In [2]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

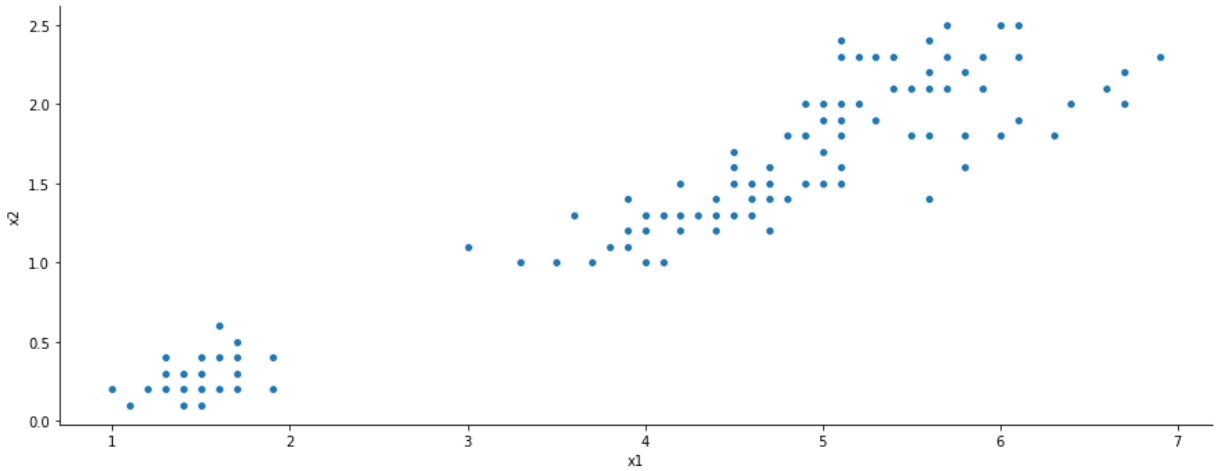
In [3]:
```
data = pd.read_csv('./data/sample_data.csv')
data.head()
```

Out[3]:

	y	x1	x2
0	5.1	1.4	0.2
1	4.9	1.4	0.2
2	4.7	1.3	0.2
3	4.6	1.5	0.2
4	5.0	1.4	0.2

In [4]:
```
X = data[['x1','x2']]
```

In [5]:
```
sns.relplot('x1','x2',data=X,aspect=2.5)
plt.show()
```



Covariance Matrix

In [6]:
```
X.cov()
```

Out[6]:

	x1	x2
x1	3.113179	1.296387
x2	1.296387	0.582414

Eigen Values & Eigen Vectors

In [11]:
```
eigvalue, eigvector = np.linalg.eig(X.cov())
print('INFO: Eigenvectos = \n',eigvector)
print('\nINFO: Eigenvalues =',eigvalue)
```

```
INFO: Eigenvectos =
 [[ 0.92154695 -0.38826694]
 [ 0.38826694  0.92154695]]

INFO: Eigenvalues = [3.65937449 0.03621925]
```

Transformed vectors

$$[Xtransform] = [X].[Eigenvectos]$$

In [14]:
```
x_arr = X.values # converting into array
```

In [17]:
```
# None, 2  = (None, 2 ) * (2,2)
X_pca = np.dot(x_arr,eigvector) # performing dot product
```

In [20]:
```
X_pca_df = pd.DataFrame(X_pca,columns=['x1','x2'])
X_pca_df.head()
```

Out[20]:

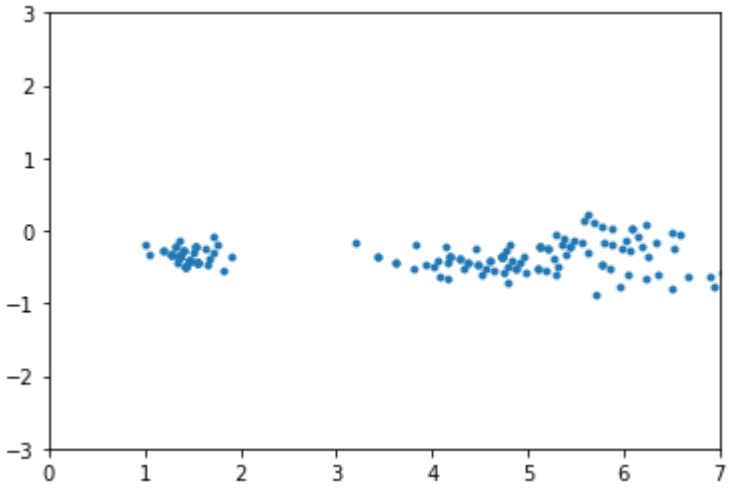
	x1	x2
0	1.367819	-0.359264
1	1.367819	-0.359264
2	1.275664	-0.320438
3	1.459974	-0.398091
4	1.367819	-0.359264

In [21]:
```
X_pca_df.var()
```

Out[21]:
```
x1    3.659374
x2    0.036219
dtype: float64
```

Visualizing data

In [37]:
```
plt.plot(X_pca[:,0],X_pca[:,1],'.')
plt.xlim((0,7)),plt.ylim((-3,3))
plt.show()
```



Setting X_2 to zero

In [40]:
```
X_pca_df['X2_0'] = 0
X_pca_df.head()
```

Out[40]:

	x1	x2	X2_0
0	1.367819	-0.359264	0
1	1.367819	-0.359264	0
2	1.275664	-0.320438	0
3	1.459974	-0.398091	0
4	1.367819	-0.359264	0

In [46]:
```
plt.figure(figsize=(10,6))
plt.plot(X_pca_df.iloc[:,0],X_pca_df.iloc[:,1],'.')
plt.plot(X_pca_df.iloc[:,0],X_pca_df.iloc[:,2],'r.')
plt.xlim((1,7)),plt.ylim((-2,2))
plt.legend(['With X1 and X2','Consider only X1 and X = 0'])
plt.show()
```