In [ ]:

```

```

In [1]:

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

In [8]:

```
from mlxtend.frequent_patterns import apriori,association_rules
from mlxtend.preprocessing import transactionencoder
```

In [2]:

```
books=pd.read_csv("C:/Users/Hp/Downloads/book.csv")
```

In [3]:

```
books
```

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

In [4]:

```
books2=pd.get_dummies(books)
min(books2.mean())
```

Out[4]:

```
0.037
```

In [9]:

```
frequent1 = apriori(books2,min_support =0.16,use_colnames=True)
frequent1
```

Out[9]:

	support	itemsets
0	0.4230	(ChildBks)
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	0.1650	(ChildBks, YouthBks)
8	0.2560	(CookBks, ChildBks)
9	0.1840	(DoItYBks, ChildBks)
10	0.1625	(ArtBks, ChildBks)
11	0.1950	(ChildBks, GeogBks)
12	0.1620	(CookBks, YouthBks)
13	0.1875	(DoItYBks, CookBks)
14	0.1670	(ArtBks, CookBks)
15	0.1925	(CookBks, GeogBks)

In [10]:

```
frequent2 = apriori(books2,min_support = 0.2,use_colnames=True)
frequent2
```

Out[10]:

	support	itemsets
0	0.4230	(ChildBks)
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	0.2560	(CookBks, ChildBks)

In [11]:

```
rules1 = association_rules(frequent1,metric="confidence",min_threshold=0.3)
rules1
```

Out[11]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverag
0	(ChildBks)	(YouthBks)	0.4230	0.2475	0.1650	0.390071	1.576044	0.06030
1	(YouthBks)	(ChildBks)	0.2475	0.4230	0.1650	0.666667	1.576044	0.06030
2	(CookBks)	(ChildBks)	0.4310	0.4230	0.2560	0.593968	1.404179	0.07368
3	(ChildBks)	(CookBks)	0.4230	0.4310	0.2560	0.605201	1.404179	0.07368
4	(DoItYBks)	(ChildBks)	0.2820	0.4230	0.1840	0.652482	1.542511	0.06471
5	(ChildBks)	(DoItYBks)	0.4230	0.2820	0.1840	0.434988	1.542511	0.06471
6	(ArtBks)	(ChildBks)	0.2410	0.4230	0.1625	0.674274	1.594028	0.06055
7	(ChildBks)	(ArtBks)	0.4230	0.2410	0.1625	0.384161	1.594028	0.06055
8	(ChildBks)	(GeogBks)	0.4230	0.2760	0.1950	0.460993	1.670264	0.07825
9	(GeogBks)	(ChildBks)	0.2760	0.4230	0.1950	0.706522	1.670264	0.07825
10	(CookBks)	(YouthBks)	0.4310	0.2475	0.1620	0.375870	1.518667	0.05532
11	(YouthBks)	(CookBks)	0.2475	0.4310	0.1620	0.654545	1.518667	0.05532
12	(DoItYBks)	(CookBks)	0.2820	0.4310	0.1875	0.664894	1.542677	0.06595
13	(CookBks)	(DoItYBks)	0.4310	0.2820	0.1875	0.435035	1.542677	0.06595
14	(ArtBks)	(CookBks)	0.2410	0.4310	0.1670	0.692946	1.607763	0.06312
15	(CookBks)	(ArtBks)	0.4310	0.2410	0.1670	0.387471	1.607763	0.06312
16	(CookBks)	(GeogBks)	0.4310	0.2760	0.1925	0.446636	1.618245	0.07354
17	(GeogBks)	(CookBks)	0.2760	0.4310	0.1925	0.697464	1.618245	0.07354

In [12]:

```
rules2 = association_rules(frequent2,metric="confidence",min_threshold=0.1)
rules2
```

Out[12]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage
0	(CookBks)	(ChildBks)	0.431	0.423	0.256	0.593968	1.404179	0.073687
1	(ChildBks)	(CookBks)	0.423	0.431	0.256	0.605201	1.404179	0.073687

In [13]:

```
result1=rules1.sort_values('lift',ascending=False)
result1
```

Out[13]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverag
8	(ChildBks)	(GeogBks)	0.4230	0.2760	0.1950	0.460993	1.670264	0.07825
9	(GeogBks)	(ChildBks)	0.2760	0.4230	0.1950	0.706522	1.670264	0.07825
16	(CookBks)	(GeogBks)	0.4310	0.2760	0.1925	0.446636	1.618245	0.07354
17	(GeogBks)	(CookBks)	0.2760	0.4310	0.1925	0.697464	1.618245	0.07354
14	(ArtBks)	(CookBks)	0.2410	0.4310	0.1670	0.692946	1.607763	0.06312
15	(CookBks)	(ArtBks)	0.4310	0.2410	0.1670	0.387471	1.607763	0.06312
6	(ArtBks)	(ChildBks)	0.2410	0.4230	0.1625	0.674274	1.594028	0.06055
7	(ChildBks)	(ArtBks)	0.4230	0.2410	0.1625	0.384161	1.594028	0.06055
1	(YouthBks)	(ChildBks)	0.2475	0.4230	0.1650	0.666667	1.576044	0.06030
0	(ChildBks)	(YouthBks)	0.4230	0.2475	0.1650	0.390071	1.576044	0.06030
12	(DoItYBks)	(CookBks)	0.2820	0.4310	0.1875	0.664894	1.542677	0.06595
13	(CookBks)	(DoItYBks)	0.4310	0.2820	0.1875	0.435035	1.542677	0.06595
5	(ChildBks)	(DoItYBks)	0.4230	0.2820	0.1840	0.434988	1.542511	0.06471
4	(DoItYBks)	(ChildBks)	0.2820	0.4230	0.1840	0.652482	1.542511	0.06471
10	(CookBks)	(YouthBks)	0.4310	0.2475	0.1620	0.375870	1.518667	0.05532
11	(YouthBks)	(CookBks)	0.2475	0.4310	0.1620	0.654545	1.518667	0.05532
3	(ChildBks)	(CookBks)	0.4230	0.4310	0.2560	0.605201	1.404179	0.07368
2	(CookBks)	(ChildBks)	0.4310	0.4230	0.2560	0.593968	1.404179	0.07368

In [14]:

```
result2=rules2.sort_values('lift',ascending=False)
result2
```

Out[14]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage
0	(CookBks)	(ChildBks)	0.431	0.423	0.256	0.593968	1.404179	0.073687
1	(ChildBks)	(CookBks)	0.423	0.431	0.256	0.605201	1.404179	0.073687

In [15]:

```
result1= pd.DataFrame(rules1[rules1.lift>1])
result1
```

Out[15]:

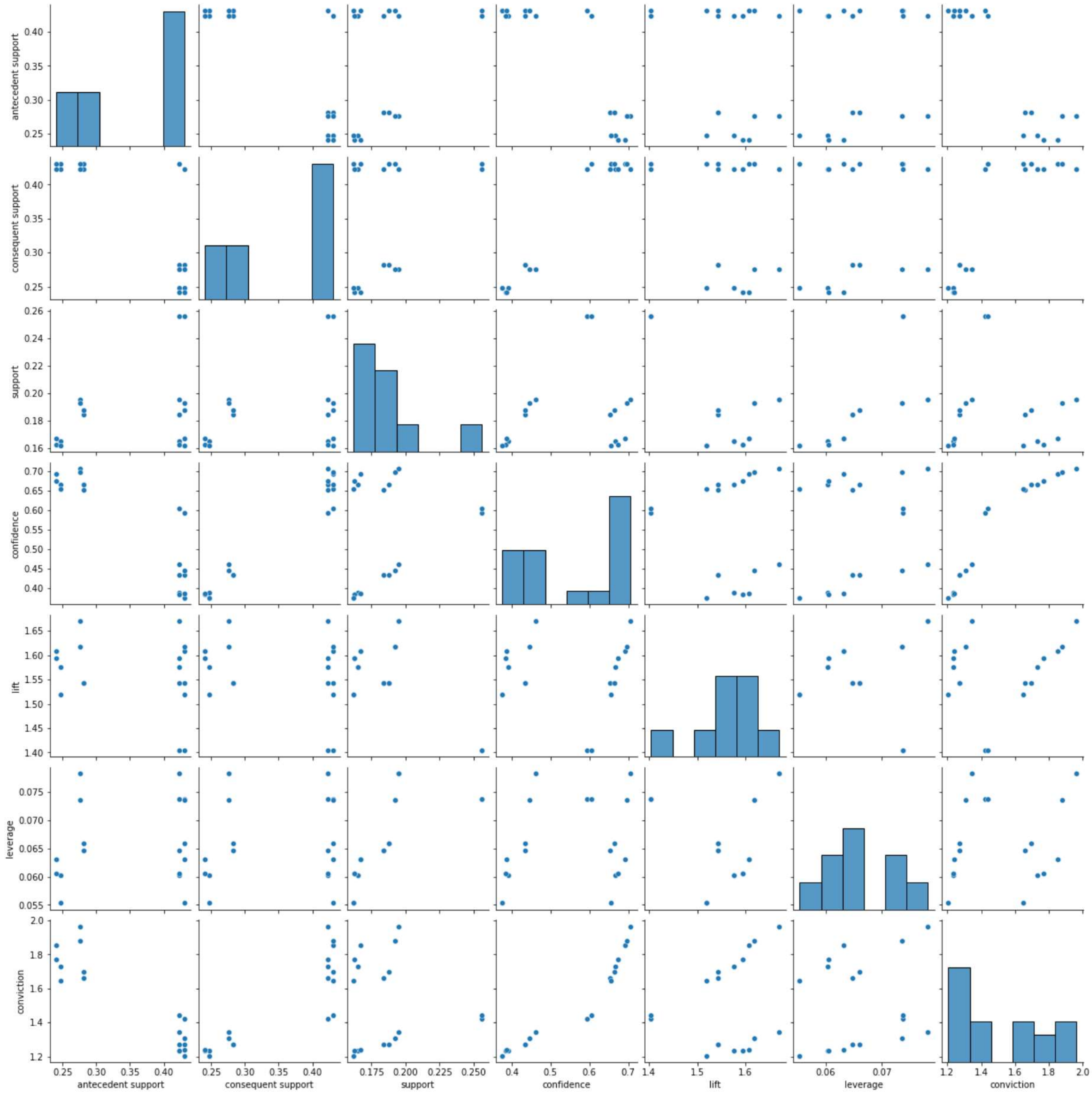
	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverag
0	(ChildBks)	(YouthBks)	0.4230	0.2475	0.1650	0.390071	1.576044	0.06030
1	(YouthBks)	(ChildBks)	0.2475	0.4230	0.1650	0.666667	1.576044	0.06030
2	(CookBks)	(ChildBks)	0.4310	0.4230	0.2560	0.593968	1.404179	0.07368
3	(ChildBks)	(CookBks)	0.4230	0.4310	0.2560	0.605201	1.404179	0.07368
4	(DoItYBks)	(ChildBks)	0.2820	0.4230	0.1840	0.652482	1.542511	0.06471
5	(ChildBks)	(DoItYBks)	0.4230	0.2820	0.1840	0.434988	1.542511	0.06471
6	(ArtBks)	(ChildBks)	0.2410	0.4230	0.1625	0.674274	1.594028	0.06055
7	(ChildBks)	(ArtBks)	0.4230	0.2410	0.1625	0.384161	1.594028	0.06055
8	(ChildBks)	(GeogBks)	0.4230	0.2760	0.1950	0.460993	1.670264	0.07825
9	(GeogBks)	(ChildBks)	0.2760	0.4230	0.1950	0.706522	1.670264	0.07825
10	(CookBks)	(YouthBks)	0.4310	0.2475	0.1620	0.375870	1.518667	0.05532
11	(YouthBks)	(CookBks)	0.2475	0.4310	0.1620	0.654545	1.518667	0.05532
12	(DoItYBks)	(CookBks)	0.2820	0.4310	0.1875	0.664894	1.542677	0.06595
13	(CookBks)	(DoItYBks)	0.4310	0.2820	0.1875	0.435035	1.542677	0.06595
14	(ArtBks)	(CookBks)	0.2410	0.4310	0.1670	0.692946	1.607763	0.06312
15	(CookBks)	(ArtBks)	0.4310	0.2410	0.1670	0.387471	1.607763	0.06312
16	(CookBks)	(GeogBks)	0.4310	0.2760	0.1925	0.446636	1.618245	0.07354
17	(GeogBks)	(CookBks)	0.2760	0.4310	0.1925	0.697464	1.618245	0.07354

In [16]:

```
import seaborn as sns
sns.pairplot(result1)
```

Out[16]:

```
<seaborn.axisgrid.PairGrid at 0x237455dc970>
```

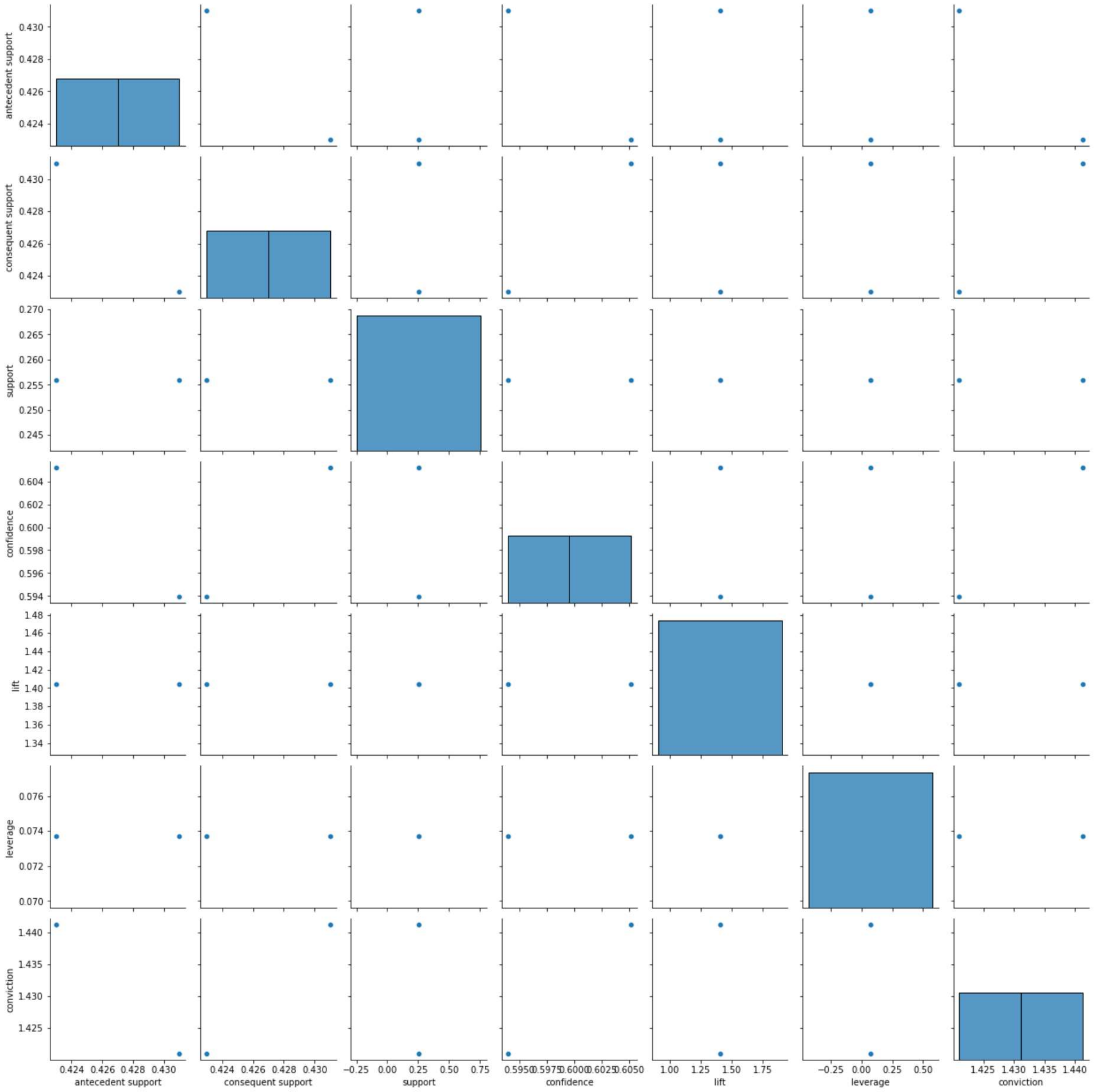


In [17]:

```
sns.pairplot(result2)
```

Out[17]:

```
<seaborn.axisgrid.PairGrid at 0x2374a95ae50>
```



In [19]:

```
result2= pd.DataFrame(rules2[rules2.lift>1])
result2
```

Out[19]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage
0	(CookBks)	(ChildBks)	0.431	0.423	0.256	0.593968	1.404179	0.073687
1	(ChildBks)	(CookBks)	0.423	0.431	0.256	0.605201	1.404179	0.073687

In [20]:

```
result1.to_csv('boooks.csv')
vis=pd.read_csv("boooks.csv")
vis
```

Out[20]:

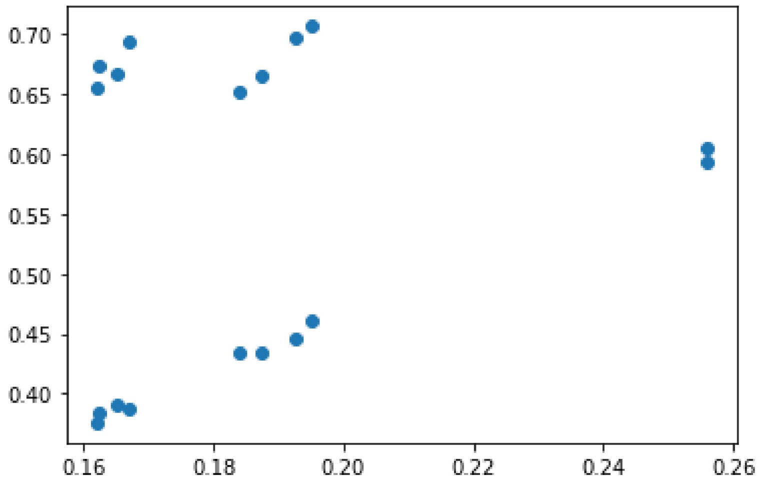
	Unnamed: 0	antecedents	consequents	antecedent support	consequent support	support	co
0	0	frozenset({'ChildBks'})	frozenset({'YouthBks'})	0.4230	0.2475	0.1650	(
1	1	frozenset({'YouthBks'})	frozenset({'ChildBks'})	0.2475	0.4230	0.1650	(
2	2	frozenset({'CookBks'})	frozenset({'ChildBks'})	0.4310	0.4230	0.2560	(
3	3	frozenset({'ChildBks'})	frozenset({'CookBks'})	0.4230	0.4310	0.2560	(
4	4	frozenset({'DoItYBks'})	frozenset({'ChildBks'})	0.2820	0.4230	0.1840	(
5	5	frozenset({'ChildBks'})	frozenset({'DoItYBks'})	0.4230	0.2820	0.1840	(
6	6	frozenset({'ArtBks'})	frozenset({'ChildBks'})	0.2410	0.4230	0.1625	(
7	7	frozenset({'ChildBks'})	frozenset({'ArtBks'})	0.4230	0.2410	0.1625	(
8	8	frozenset({'ChildBks'})	frozenset({'GeogBks'})	0.4230	0.2760	0.1950	(
9	9	frozenset({'GeogBks'})	frozenset({'ChildBks'})	0.2760	0.4230	0.1950	(
10	10	frozenset({'CookBks'})	frozenset({'YouthBks'})	0.4310	0.2475	0.1620	(
11	11	frozenset({'YouthBks'})	frozenset({'CookBks'})	0.2475	0.4310	0.1620	(
12	12	frozenset({'DoItYBks'})	frozenset({'CookBks'})	0.2820	0.4310	0.1875	(
13	13	frozenset({'CookBks'})	frozenset({'DoItYBks'})	0.4310	0.2820	0.1875	(
14	14	frozenset({'ArtBks'})	frozenset({'CookBks'})	0.2410	0.4310	0.1670	(
15	15	frozenset({'CookBks'})	frozenset({'ArtBks'})	0.4310	0.2410	0.1670	(
16	16	frozenset({'CookBks'})	frozenset({'GeogBks'})	0.4310	0.2760	0.1925	(
17	17	frozenset({'GeogBks'})	frozenset({'CookBks'})	0.2760	0.4310	0.1925	(

In [21]:

```
plt.scatter(result1.support,result1.confidence)
```

Out[21]:

```
<matplotlib.collections.PathCollection at 0x2374f73d7c0>
```

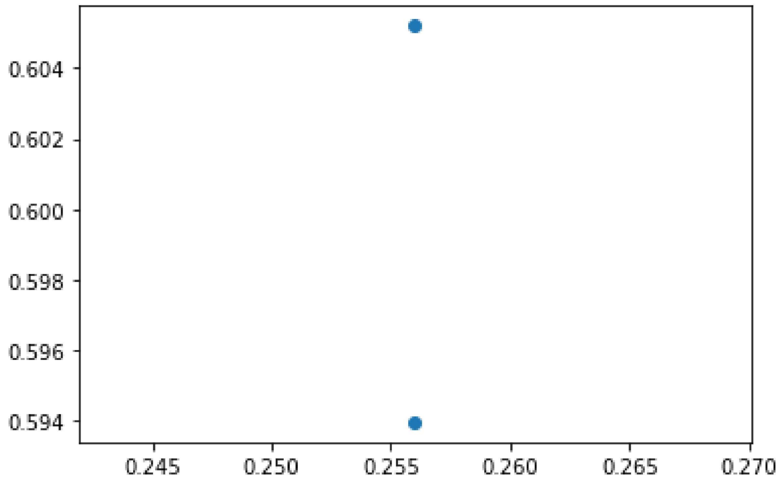


In [22]:

```
plt.scatter(result2.support,result2.confidence)
```

Out[22]:

```
<matplotlib.collections.PathCollection at 0x23750d5ce20>
```

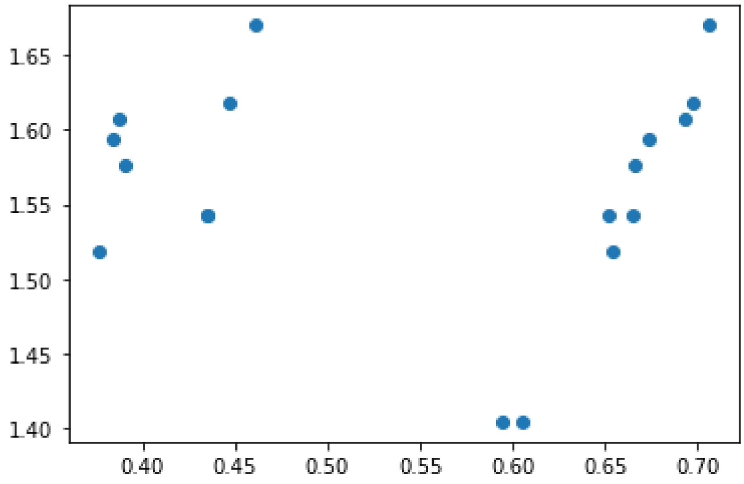


In [23]:

```
plt.scatter(result1.confidence,result1.lift)
```

Out[23]:

```
<matplotlib.collections.PathCollection at 0x23750dbd190>
```

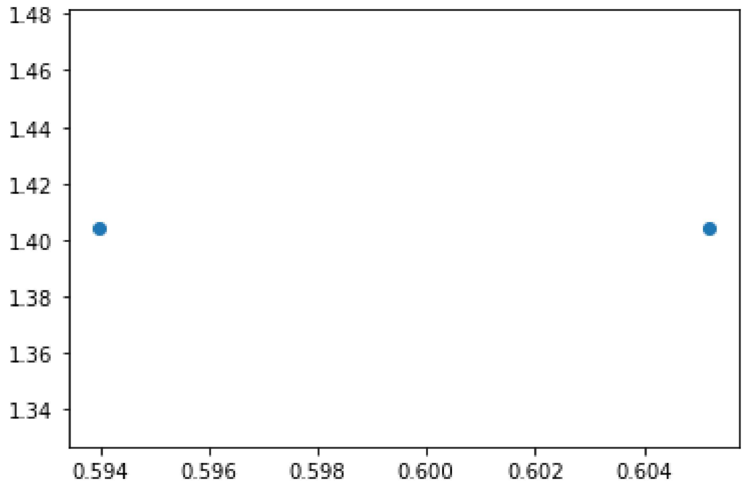


In [24]:

```
plt.scatter(result2.confidence,result2.lift)
```

Out[24]:

```
<matplotlib.collections.PathCollection at 0x23750e21c40>
```



In [25]:

```
pip install networkx
```

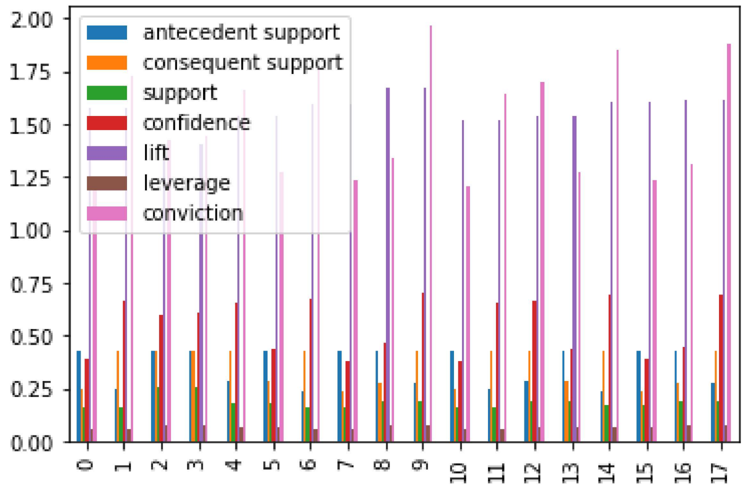
```
Requirement already satisfied: networkx in c:\users\hp\anaconda3\lib\site-pa
ckages (2.6.3)
Note: you may need to restart the kernel to use updated packages.
```

In [27]:

```
result1.plot(kind="bar")
```

Out[27]:

```
<AxesSubplot:>
```

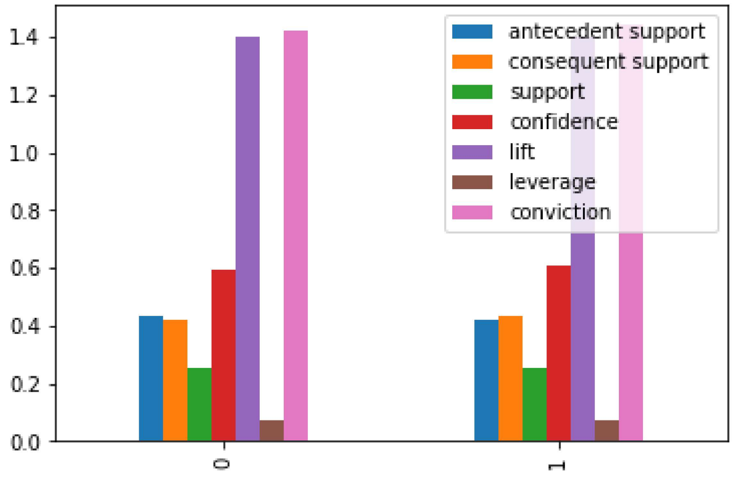


In [28]:

```
result2.plot(kind='bar')
```

Out[28]:

```
<AxesSubplot:>
```

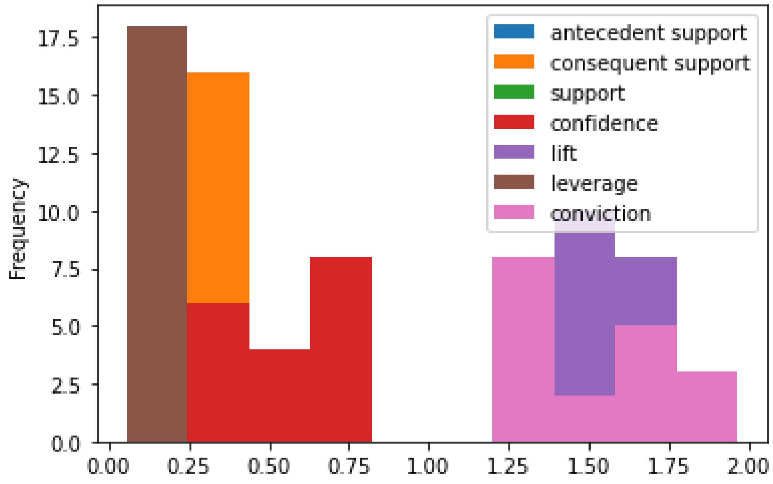


In [29]:

```
result1.plot(kind='hist')
```

Out[29]:

```
<AxesSubplot:ylabel='Frequency'>
```

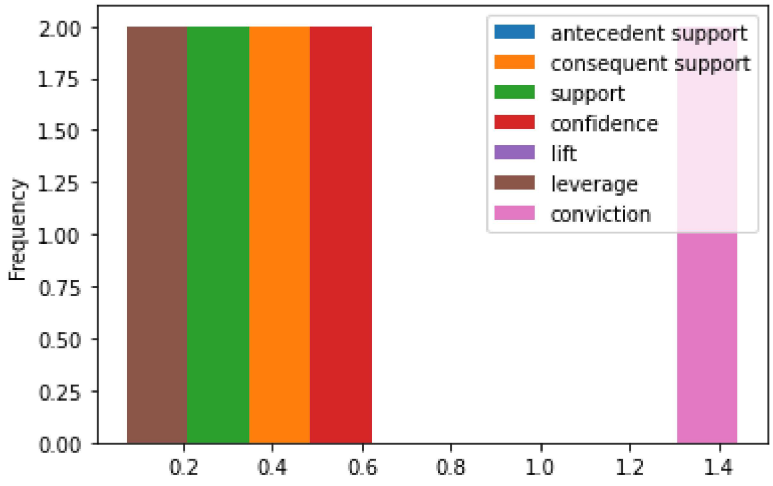


In [30]:

```
result2.plot(kind='hist')
```

Out[30]:

```
<AxesSubplot:ylabel='Frequency'>
```



In [34]:

```
pip install pyvis
```

```
Collecting pyvisNote: you may need to restart the kernel to use updated pack
ages.
  Downloading pyvis-0.2.1.tar.gz (21 kB)
Requirement already satisfied: jinja2>=2.9.6 in c:\users\hp\anaconda3\lib\si
te-packages (from pyvis) (2.11.3)
Requirement already satisfied: networkx>=1.11 in c:\users\hp\anaconda3\lib\s
ite-packages (from pyvis) (2.6.3)
Requirement already satisfied: ipython>=5.3.0 in c:\users\hp\anaconda3\lib\s
ite-packages (from pyvis) (7.29.0)
Collecting jsonpickle>=1.4.1
  Downloading jsonpickle-2.2.0-py2.py3-none-any.whl (39 kB)
Requirement already satisfied: pickleshare in c:\users\hp\anaconda3\lib\site
-packages (from ipython>=5.3.0->pyvis) (0.7.5)
Requirement already satisfied: prompt-toolkit!=3.0.0,!=3.0.1,<3.1.0,>=2.0.0
in c:\users\hp\anaconda3\lib\site-packages (from ipython>=5.3.0->pyvis) (3.
0.20)
Requirement already satisfied: decorator in c:\users\hp\anaconda3\lib\site-p
ackages (from ipython>=5.3.0->pyvis) (5.1.0)
Requirement already satisfied: pygments in c:\users\hp\anaconda3\lib\site-pa
ckages (from ipython>=5.3.0->pyvis) (2.10.0)
Requirement already satisfied: colorama in c:\users\hp\anaconda3\lib\site-pa
ckages (from ipython>=5.3.0->pyvis) (0.4.4)
Requirement already satisfied: jedi>=0.16 in c:\users\hp\anaconda3\lib\site-
packages (from ipython>=5.3.0->pyvis) (0.18.0)
Requirement already satisfied: setuptools>=18.5 in c:\users\hp\anaconda3\lib
\site-packages (from ipython>=5.3.0->pyvis) (58.0.4)
Requirement already satisfied: traitlets>=4.2 in c:\users\hp\anaconda3\lib\s
ite-packages (from ipython>=5.3.0->pyvis) (5.1.0)

Requirement already satisfied: matplotlib-inline in c:\users\hp\anaconda3\li
b\site-packages (from ipython>=5.3.0->pyvis) (0.1.2)
Requirement already satisfied: backcall in c:\users\hp\anaconda3\lib\site-pa
ckages (from ipython>=5.3.0->pyvis) (0.2.0)
Requirement already satisfied: parso<0.9.0,>=0.8.0 in c:\users\hp\anaconda3
\lib\site-packages (from jedi>=0.16->ipython>=5.3.0->pyvis) (0.8.2)
Requirement already satisfied: MarkupSafe>=0.23 in c:\users\hp\anaconda3\lib
\site-packages (from jinja2>=2.9.6->pyvis) (1.1.1)
Requirement already satisfied: wcwidth in c:\users\hp\anaconda3\lib\site-pac
kages (from prompt-toolkit!=3.0.0,!=3.0.1,<3.1.0,>=2.0.0->ipython>=5.3.0->py
vis) (0.2.5)
Building wheels for collected packages: pyvis
  Building wheel for pyvis (setup.py): started
  Building wheel for pyvis (setup.py): finished with status 'done'
  Created wheel for pyvis: filename=pyvis-0.2.1-py3-none-any.whl size=23688
sha256=96ff5c954cd0fcddd772c1b501a19ff93c45036797cd14707740d2bdd0cc74c8
  Stored in directory: c:\users\hp\appdata\local\pip\cache\wheels\05\fb\37\c
8dfe38ad21c8cc91f40a0f9e0196cfdd4534e817d0416a0ae
Successfully built pyvis
Installing collected packages: jsonpickle, pyvis
Successfully installed jsonpickle-2.2.0 pyvis-0.2.1
```

In [35]:

```
import pyvis
from pyvis import network as net
import networkx as nx
```

In [36]:

```
g= net.Network(notebook=True)
nxg = nx.complete_graph(18)
g.from_nx(nxg)
g.show('result1.html')
```

Out[36]:

In [38]:

```
g= net.Network(notebook=True)
nxg= nx.complete_graph(2)
g.from_nx(nxg)
g.show("result2.html")
```

Out[38]:

In [ ]: