数据分析报告

针对某电子商品销售数据，进行探索性数据分析，用户画像和用户分群，通过分析找到门店长处与短板，给出参考建议，并用仪表盘展示

为了完成这份分析，我们将围绕以下几个部分进行分析

- 描述统计
- 消费人群分析&用户画像
- 产品分析
- 销售分析
  订单销售额分析
  用户分层

```
# from pylab import mpl
# mpl.rcParams['font.sans-serif'] = ['SimHei']
# mpl.rcParams['axes.unicode_minus'] = False
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import re
import warnings
warnings.filterwarnings('ignore')
%matplotlib inline
plt.rcParams['font.sans-serif']=['Microsoft YaHei']
```

```
data = pd.read_csv('/Users/orangeli/huxin/电子产品销售/电子产品销售分析.csv',encoding='utf-
8',index_col=0,low_memory=False)
data.head()
```

	event_time	order_id	product_id	category_id	category_code	brand	price	
0	2020-04-24 11:50:39 UTC	2294359932054536986	1515966223509089906	2.268105e+18	electronics.tablet	samsung	162.01	1.51
1	2020-04-24 11:50:39 UTC	2294359932054536986	1515966223509089906	2.268105e+18	electronics.tablet	samsung	162.01	1.51
2	2020-04-24 14:37:43 UTC	2294444024058086220	2273948319057183658	2.268105e+18	electronics.audio.headphone	huawei	77.52	1.51
3	2020-04-24 14:37:43 UTC	2294444024058086220	2273948319057183658	2.268105e+18	electronics.audio.headphone	huawei	77.52	1.51
4	2020-04-24 19:16:21 UTC	2294584263154074236	2273948316817424439	2.268105e+18	NaN	karcher	217.57	1.51

- event_time：下单时间
- user_id：用户编号
- order_id:订单编号
- product_id：产品编号
- category_id：类别编号
- brand：品牌
- price：购买金额
- age：年龄
- sex：性别
- local：省份

一、探索性数据分析

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 564169 entries, 0 to 2633520
Data columns (total 11 columns):
 #   Column         Non-Null Count   Dtype
---  ------         --------------   -----
 0   event_time     564169 non-null  object
 1   order_id       564169 non-null  object
 2   product_id     564169 non-null  int64
 3   category_id    564169 non-null  float64
```

```
 4   category_code  434799 non-null  object
 5   brand          536945 non-null  object
 6   price          564169 non-null  float64
 7   user_id        564169 non-null  float64
 8   age            564169 non-null  float64
 9   sex            564169 non-null  object
 10  local          564169 non-null  object
dtypes: float64(4), int64(1), object(6)
memory usage: 51.7+ MB
```

```
data.describe()
```

	product_id	category_id	price	user_id	age
count	5.641690e+05	5.641690e+05	564169.000000	5.641690e+05	564169.000000
mean	1.695711e+18	2.272919e+18	208.269324	1.515916e+18	33.184388
std	3.290688e+17	2.158282e+16	304.559875	2.377083e+07	10.122088
min	1.515966e+18	2.268105e+18	0.000000	1.515916e+18	16.000000
25%	1.515966e+18	2.268105e+18	23.130000	1.515916e+18	24.000000
50%	1.515966e+18	2.268105e+18	87.940000	1.515916e+18	33.000000
75%	1.515966e+18	2.268105e+18	277.750000	1.515916e+18	42.000000
max	2.388434e+18	2.374499e+18	18328.680000	1.515916e+18	50.000000

- 订单金额平均消费208元，中位数在304元，说明用户消费金额相对比较稳定，但存在一定极值干扰

```
del data['category_code']
data.fillna('no_brand',inplace = True)
data = data.drop_duplicates('order_id')
data['event_time'] = data['event_time'].str.replace('1970','2020')
data['event_time'] = pd.to_datetime(data['event_time']).dt.to_period('D')
data = data.set_index('event_time',drop = False)
data['month'] = data['event_time'].dt.month
data.head(5)
```

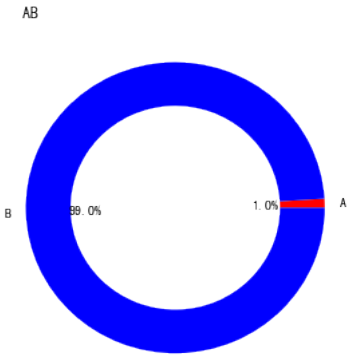
	event_time	order_id	product_id	category_id	brand	price	user_id	age
event_time								
2020-04-24	2020-04-24	2294359932054536986	1515966223509089906	2.268105e+18	samsung	162.01	1.515916e+18	24.0
2020-04-24	2020-04-24	2294444024058086220	2273948319057183658	2.268105e+18	huawei	77.52	1.515916e+18	38.0
2020-04-24	2020-04-24	2294584263154074236	2273948316817424439	2.268105e+18	karcher	217.57	1.515916e+18	32.0
2020-04-26	2020-04-26	2295716521449619559	1515966223509261697	2.268105e+18	maestro	39.33	1.515916e+18	20.0
2020-04-26	2020-04-26	2295740594749702229	1515966223509104892	2.268105e+18	apple	1387.01	1.515916e+18	21.0

二、消费人群分析&用户画像

```
#按照每个用户的订单数，对用户进行分层，订单数>30，用户为A，订单数<30，用户为B
user_order=data.groupby('user_id')['order_id'].count().sort_values(ascending=False)
data_b = data.loc[data['user_id'].isin(user_order[user_order<30].index)]
data_b['user_level']= 'B'
data_a=data.loc[~data['user_id'].isin(list(data_b['user_id']))]
data_a['user_level']='A'
data_ab = pd.concat([data_a,data_b])
data_ab.head(5)
```

	event_time	order_id	product_id	category_id	brand	price	user_id	age
event_time								
2020-04-29	2020-04-29	2297988436574864215	1515966223509089486	2.268105e+18	samsung	115.72	1.515916e+18	47.0
2020-04-29	2020-04-29	2298027408663511168	1515966223510206441	2.268105e+18	no_brand	2.52	1.515916e+18	31.0
2020-04-29	2020-04-29	2298114976126075117	1515966223509127845	2.268105e+18	varta	2.08	1.515916e+18	33.0
2020-04-30	2020-04-30	2298477621916205325	1515966223509104136	2.268105e+18	apple	23.13	1.515916e+18	33.0
2020-04-30	2020-04-30	2298590293420670991	1515966223509089483	2.268105e+18	huawei	92.34	1.515916e+18	19.0

```
plt.rcParams['font.sans-serif']=['SimHei'] #用来正常显示中文标签
plt.rcParams['axes.unicode_minus']=False #用来正常显示负号
user_level_patio = data_ab.groupby('user_level')['user_id'].nunique()
plt.figure(figsize=(5,5))
lables = ['A','B']
sizes = [1,99]
colors = ['red','blue']
plt.title ('AB类客户占比图')
plt.pie(sizes,labels= lables, colors= colors,autopct='%1.1f%%',wedgeprops={'width':0.3})
plt.show()
```

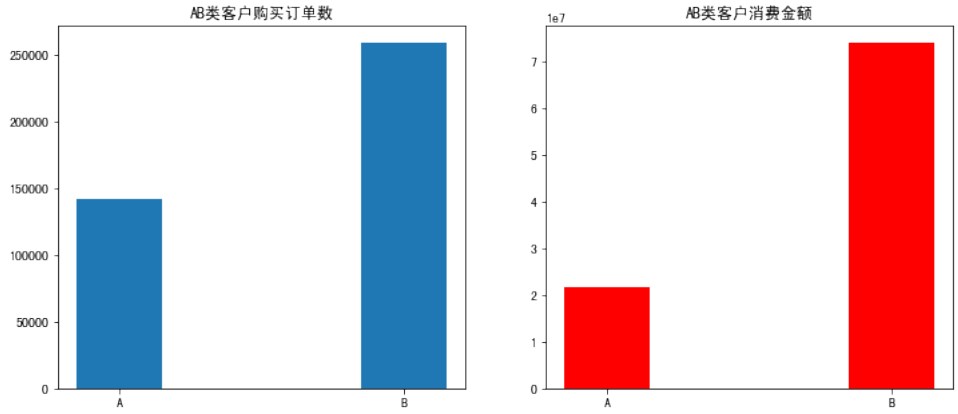



```
level_user = data_ab.groupby('user_level')['order_id'].count()
level_price = data_ab.groupby('user_level')['price'].sum()
level_user_price = pd.concat([level_user,level_price],axis=1)
level_user_price
```

user_level	order_id	price
A	141636	2.170747e+07
B	258902	7.404613e+07

```
plt.rcParams['font.sans-serif']=['SimHei'] #用来正常显示中文标签
plt.rcParams['axes.unicode_minus']=False #用来正常显示负号
fig,axs = plt.subplots(1,2 ,figsize=(12,5))
x =['A','B']
plt.title ('AB类客户订单数')
level_user_x = level_user.index
level_user_y = level_user.values
level_price_x = level_price.index
level_price_y = level_price.values
bar_width = 0.3
ax1 = plt.subplot(1,2,1)
plt.title('AB类客户购买订单数')
plt.bar(level_user_x,level_user_y,bar_width)
ax2 = plt.subplot(1,2,2)
plt.title('AB类客户消费金额')
plt.bar(level_price_x,level_price_y,bar_width,facecolor = 'red')
```

```
<BarContainer object of 2 artists>
```



- 从上图发现，A类客户以1%的数量贡献了20%以上的销售额，可能存在异常数据，否则A类客户应被视为重点客户维系
- B类客户数量占比99%，下面有B类客户做重点分析

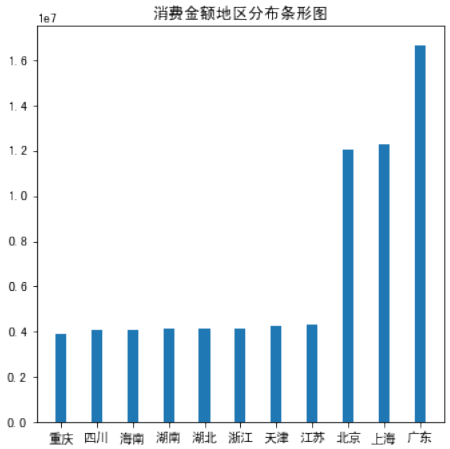
```
df = data_ab[data_ab.user_level == 'B']
df.info()
```

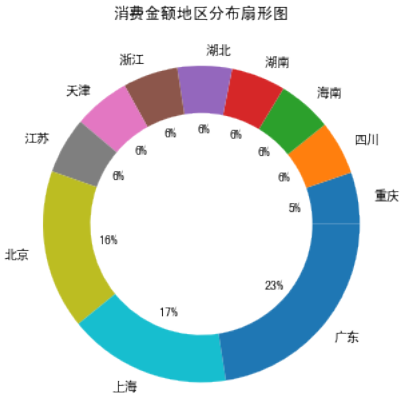
```
<class 'pandas.core.frame.DataFrame'>
PeriodIndex: 258902 entries, 2020-04-24 to 2020-11-21
Freq: D
Data columns (total 12 columns):
 #   Column       Non-Null Count   Dtype
---  ------       --------------   -----
 0   event_time   258902 non-null  period[D]
 1   order_id     258902 non-null  object
 2   product_id   258902 non-null  int64
 3   category_id  258902 non-null  float64
 4   brand        258902 non-null  object
 5   price        258902 non-null  float64
 6   user_id      258902 non-null  float64
 7   age          258902 non-null  float64
 8   sex          258902 non-null  object
 9   local        258902 non-null  object
 10  month        258902 non-null  int64
 11  user_level   258902 non-null  object
dtypes: float64(4), int64(2), object(5), period[D](1)
memory usage: 25.7+ MB
```

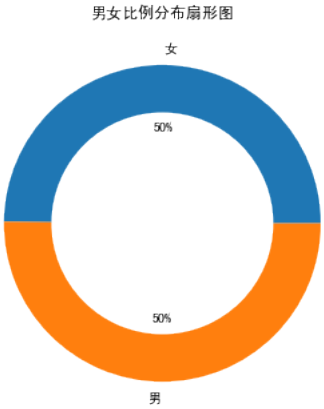
对B类客户做用户画像分析

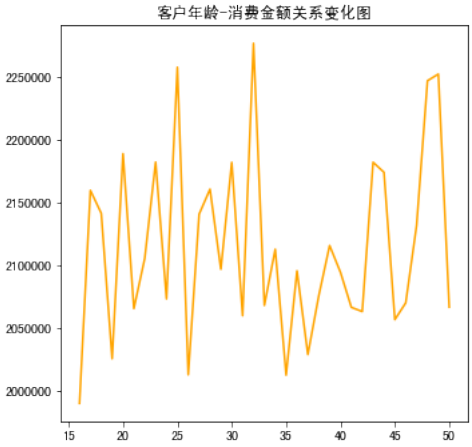
```
plt.rcParams['font.sans-serif']=['SimHei'] #用来正常显示中文标签
plt.rcParams['axes.unicode_minus']=False #用来正常显示负号
fig,axs = plt.subplots(2,2,figsize = (12,12))
ax1 = plt.subplot(2,2,1)
local_price = df.groupby('local')['price'].sum().sort_values()
lable1 = local_price.index
plt.bar(local_price.index,local_price.values,width = 0.3)
plt.title('消费金额地区分布条形图')
ax2 = plt.subplot(2,2,2)
plt.pie(local_price,labels=lable1,autopct='%.0f%%',wedgeprops={'width':0.3})
plt.title('消费金额地区分布扇形图')
ax3 = plt.subplot(2,2,3)
sex_count = df.groupby('sex')['user_id'].nunique().rename('人数')
lable2 = sex_count.index
plt.pie(sex_count,labels=lable2,autopct='%.0f%%',wedgeprops={'width':0.3})
plt.title('男女比例分布扇形图')
ax4 = plt.subplot(2,2,4)
age_price = df.groupby('age')['price'].sum()
lable3 = age_price.index
plt.ylabel='消费金额'
plt.xlabel = '年龄'
plt.plot(age_price,color = 'orange')
plt.title('客户年龄-消费金额关系变化图')
```

```
Text(0.5, 1.0, '客户年龄-消费金额关系变化图')
```









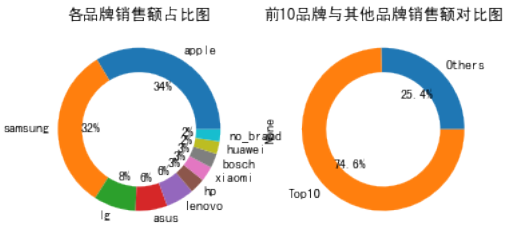
用户画像分析

- 北上广消费能力远超其他地区，消费金额是其他地区的2~3倍，且占了销售总额的一半以上，营销策略可以向北上广地区倾斜
- 对比消费人群的性别和年龄，可能存在异常数据，无其他明显特征

三、产品分析

```
brand_price = data_ab.groupby('brand')['price'].sum().sort_values(ascending=False).head(10)
top_sales = brand_price.sum()
ax1 = plt.subplot(1,2,1)
lable4 = brand_price.index
plt.title('各品牌销售额占比图')
plt.pie(brand_price,labels= lable4, autopct='%.0f%%',wedgeprops={'width':0.3})
ax2 = plt.subplot(1,2,2)
plt.title('前10品牌与其他品牌销售额对比图')
pd.Series({'Others':data_ab['price'].sum()-top_sales,'Top10':top_sales}).plot(kind =
'pie',autopct='%.1f%%',wedgeprops={'width':0.3},radius =1)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8b3ecd3b50>
```



结果与建议

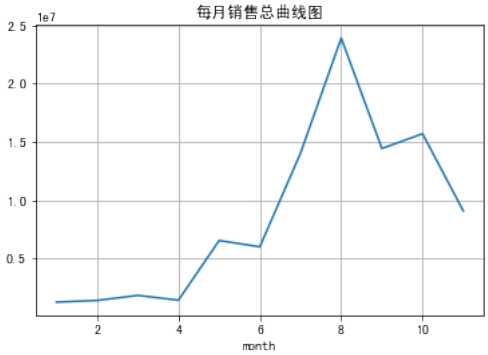
- 2020年手机品牌市场销售份额主要集中在前两大品牌三星和苹果，销售额占比为65%
- 对比2021年手机品牌销售市场份额（数据来源于网上）前三为华为、OPPO 、小米，证明国产品牌崛起，可以深挖国产品牌机会，提高销售额

四、销售额分析

- 多维度交叉分析
- 用户分层

```
plt.rcParams['font.sans-serif']=['SimHei'] #用来正常显示中文标签
plt.rcParams['axes.unicode_minus']=False #用来正常显示负号
plt.title('每月销售总曲线图')
data_ab.groupby('month').price.sum().plot(grid=True)
```

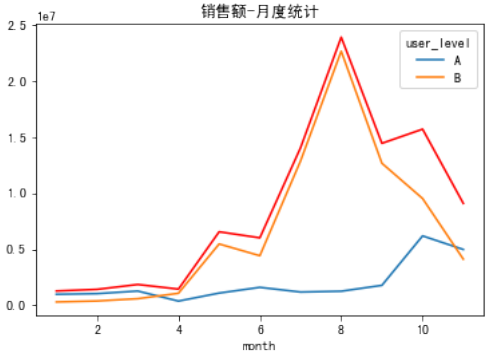
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8b2f808150>
```



2020年初销量较低，从4月份开始显著增长，8月快速下滑，下滑率达59%
下面从多维度对比分析，对销售额下滑原因进行分析挖掘，

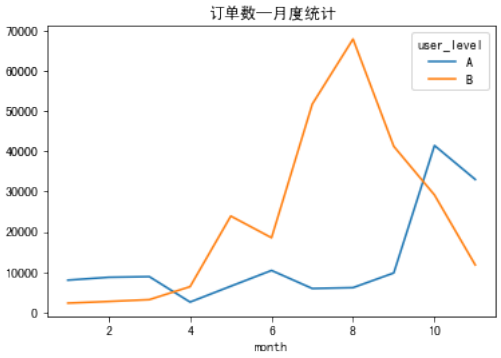
```
data_ab.groupby(['month','user_level'])['price'].sum().unstack().plot()
data_ab.groupby('month')['price'].sum().rename('A+B').plot(color='r')
plt.title('销售额-月度统计')
```

```
Text(0.5, 1.0, '销售额-月度统计')
```



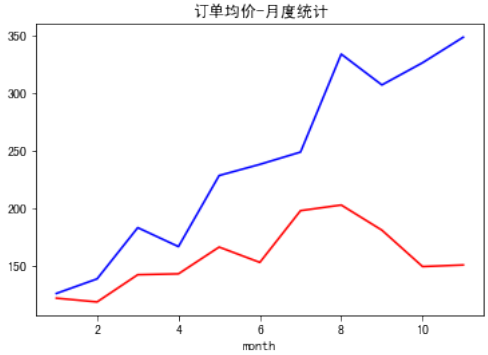

```
data_ab.groupby(['month','user_level'])['order_id'].count().unstack().plot()
plt.title('订单数-月度统计')
```

```
Text(0.5, 1.0, '订单数-月度统计')
```



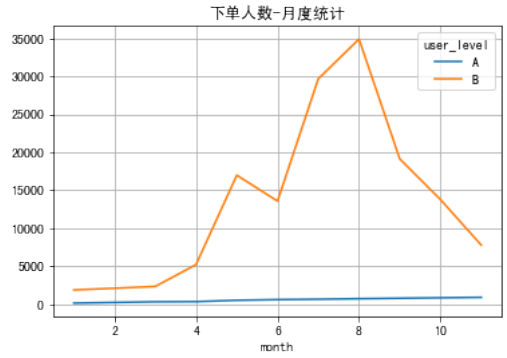

```
(data_a.groupby('month')['price'].sum()/data_a.groupby('month')
['order_id'].count()).rename('A').plot(color='red')
(data_b.groupby('month')['price'].sum()/data_b.groupby('month')
['order_id'].count()).rename('B').plot(color='blue')
plt.title('订单均价-月度统计')
```

```
Text(0.5, 1.0, '订单均价-月度统计')
```



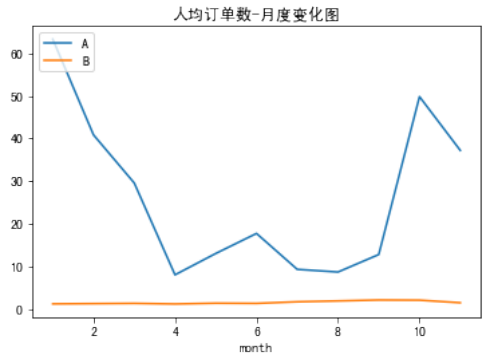

```
data_ab.groupby(['month','user_level']).user_id.nunique().unstack().plot(grid=True)
plt.title('下单人数-月度统计')
```

```
Text(0.5, 1.0, '下单人数-月度统计')
```



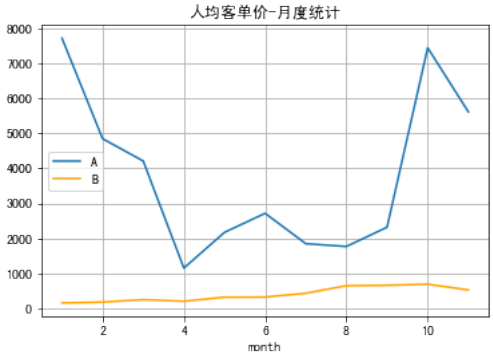

```
(data_a.groupby('month')
['order_id'].count()/data_a.groupby('month').user_id.nunique()).rename('A').plot(grid=True).legend(loc=1)
(data_b.groupby('month')
['order_id'].count()/data_b.groupby('month').user_id.nunique()).rename('B').plot().legend(loc=2)
plt.title('人均订单数-月度变化图')
```

```
Text(0.5, 1.0, '人均订单数-月度变化图')
```




```
(data_a.groupby('month')
['price'].sum()/data_a.groupby('month').user_id.nunique()).rename('A').plot(grid=True).legend(loc=1)
(data_b.groupby('month')['price'].sum()/data_b.groupby('month').user_id.nunique()).rename('B').plot(grid =
True,color='orange').legend(loc=6)
plt.title('人均客单价-月度统计')
```

```
Text(0.5, 1.0, '人均客单价-月度统计')
```



结论与建议：

- B类客户下单人数、订单量下降是造成销售额下降的主要原因
- B类客户的订单均价和人均客单价一直保持上升趋势
- B类客户的人均订单数和客单件也在稳步上升
- 从订单数和下单人数可以发现，4-8月有显现的流量导入，8月以后流量较少，同时会员的价值在不断释放

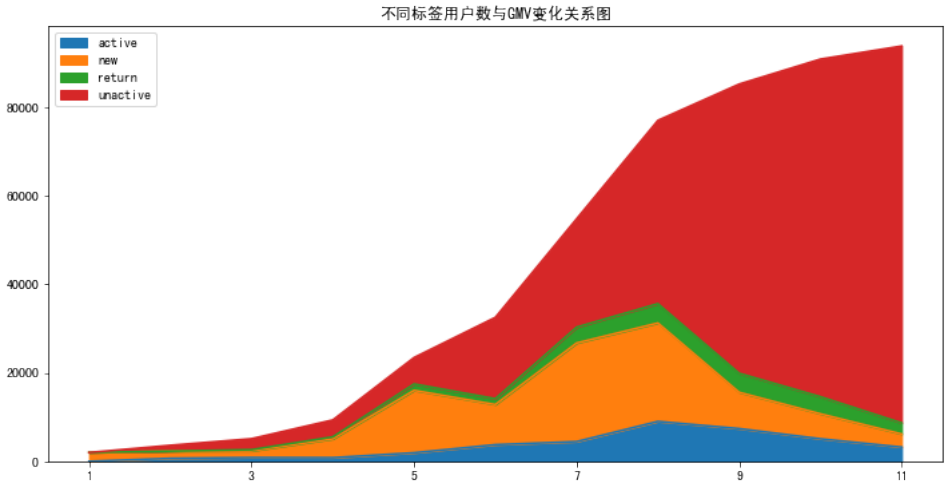
```
#用户分层
def active_status(x):
    status = []
    for i in range(11):
        if x[i] == 0:
            if i == 0:
                status.append('unreg')
            else :
                status.append('unreg') if status[i-1] == 'unreg' else  status.append('unactive')

        else:
            if i == 0:
                status.append('new')
            else:
                if status[i-1] == 'unreg':
                    status.append('new')
                else:
                    status.append('return') if status[i-1]=='unactive' else status.append('active')
    return pd.Series(status,index = columns_month)

columns_month = data['month'].sort_values().astype('str').unique()
order_record = data.pivot_table(index = 'user_id',columns='month',values
='price',aggfunc='sum').fillna(0).applymap(lambda i: 1 if i>0 else 0)
order_record.columns = data['month'].sort_values().astype('str').unique()
user_active_status = order_record.apply(active_status,axis = 1)
```

```
user_active_status.apply(lambda x: pd.value_counts(x)).drop('unreg').fillna(0).T.plot(kind='area',figsize=
(12,6))
plt.title('不同标签用户数与GMV变化关系图')
```

```
Text(0.5, 1.0, '不同标签用户数与GMV变化关系图')
```



- 4-8月销售额增加主要是新用户的持续导入
- 8月以后新用户数急剧下降，不活跃用户急剧增加，销售额大幅下滑
- 有部分会员成功转化为活跃会员，这也是在11月新用降至4月水平时，销售远高4月的重要原因

- 可以复盘8月后新用户降低的原因，同时从ROI的角度复盘4-8月运营策略，以及策略是否可以持续