In [10]:
```
import pandas as pd
from mlxtend.frequent_patterns import apriori,association_rules
from mlxtend.preprocessing import TransactionEncoder
```

In [11]:
```
data=pd.read_csv("C:\\Users\\Admin\\Downloads\\Assignment\\book.csv")
data
```

Out[11]:

	ChildBks	YouthBks	CookBks	DoItYBks	RefBks	ArtBks	GeogBks	ItalCook	ItalAtlas	ItalArt	F
0	0	1	0	1	0	0	1	0	0	0	
1	1	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	
3	1	1	1	0	1	0	1	0	0	0	
4	0	0	1	0	0	0	1	0	0	0	
...	...	...	...	...	...	...	...	...	...	...	...
1995	0	0	1	0	0	1	1	1	0	1	
1996	0	0	0	0	0	0	0	0	0	0	
1997	0	0	0	0	0	0	0	0	0	0	
1998	0	0	1	0	0	0	0	0	0	0	
1999	0	0	0	0	0	0	0	0	0	0	

2000 rows × 11 columns

In [12]:
```
df=pd.get_dummies(data)
data.head()
```

Out[12]:

	ChildBks	YouthBks	CookBks	DoItYBks	RefBks	ArtBks	GeogBks	ItalCook	ItalAtlas	ItalArt	Flore
0	0	1	0	1	0	0	1	0	0	0	
1	1	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	
3	1	1	1	0	1	0	1	0	0	0	
4	0	0	1	0	0	0	1	0	0	0	

In [13]:
```
frequent_itemsets=apriori(df,min_support=0.1, use_colnames=True)
frequent_itemsets
```

Out[13]:

	support	itemsets
0	0.4230	(ChildBks)

	support	itemsets
1	0.2475	(YouthBks)
2	0.4310	(CookBks)
3	0.2820	(DoItYBks)
4	0.2145	(RefBks)
5	0.2410	(ArtBks)
6	0.2760	(GeogBks)
7	0.1135	(ItalCook)
8	0.1085	(Florence)
9	0.1650	(ChildBks, YouthBks)
10	0.2560	(ChildBks, CookBks)
11	0.1840	(ChildBks, DoItYBks)
12	0.1515	(ChildBks, RefBks)
13	0.1625	(ChildBks, ArtBks)
14	0.1950	(ChildBks, GeogBks)
15	0.1620	(CookBks, YouthBks)
16	0.1155	(YouthBks, DoItYBks)
17	0.1010	(ArtBks, YouthBks)
18	0.1205	(YouthBks, GeogBks)
19	0.1875	(CookBks, DoItYBks)
20	0.1525	(RefBks, CookBks)
21	0.1670	(ArtBks, CookBks)
22	0.1925	(CookBks, GeogBks)
23	0.1135	(CookBks, ItalCook)
24	0.1055	(RefBks, DoItYBks)
25	0.1235	(ArtBks, DoItYBks)
26	0.1325	(GeogBks, DoItYBks)
27	0.1105	(RefBks, GeogBks)
28	0.1275	(ArtBks, GeogBks)
29	0.1290	(ChildBks, CookBks, YouthBks)
30	0.1460	(ChildBks, CookBks, DoItYBks)
31	0.1225	(ChildBks, RefBks, CookBks)
32	0.1265	(ChildBks, ArtBks, CookBks)
33	0.1495	(ChildBks, CookBks, GeogBks)

	support	itemsets
34	0.1045	(ChildBks, GeogBks, DoItYBks)
35	0.1020	(ChildBks, ArtBks, GeogBks)
36	0.1015	(ArtBks, CookBks, DoItYBks)
37	0.1085	(CookBks, GeogBks, DoItYBks)
38	0.1035	(ArtBks, CookBks, GeogBks)

In [15]:
```
rules=association_rules(frequent_itemsets,metric='lift',min_threshold=0.7)
rules
rules.sort_values('lift',ascending=False)
```

Out[15]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	convic
28	(CookBks)	(ItalCook)	0.4310	0.1135	0.1135	0.263341	2.320186	0.064582	1.20
29	(ItalCook)	(CookBks)	0.1135	0.4310	0.1135	1.000000	2.320186	0.064582	
76	(ChildBks, ArtBks)	(GeogBks)	0.1625	0.2760	0.1020	0.627692	2.274247	0.057150	1.94
81	(GeogBks)	(ChildBks, ArtBks)	0.2760	0.1625	0.1020	0.369565	2.274247	0.057150	1.32
85	(ArtBks)	(CookBks, DoItYBks)	0.2410	0.1875	0.1015	0.421162	2.246196	0.056313	1.40
...	...	...	...	...	...	...	...	...	
5	(DoItYBks)	(ChildBks)	0.2820	0.4230	0.1840	0.652482	1.542511	0.064714	1.66
12	(CookBks)	(YouthBks)	0.4310	0.2475	0.1620	0.375870	1.518667	0.055328	1.20
13	(YouthBks)	(CookBks)	0.2475	0.4310	0.1620	0.654545	1.518667	0.055328	1.64
3	(CookBks)	(ChildBks)	0.4310	0.4230	0.2560	0.593968	1.404179	0.073687	1.42
2	(ChildBks)	(CookBks)	0.4230	0.4310	0.2560	0.605201	1.404179	0.073687	1.44

100 rows × 9 columns

In [16]:
```
rules.sort_values('lift',ascending=False)[0:20]
```

Out[16]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	convic
28	(CookBks)	(ItalCook)	0.4310	0.1135	0.1135	0.263341	2.320186	0.064582	1.20
29	(ItalCook)	(CookBks)	0.1135	0.4310	0.1135	1.000000	2.320186	0.064582	
76	(ChildBks, ArtBks)	(GeogBks)	0.1625	0.2760	0.1020	0.627692	2.274247	0.057150	1.94

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	convic
81	(GeogBks)	(ChildBks, ArtBks)	0.2760	0.1625	0.1020	0.369565	2.274247	0.057150	1.32
85	(ArtBks)	(CookBks, DoItYBks)	0.2410	0.1875	0.1015	0.421162	2.246196	0.056313	1.40
84	(CookBks, DoItYBks)	(ArtBks)	0.1875	0.2410	0.1015	0.541333	2.246196	0.056313	1.65
99	(GeogBks)	(ArtBks, CookBks)	0.2760	0.1670	0.1035	0.375000	2.245509	0.057408	1.33
94	(ArtBks, CookBks)	(GeogBks)	0.1670	0.2760	0.1035	0.619760	2.245509	0.057408	1.90
96	(CookBks, GeogBks)	(ArtBks)	0.1925	0.2410	0.1035	0.537662	2.230964	0.057107	1.64
97	(ArtBks)	(CookBks, GeogBks)	0.2410	0.1925	0.1035	0.429461	2.230964	0.057107	1.41
53	(ChildBks, CookBks)	(RefBks)	0.2560	0.2145	0.1225	0.478516	2.230842	0.067588	1.50
56	(RefBks)	(ChildBks, CookBks)	0.2145	0.2560	0.1225	0.571096	2.230842	0.067588	1.73
77	(ChildBks, GeogBks)	(ArtBks)	0.1950	0.2410	0.1020	0.523077	2.170444	0.055005	1.59
80	(ArtBks)	(ChildBks, GeogBks)	0.2410	0.1950	0.1020	0.423237	2.170444	0.055005	1.39
87	(DoItYBks)	(ArtBks, CookBks)	0.2820	0.1670	0.1015	0.359929	2.155264	0.054406	1.30
82	(ArtBks, CookBks)	(DoItYBks)	0.1670	0.2820	0.1015	0.607784	2.155264	0.054406	1.83
69	(GeogBks)	(ChildBks, CookBks)	0.2760	0.2560	0.1495	0.541667	2.115885	0.078844	1.62
64	(ChildBks, CookBks)	(GeogBks)	0.2560	0.2760	0.1495	0.583984	2.115885	0.078844	1.74
92	(GeogBks)	(CookBks, DoItYBks)	0.2760	0.1875	0.1085	0.393116	2.096618	0.056750	1.33
89	(CookBks, DoItYBks)	(GeogBks)	0.1875	0.2760	0.1085	0.578667	2.096618	0.056750	1.71

In [17]:
```
rules[rules.lift>1]
```

Out[17]:

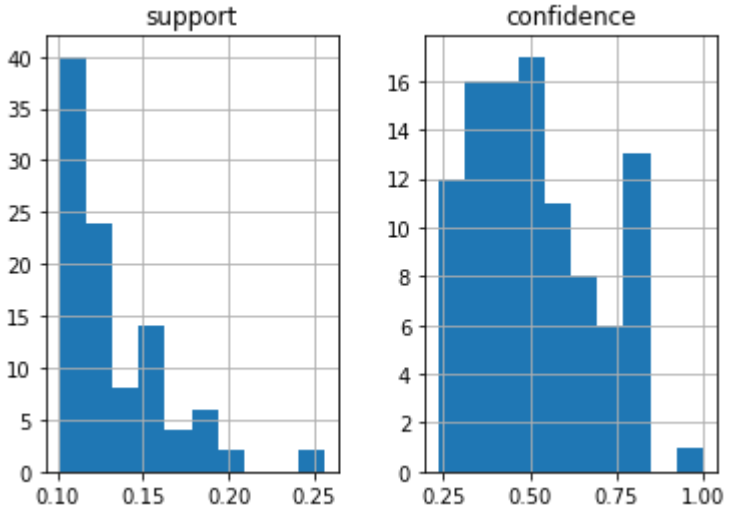
	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	convic
0	(ChildBks)	(YouthBks)	0.4230	0.2475	0.1650	0.390071	1.576044	0.060308	1.23

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	convic
1	(YouthBks)	(ChildBks)	0.2475	0.4230	0.1650	0.666667	1.576044	0.060308	1.73
2	(ChildBks)	(CookBks)	0.4230	0.4310	0.2560	0.605201	1.404179	0.073687	1.44
3	(CookBks)	(ChildBks)	0.4310	0.4230	0.2560	0.593968	1.404179	0.073687	1.42
4	(ChildBks)	(DoItYBks)	0.4230	0.2820	0.1840	0.434988	1.542511	0.064714	1.27
...	...	...	...	...	...	...	...	...	
95	(ArtBks, GeogBks)	(CookBks)	0.1275	0.4310	0.1035	0.811765	1.883445	0.048547	3.02
96	(CookBks, GeogBks)	(ArtBks)	0.1925	0.2410	0.1035	0.537662	2.230964	0.057107	1.64
97	(ArtBks)	(CookBks, GeogBks)	0.2410	0.1925	0.1035	0.429461	2.230964	0.057107	1.41
98	(CookBks)	(ArtBks, GeogBks)	0.4310	0.1275	0.1035	0.240139	1.883445	0.048547	1.14
99	(GeogBks)	(ArtBks, CookBks)	0.2760	0.1670	0.1035	0.375000	2.245509	0.057408	1.33

100 rows × 9 columns

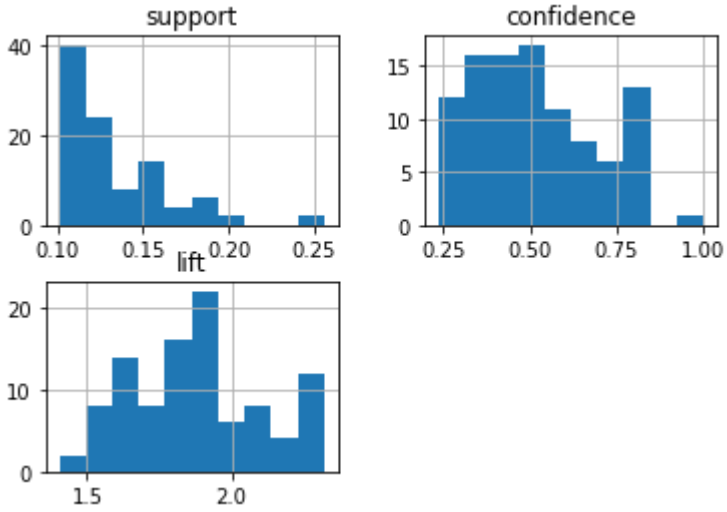
In [18]:
```
rules[['support','confidence']].hist()
```

Out[18]:
```
array([[<AxesSubplot:title={'center':'support'}>,
        <AxesSubplot:title={'center':'confidence'}>]], dtype=object)
```



In [19]:
```
rules[['support','confidence','lift']].hist()
```

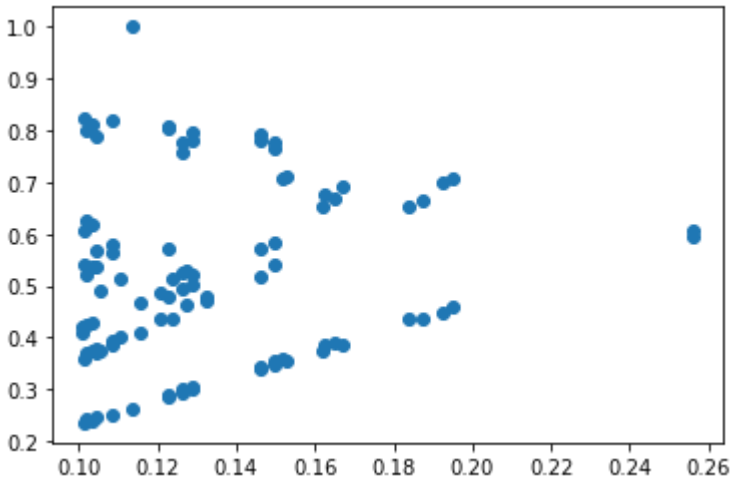
Out[19]:
```
array([[<AxesSubplot:title={'center':'support'}>,
        <AxesSubplot:title={'center':'confidence'}>],
       [<AxesSubplot:title={'center':'lift'}>, <AxesSubplot:>]],
      dtype=object)
```



In [20]:

```
import matplotlib.pyplot as plt

x=[5,7,8,11,17,9,5,4,3,5,8,14]
y=[98,87,96,92,85,2,45,88,57,111]
plt.scatter(rules['support'],rules['confidence'])
plt.show()
```



In [ ]: