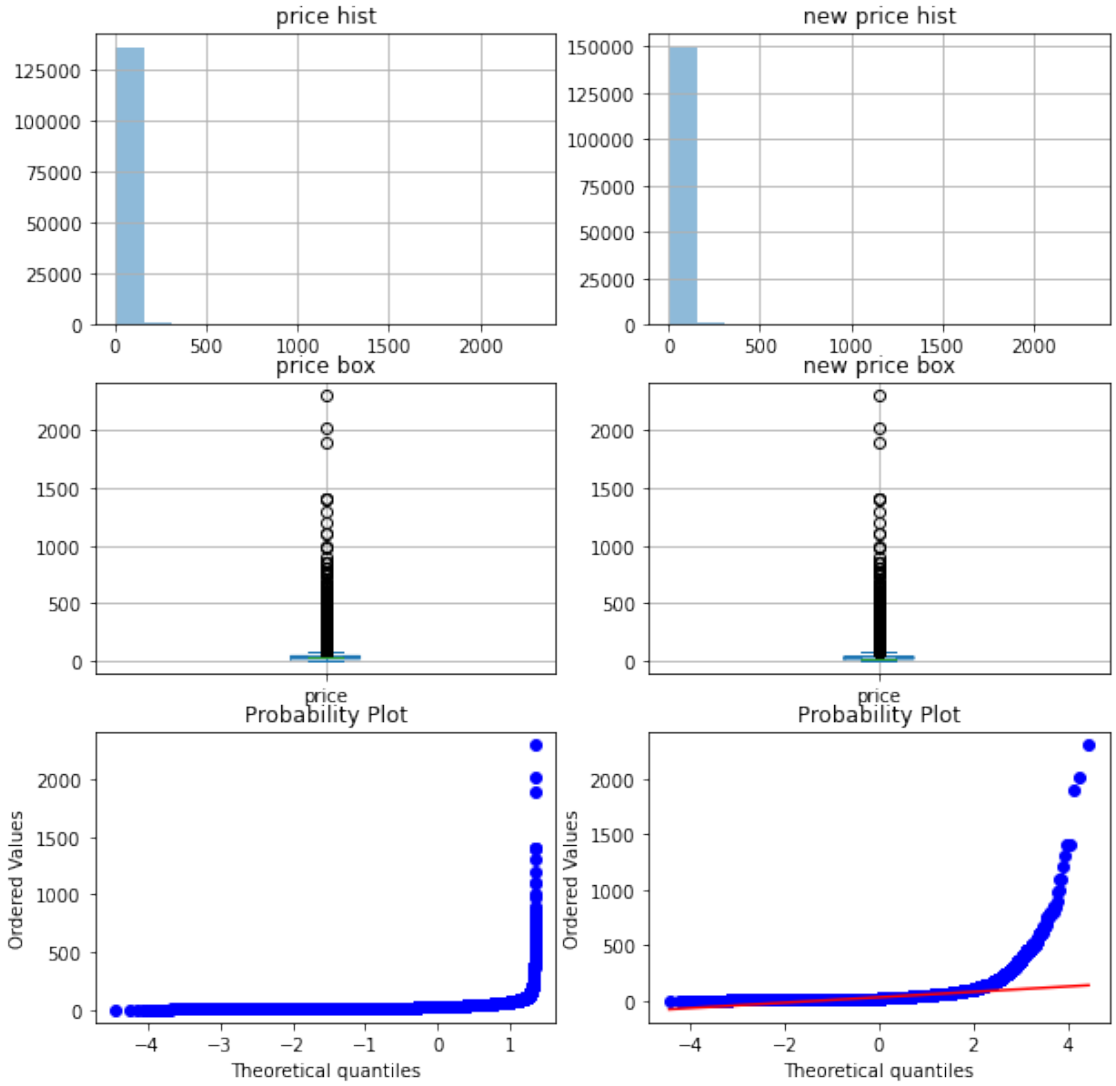
[69]:
```
# 查看相关的属性关系
data.corr()
```

[69]:
```
          points     price
points  1.000000  0.459863
price   0.459863  1.000000
```

[70]:
```
# 通过属性的相关关系来填补缺失值
target_data = data['price'].copy(deep=True)
source_data = data['points'].copy(deep=True)

flag1 = target_data.isnull().values
flag2 = source_data.isnull().values

i=0
for _,value in target_data.iteritems():
    if(flag1[i]==True) and (flag2[i]==False):
        target_data[i] = 104 - source_data[i]
    i=i+1
```

[71]:
```
# 可视化对比新旧数据

plt.figure(figsize = (10,10))

# 直方图
plt.subplot(3,2,1)
plt.title("price hist")
data['price'].hist(alpha=0.5,bins=15) #alpha 透明度, bins 竖条数

# 直方图
plt.subplot(3,2,2)
plt.title("new price hist")
```

```
target_data.hist(alpha=0.5,bins=15) #alpha 透明度, bins 竖条数


# 盒图
plt.subplot(3,2,3)
plt.title("price box")
data['price'].plot(kind='box',notch=True,grid=True)

# 盒图
plt.subplot(3,2,4)
plt.title("new price box")
target_data.plot(kind='box',notch=True,grid=True)

#q-q 图
plt.subplot(3,2,5)
stats.probplot(data['price'],dist="norm",plot=plt)

plt.subplot(3,2,6)
stats.probplot(target_data,dist="norm",plot=plt)

plt.show()
```



[72]:
```
target_data.describe()
```

[72]:
```
count    150930.00000
mean         31.49576
std          35.03242
min           4.00000
25%          15.00000
50%          22.00000
75%          38.00000
max        2300.00000
```

```
Name: price, dtype: float64
```

3.4 通过对象的相似性填补缺失值

[73]:
```
numeric_attr = ['price','points']
# 查找两个对象间的相似性
# 如果通过暴力法求解耗时耗力
# 所以选择通过二分法查找的方法进行相似性选择

def find_dis_value(dataset, pos, numeric_attr):
    def dis_objs(tar_obj_index, sou_obj_index):
        tar_obj = dataset.iloc[tar_obj_index]
        sou_obj = dataset.iloc[sou_obj_index]
        dis_value = 0
        for column in tar_obj.index:
            if column == 'points':
                if (not math.isnan(tar_obj[column])) and (not math.
 ↪isnan(sou_obj[column])):
                    dis_value += sou_obj[column] - tar_obj[column]
                else:
                    dis_value += 9998
        return dis_value


    mindis = 9999
    result_pos = -1
    leftindex = 0;
    rightindex = dataset.shape[0]-1
    # 二分查找返回最近距离的一个 result_pos
    while leftindex<=rightindex:
        midindex = int((leftindex+rightindex)/2)
        tmpdis = dis_objs(pos,midindex)
        if(tmpdis>0):
            rightindex = midindex-1
        elif(tmpdis == 0):
            result_pos = midindex
```

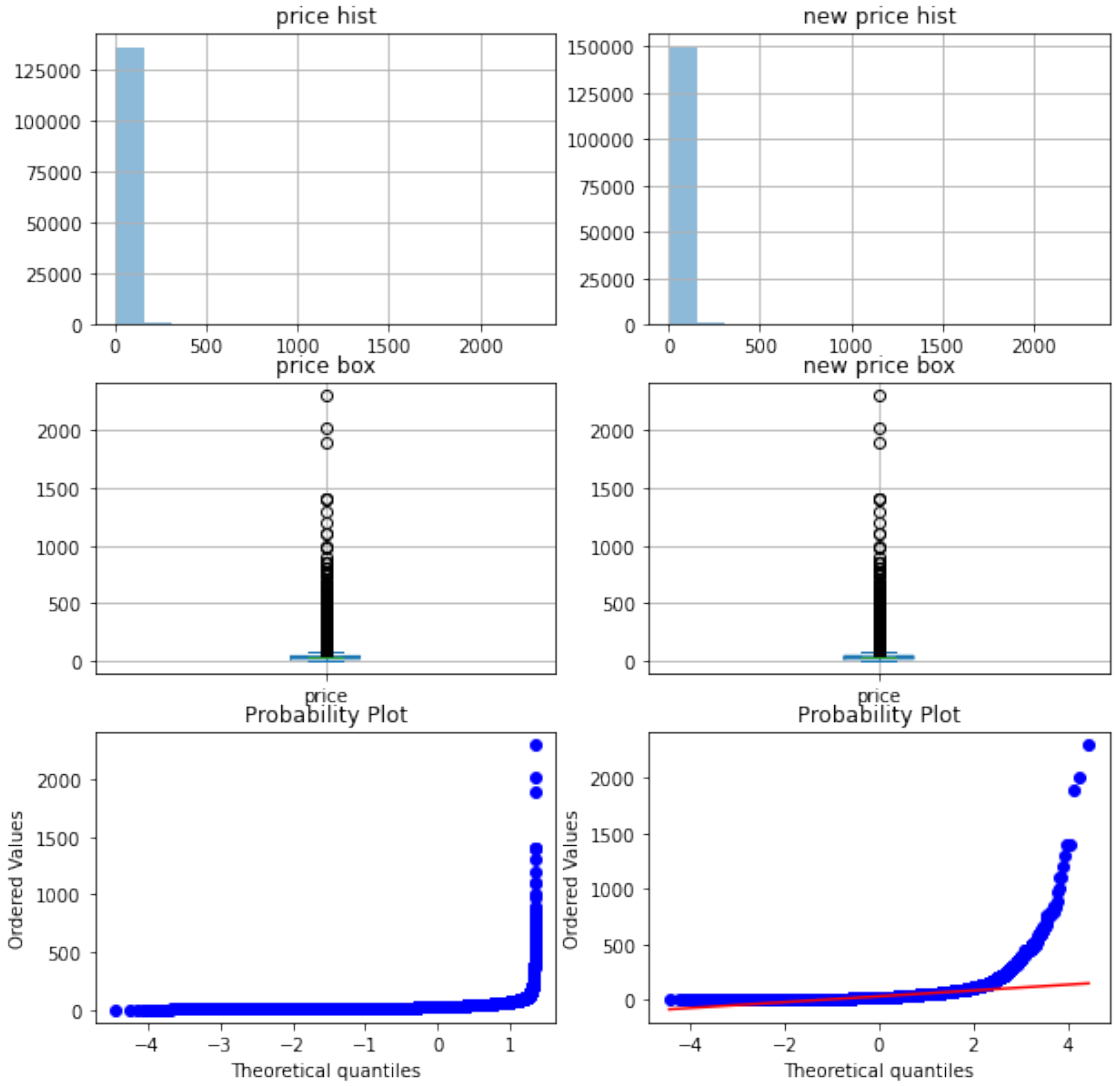
```
            break;
        else:
            leftindex = midindex+1
        if(tmpdis<mindis):
            result_pos = midindex
    return result_pos




# 通过数据对象之间的相似性来填补缺失值
numical_datasets = pd.DataFrame(data[numeric_attr].copy(deep=True))

# 对 numical_datasets 排序
numical_datasets.sort_values("points",inplace=True)
data_price = numical_datasets['price'].copy(deep=True)

print('空数据数量为:',data_price.isnull().sum())
length = numical_datasets.shape[0]
count=1;
for i in range(length):
    if math.isnan(numical_datasets['price'].iloc[i]):
#         print(' 当前处理第'+str(count)+" 个")
#         print(i,numical_datasets.iloc[i])
        result_pos = find_dis_value(numical_datasets, i, numeric_attr)
#         print(result_pos,numical_datasets.iloc[result_pos])
        data_price.iloc[i] = data_price.iloc[result_pos]
#         print(i,data_price.iloc[i])
        count+=1
```

空数据数量为: 13695

[74]:
```
print(data_price.isnull().sum())
```

0

[75]:
```
# 可视化对比新旧数据

plt.figure(figsize = (10,10))

# 直方图
plt.subplot(3,2,1)
plt.title("price hist")
data['price'].hist(alpha=0.5,bins=15) #alpha 透明度, bins 竖条数

# 直方图
plt.subplot(3,2,2)
plt.title("new price hist")
data_price.hist(alpha=0.5,bins=15) #alpha 透明度, bins 竖条数



# 盒图
plt.subplot(3,2,3)
plt.title("price box")
data['price'].plot(kind='box',notch=True,grid=True)

# 盒图
plt.subplot(3,2,4)
plt.title("new price box")
data_price.plot(kind='box',notch=True,grid=True)

#q-q 图
plt.subplot(3,2,5)
stats.probplot(data['price'],dist="norm",plot=plt)

plt.subplot(3,2,6)
stats.probplot(data_price,dist="norm",plot=plt)

plt.show()
```



[80]:
```
data_price.describe()  # # 通过数据对象之间的相似性来填补后数据的 5 数概况
```

[80]:
```
count    150930.000000
mean         34.107434
std          36.281767
min           4.000000
25%          16.000000
50%          25.000000
75%          42.000000
max        2300.000000
```

```
Name: price, dtype: float64
```

[ ]: