In [1]:

```
import numpy as np
import matplotlib.pyplot as plt
import scipy.stats as sps
import pandas as pd
from statsmodels.sandbox.stats.multicomp import multipletests


%matplotlib inline
```

In [4]:

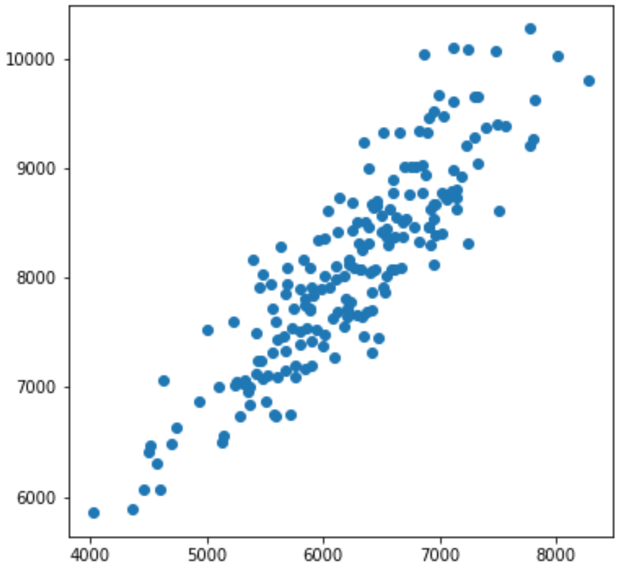
```
data = pd.read_csv('hw6t3v1.txt', header = None, sep='\s+')
data.head()
```

Out[4]:

	0	1
0	7152.5	8630.8
1	5942.3	7531.9
2	6879.0	8943.6
3	5565.8	7313.8
4	6947.2	8664.6

In [8]:

```
x1 = data.values[:,0]
x2 = data.values[:,1]
plt.figure(figsize=(6,6))
plt.scatter(x1, x2)
plt.show()
```



```
In [23]: def mult(x1, x2, alpha = 0.01, method='holm'):
             p_val = np.zeros(4)
             observed = np.histogram2d(x1, x2, bins=[len(np.unique(x1)), len(np.uniq
             observed += np.ones(observed.shape)
             depend = sps.chi2_contingency(observed)[1]
             p_val[1] = sps.shapiro(x1)[1]
             p_val[2] = sps.shapiro(x2)[1]
             if (depend < alpha / 4):
                 p_val[0] = 1 - depend
                 p_val[3] = sps.wilcoxon(x1, x2)[1]
                 return multipletests(p_val, alpha=alpha, method=method)
             else:
                 p_val[0] = depend
                 p_val[3] = sps.ranksums(x1, x2)[1]
                 return multipletests(p_val, alpha=alpha, method=method)
```

```
In [24]: mult(x1, x2)
```

```
Out[24]: (array([False, False, False,  True], dtype=bool),
          array([  1.00000000e+00,   1.00000000e+00,   1.00000000e+00,
                   1.11128718e-52]),
          0.002509430066318874,
          0.0025)
```

```
In [30]: def mult_upgrade(x1, x2, alpha = 0.01, method='holm'):
             p_val = np.zeros(4)
             observed = np.histogram2d(x1, x2, bins=[len(np.unique(x1)), len(np.uniq
             observed += np.ones(observed.shape)
             depend = sps.chi2_contingency(observed)[1]
             p_val[1] = sps.shapiro(x1)[1]
             p_val[2] = sps.shapiro(x2)[1]
             if (depend < alpha / 4):
                 p_val[0] = 1 - depend
                 if (p_val[1] < alpha / 3) and (p_val[2] < alpha / 2):
                     p_val[1] = 1 - p_val[1]
                     p_val[2] = 1 - p_val[2]
                     p_val[3] = sps.ttest_rel(x1,x2)[1]
                     return multipletests(p_val, alpha=alpha, method=method)
                 else:
                     p_val[3] = sps.wilcoxon(x1, x2)[1]
                     return multipletests(p_val, alpha=alpha, method=method)
             else:
                 p_val[0] = depend
                 if (p_val[1] < alpha / 3) and (p_val[2] < alpha / 2):
                     p_val[1] = 1 - p_val[1]
                     p_val[2] = 1 - p_val[2]
                     p_val[3] = sps.ttest_ind(x1,x2)[1]
                     return multipletests(p_val, alpha=alpha, method=method)
                 else:
                     p_val[3] = sps.ranksums(x1, x2)[1]
                     return multipletests(p_val, alpha=alpha, method=method)
```

```
In [31]: mult_upgrade(x1, x2)
```

```
Out[31]: (array([False, False, False,  True], dtype=bool),
          array([  1.00000000e+00,   1.00000000e+00,   1.00000000e+00,
                   1.11128718e-52]),
          0.002509430066318874,
          0.0025)
```

То есть гипотеза об отсутствии сдвига отвергается