Если прочитать описание данных, можно увидеть следующее:
shift - на сколько недель значения признаков отстают от недели, записанной в week (отставание признаков нужно чтобы научиться прогнозировать продажи на 2 или 3 недели вперед)
Действительно направгивается какое-то преобразование датасета, так как в данный момент, если посмотреть на датасет train, видно, что у нас одинаковые целевые переменные, например 110776, разные shift, и абсолютно разный набор f-ок.
Довольно странно ожидать хорошего качества регрессии, если у нас при абсолютно разных наборах X одинаковые значения y.
Можно сдвинуть признаки к соответствующим неделям, чтобы не было запоздания, но это получится сделать не у всех, их мы в данный момент просто выкинем. В тестовом датасете получится сделать такой сдвиг у 2/3 записей, я обучал отдельно модель1 для записей со сдвигом (2/3) (конечно же на преобразованном датасете) и отдельно модель2 для предсказания записей без сдвига (1/3). Я не очень заморачивался с подбором параметром, возможно, при хорошем переборе, можно добиться улучшения на 0.5-1.0 по метрике smape. Мой финальный результат 9.7130.

In [1]:

```
import numpy as np
import pandas as pd
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_absolute_error
from sklearn.linear_model import LinearRegression, Lasso
from collections import Counter
import xgboost
import matplotlib.pyplot as plt
from sklearn import cross_validation, grid_search
import seaborn as sns
from tqdm import tqdm
from sklearn.utils import shuffle
import warnings
warnings.filterwarnings('ignore')
%matplotlib inline
```

```
/Users/daniilkorbut/anaconda/lib/python3.5/site-packages/sklearn/cross_validation.py:44: DeprecationWarning:
 This module was deprecated in version 0.18 in favor of the model_selection module into which all the refacto
red classes and functions are moved. Also note that the interface of the new CV iterators are different from
 that of this module. This module will be removed in 0.20.
  "This module will be removed in 0.20.", DeprecationWarning)
/Users/daniilkorbut/anaconda/lib/python3.5/site-packages/sklearn/grid_search.py:43: DeprecationWarning: This
 module was deprecated in version 0.18 in favor of the model_selection module into which all the refactored c
lasses and functions are moved. This module will be removed in 0.20.
  DeprecationWarning)
```

In [2]:

```
train = pd.read_csv("train.tsv")
test = pd.read_csv("test.tsv")
sample_submission = pd.read_csv("sample_submission.tsv")
```

In [3]:
```
test.head()
```

Out[3]:

	Num	year	week	shift	item_id	f1	f2	f3	f4	f5	...	f51	f52	f53	f54	f55
0	348622	2015	3	3	20447918	960.0	820.0	1128.0	1801.0	1045.0	...	1510.0	580.0	969.0	1635.0	895
1	348623	2015	3	3	20447902	9086.0	12585.0	11595.0	9685.0	12917.0	...	22055.0	14235.0	21195.0	18280.0	182
2	348624	2015	3	3	20447732	115087.0	147287.0	176065.0	143105.0	202069.0	...	302165.0	162232.0	221622.0	256605.0	240
3	348625	2015	3	3	20443951	20900.0	24420.0	27068.0	20460.0	25580.0	...	39055.0	14445.0	22450.0	22093.0	311
4	348626	2015	3	3	20443944	4430.0	5864.0	3310.0	1853.0	2836.0	...	120.0	130.0	60.0	30.0	50.

5 rows × 65 columns

In [4]:
```
train.head()
```

Out[4]:

	Num	y	year	week	shift	item_id	f1	f2	f3	f4	...	f51	f52	f53	f54	f55	f56
0	0	123438	2012	52	1	20442076	4915.0	38056.0	40185.0	45733.0	...	39423.0	41765.0	52590.0	31452.0	44420.0	41865.0
1	1	58410	2012	52	1	20441997	2230.0	18817.0	20110.0	26368.0	...	22830.0	25230.0	27850.0	21390.0	27090.0	23170.0
2	2	163930	2012	52	1	20441990	5695.0	47480.0	47619.0	89708.0	...	14930.0	44290.0	46412.0	29320.0	21140.0	28406.0
3	3	53902	2012	52	1	20441989	1995.0	17146.0	20066.0	27070.0	...	15120.0	12480.0	19780.0	7990.0	8230.0	10650.0
4	4	105970	2012	52	1	20441988	6515.0	49262.0	50045.0	95167.0	...	18872.0	19328.0	37168.0	13570.0	19760.0	20208.0

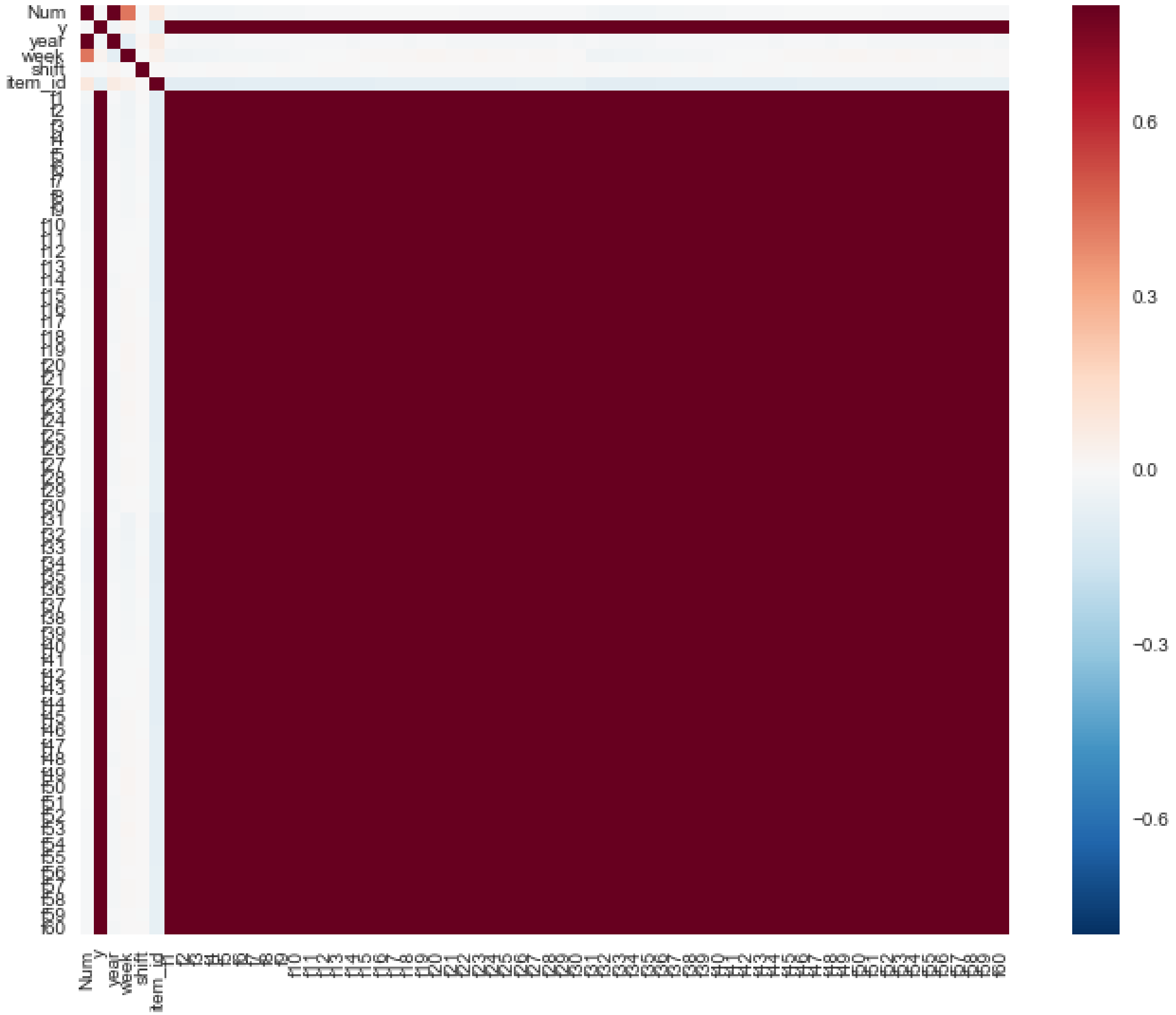
5 rows × 66 columns

In [5]:
```
def smape(y_pred, y_true):
    return (100 / y_pred.shape[0]) * np.sum(np.abs(y_pred - y_true) / ((np.abs(y_pred) + np.abs(y_true)) / 2))
```

Давайте посмотрим на забавную матрицу корреляций признаков

In [6]:
```
corrmat = train.corr()
f, ax = plt.subplots(figsize=(12, 9))
sns.heatmap(corrmat, vmax=.8, square=True)
```

Out[6]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x115dcc5f8>
```



Также стоит зметить, что признаки f1 и f31 полностью совпадают, f2 и f32 и тд., нет смысла включать их в модель

In [7]:

```
print (np.array(train["f1"]))
print (np.array(train["f31"]))
print (np.array(train["f2"]))
print (np.array(train["f32"]))
res = 0
for i in range(1, 31):
    if (np.sum(np.array(train["f"+str(i)]) == np.array(train["f"+str(i+30)])) == train.shape[0]):
        res += 1
print(res)
```

```
[ 4915.  2230.  5695. ...,   515.  5597.    10.]
[ 4915.  2230.  5695. ...,   515.  5597.    10.]
[ 38056.  18817.  47480. ...,    795.   5595.      0.]
[ 38056.  18817.  47480. ...,    795.   5595.      0.]
30
```

In [8]:

```
for i in range(31, 61):
    del train["f" + str(i)]
    del test["f" + str(i)]
```

In [9]:

```
print (train.shape)
train.head()
```

```
(72457, 36)
```

Out[9]:

	Num	y	year	week	shift	item_id	f1	f2	f3	f4	...	f21	f22	f23	f24	f25	f26
0	0	123438	2012	52	1	20442076	4915.0	38056.0	40185.0	45733.0	...	39423.0	41765.0	52590.0	31452.0	44420.0	41865.0
1	1	58410	2012	52	1	20441997	2230.0	18817.0	20110.0	26368.0	...	22830.0	25230.0	27850.0	21390.0	27090.0	23170.0
2	2	163930	2012	52	1	20441990	5695.0	47480.0	47619.0	89708.0	...	14930.0	44290.0	46412.0	29320.0	21140.0	28406.0
3	3	53902	2012	52	1	20441989	1995.0	17146.0	20066.0	27070.0	...	15120.0	12480.0	19780.0	7990.0	8230.0	10650.0
4	4	105970	2012	52	1	20441988	6515.0	49262.0	50045.0	95167.0	...	18872.0	19328.0	37168.0	13570.0	19760.0	20208.0

5 rows × 36 columns

In [10]:

```
print (test.shape)
test.head()
```

```
(2016, 35)
```

Out[10]:

	Num	year	week	shift	item_id	f1	f2	f3	f4	f5	...	f21	f22	f23	f24	f25
0	348622	2015	3	3	20447918	960.0	820.0	1128.0	1801.0	1045.0	...	1510.0	580.0	969.0	1635.0	895
1	348623	2015	3	3	20447902	9086.0	12585.0	11595.0	9685.0	12917.0	...	22055.0	14235.0	21195.0	18280.0	182
2	348624	2015	3	3	20447732	115087.0	147287.0	176065.0	143105.0	202069.0	...	302165.0	162232.0	221622.0	256605.0	240
3	348625	2015	3	3	20443951	20900.0	24420.0	27068.0	20460.0	25580.0	...	39055.0	14445.0	22450.0	22093.0	311
4	348626	2015	3	3	20443944	4430.0	5864.0	3310.0	1853.0	2836.0	...	120.0	130.0	60.0	30.0	50.

5 rows × 35 columns

Я уже знаю, что ждёт нас дальше, так что давайте просто обучим RandomForest на неизменённом датасете (именно он показал самое хорошое качество из первых 3 посылок)

In [11]:

```
model_1 = RandomForestRegressor(n_estimators=50, min_samples_leaf=2, min_samples_split=4)
```

In [12]:

```
train1 = train.head(50000)
train2 = train.tail(train.shape[0]-50000)
```

In [13]:

```
X1 = train1.drop(['Num','y'], axis=1)
y1 = train1['y']
X2 = train2.drop(['Num','y'], axis=1)
y2 = train2['y']
y1 = np.array(y1)
y2 = np.array(y2)
```

```
In [14]: %%time
         model_1.fit(X1, y1)

         CPU times: user 1min 8s, sys: 954 ms, total: 1min 9s
         Wall time: 1min 15s

Out[14]: RandomForestRegressor(bootstrap=True, criterion='mse', max_depth=None,
                    max_features='auto', max_leaf_nodes=None,
                    min_impurity_split=1e-07, min_samples_leaf=2,
                    min_samples_split=4, min_weight_fraction_leaf=0.0,
                    n_estimators=50, n_jobs=1, oob_score=False, random_state=None,
                    verbose=0, warm_start=False)
```

```
In [15]: res = model_1.predict(X2)
         smape(res, y2)

Out[15]: 28.648295586100343
```

```
In [16]: train = train.sort(['item_id', 'year', 'week', 'shift'])
         print (train.shape)

         (72457, 36)
```

```
In [17]: del train['Num']
```

```
In [18]: converted_train = train
```

Посмотрим, сколько недель в 2013 и 2014 годах, это нам поможет при изменении датасета

In [19]:

```
converted_train[converted_train["year"] == 2013].tail(5)
```

Out[19]:

	y	year	week	shift	item_id	f1	f2	f3	f4	f5	...	f21	f22	f23	f24
34531	223657	2013	51	2	20453563	229136.0	237506.0	295042.0	210294.0	132000.0	...	270833.0	101837.0	116481.0	117941.0
34086	223657	2013	51	3	20453563	180591.0	229136.0	237506.0	295042.0	210294.0	...	167200.0	270833.0	101837.0	116481.0
35655	329673	2013	52	1	20453563	295042.0	210294.0	132000.0	237890.0	218525.0	...	116481.0	117941.0	212682.0	54410.0
35205	329673	2013	52	2	20453563	237506.0	295042.0	210294.0	132000.0	237890.0	...	101837.0	116481.0	117941.0	212682.0
34756	329673	2013	52	3	20453563	229136.0	237506.0	295042.0	210294.0	132000.0	...	270833.0	101837.0	116481.0	117941.0

5 rows × 35 columns

In [20]:

```
converted_train[converted_train["year"] == 2014].tail(5)
```

Out[20]:

	y	year	week	shift	item_id	f1	f2	f3	f4	f5	...	f21	f22	f23	f24
70077	171081	2014	52	2	20453563	125906.0	151188.0	120173.0	103150.0	128910.0	...	68340.0	66660.0	76850.0	107219.0
69625	171081	2014	52	3	20453563	112293.0	125906.0	151188.0	120173.0	103150.0	...	155135.0	68340.0	66660.0	76850.0
71197	168919	2014	53	1	20453563	120173.0	103150.0	128910.0	119210.0	118701.0	...	76850.0	107219.0	55220.0	83429.0
70751	168919	2014	53	2	20453563	151188.0	120173.0	103150.0	128910.0	119210.0	...	66660.0	76850.0	107219.0	55220.0
70302	168919	2014	53	3	20453563	125906.0	151188.0	120173.0	103150.0	128910.0	...	68340.0	66660.0	76850.0	107219.0

5 rows × 35 columns

```
In [21]: converted_train_m = converted_train.as_matrix()
         print (converted_train_m.shape)
         converted_train_m
```

```
(72457, 35)
```

```
Out[21]: array([[  3.40138000e+05,   2.01200000e+03,   5.20000000e+01, ...,
                   8.87890000e+04,   1.08817000e+05,   1.10228000e+05],
                [  1.10776000e+05,   2.01300000e+03,   1.00000000e+00, ...,
                   1.08817000e+05,   1.10228000e+05,   2.11266000e+05],
                [  1.10776000e+05,   2.01300000e+03,   1.00000000e+00, ...,
                   8.87890000e+04,   1.08817000e+05,   1.10228000e+05],
                ...,
                [  1.26618000e+05,   2.01500000e+03,   2.00000000e+00, ...,
                   1.06262000e+05,   1.04919000e+05,   1.83820000e+04],
                [  1.26618000e+05,   2.01500000e+03,   2.00000000e+00, ...,
                   8.19260000e+04,   1.06262000e+05,   1.04919000e+05],
                [  1.26618000e+05,   2.01500000e+03,   2.00000000e+00, ...,
                   7.41740000e+04,   8.19260000e+04,   1.06262000e+05]])
```

```
In [22]: modified = np.zeros(converted_train_m.shape[0])
```

```
In [23]: train.head()
```

Out[23]:

	y	year	week	shift	item_id	f1	f2	f3	f4	f5	...	f21	f22	f23	f24
150	340138	2012	52	1	20427028	9700.0	92038.0	111363.0	146522.0	174408.0	...	93799.0	113945.0	156656.0	69913.0
841	110776	2013	1	1	20427028	92038.0	111363.0	146522.0	174408.0	111337.0	...	113945.0	156656.0	69913.0	96291.0
380	110776	2013	1	2	20427028	9700.0	92038.0	111363.0	146522.0	174408.0	...	93799.0	113945.0	156656.0	69913.0
1536	70915	2013	2	1	20427028	111363.0	146522.0	174408.0	111337.0	124149.0	...	156656.0	69913.0	96291.0	112953.0
1072	70915	2013	2	2	20427028	92038.0	111363.0	146522.0	174408.0	111337.0	...	113945.0	156656.0	69913.0	96291.0

5 rows × 35 columns

In [24]:

```
year_pos = 1
week_pos = 2
shift_pos = 3
item_pos = 4
for i in tqdm(range(converted_train_m.shape[0])):
    year1 = converted_train_m[i][year_pos]
    week1 = converted_train_m[i][week_pos]
    shift1 = converted_train_m[i][shift_pos]
    item1 = converted_train_m[i][item_pos]
    week2 = week1 - shift1
    year2 = year1
    #if (i == 6):
    #    print (week1, year1, item1, shift1)
    if (week2 <= 0):
        if (year1 == 2014):
            week2 = 52 - week1
        if (year2 == 2015):
            week2 = 53 - week1
        year2 = year1 - 1
    for j in range(i, 0, -1):
        #if (i == 6):
        #    print (j, ": ", converted_train_m[j][year_pos], converted_train_m[j][week_pos], converted_train_m[j
        if (converted_train_m[j][year_pos] == year2 and converted_train_m[j][week_pos] == week2 and
            converted_train_m[j][item_pos] == item1 and converted_train_m[j][shift_pos] == shift1):
            if (modified[j] == 0):
                converted_train_m[j][5:35] = converted_train_m[i][5:35]
                modified[j] = 1
            break
```

```
100%|██████████| 72457/72457 [01:11<00:00, 1013.90it/s]
```

In [25]:

```
print (len(modified))
print (np.sum(modified))
```

```
72457
68763.0
```

In [26]:

```
corrected_train_m = converted_train_m
```

In [27]:
```
cols = train.columns
cols
```

Out[27]:
```
Index(['y', 'year', 'week', 'shift', 'item_id', 'f1', 'f2', 'f3', 'f4', 'f5',
       'f6', 'f7', 'f8', 'f9', 'f10', 'f11', 'f12', 'f13', 'f14', 'f15', 'f16',
       'f17', 'f18', 'f19', 'f20', 'f21', 'f22', 'f23', 'f24', 'f25', 'f26',
       'f27', 'f28', 'f29', 'f30'],
      dtype='object')
```

In [28]:
```
new_dataset_train = pd.DataFrame(converted_train_m, columns=cols)
```

In [29]:
```
new_dataset_train.head()
```

Out[29]:

	y	year	week	shift	item_id	f1	f2	f3	f4	f5	...	f21	f22	f23	f24
0	340138.0	2012.0	52.0	1.0	20427028.0	9700.0	92038.0	111363.0	146522.0	174408.0	...	93799.0	113945.0	156656.0	69913.0
1	110776.0	2013.0	1.0	1.0	20427028.0	111363.0	146522.0	174408.0	111337.0	124149.0	...	156656.0	69913.0	96291.0	112953.
2	110776.0	2013.0	1.0	2.0	20427028.0	111363.0	146522.0	174408.0	111337.0	124149.0	...	156656.0	69913.0	96291.0	112953.
3	70915.0	2013.0	2.0	1.0	20427028.0	146522.0	174408.0	111337.0	124149.0	119286.0	...	69913.0	96291.0	112953.0	164259.
4	70915.0	2013.0	2.0	2.0	20427028.0	146522.0	174408.0	111337.0	124149.0	119286.0	...	69913.0	96291.0	112953.0	164259.

5 rows × 35 columns

In [30]:
```
new_dataset_train["modi"] = modified
new_dataset_train.head()
```

Out[30]:

	y	year	week	shift	item_id	f1	f2	f3	f4	f5	...	f22	f23	f24	f25
0	340138.0	2012.0	52.0	1.0	20427028.0	9700.0	92038.0	111363.0	146522.0	174408.0	...	113945.0	156656.0	69913.0	96291.0
1	110776.0	2013.0	1.0	1.0	20427028.0	111363.0	146522.0	174408.0	111337.0	124149.0	...	69913.0	96291.0	112953.0	164259.0
2	110776.0	2013.0	1.0	2.0	20427028.0	111363.0	146522.0	174408.0	111337.0	124149.0	...	69913.0	96291.0	112953.0	164259.0
3	70915.0	2013.0	2.0	1.0	20427028.0	146522.0	174408.0	111337.0	124149.0	119286.0	...	96291.0	112953.0	164259.0	88789.0
4	70915.0	2013.0	2.0	2.0	20427028.0	146522.0	174408.0	111337.0	124149.0	119286.0	...	96291.0	112953.0	164259.0	88789.0

5 rows × 36 columns

In [31]:
```
new_dataset_train = new_dataset_train[new_dataset_train["modi"] == 1]
del new_dataset_train['modi']
new_dataset_train.head()
```

Out[31]:

	y	year	week	shift	item_id	f1	f2	f3	f4	f5	...	f21	f22	f23	f24
1	110776.0	2013.0	1.0	1.0	20427028.0	111363.0	146522.0	174408.0	111337.0	124149.0	...	156656.0	69913.0	96291.0	112953.0
2	110776.0	2013.0	1.0	2.0	20427028.0	111363.0	146522.0	174408.0	111337.0	124149.0	...	156656.0	69913.0	96291.0	112953.0
3	70915.0	2013.0	2.0	1.0	20427028.0	146522.0	174408.0	111337.0	124149.0	119286.0	...	69913.0	96291.0	112953.0	164259.0
4	70915.0	2013.0	2.0	2.0	20427028.0	146522.0	174408.0	111337.0	124149.0	119286.0	...	69913.0	96291.0	112953.0	164259.0
5	70915.0	2013.0	2.0	3.0	20427028.0	146522.0	174408.0	111337.0	124149.0	119286.0	...	69913.0	96291.0	112953.0	164259.0

5 rows × 35 columns

Теперь поработаем с тестовым датасетом

In [32]:

```
print (test.shape)
test.sort(['item_id', 'year', 'week', 'shift']).head()
```

```
(2016, 35)
```

Out[32]:

	Num	year	week	shift	item_id	f1	f2	f3	f4	f5	...	f21	f22	f23	f24
822	350335	2015	3	1	20427028	112386.0	103264.0	98742.0	108584.0	102320.0	...	95788.0	81425.0	105634.0	96496.0
370	349663	2015	3	2	20427028	107536.0	112386.0	103264.0	98742.0	108584.0	...	61980.0	95788.0	81425.0	105634.0
144	348766	2015	3	3	20427028	92012.0	107536.0	112386.0	103264.0	98742.0	...	126866.0	61980.0	95788.0	81425.0
1496	351009	2015	4	1	20427028	103264.0	98742.0	108584.0	102320.0	122395.0	...	81425.0	105634.0	96496.0	82307.0
1050	350563	2015	4	2	20427028	112386.0	103264.0	98742.0	108584.0	102320.0	...	95788.0	81425.0	105634.0	96496.0

5 rows × 35 columns

In [33]:

```
test_m = test.as_matrix()
print (test_m.shape)
test_m
```

```
(2016, 35)
```

Out[33]:

```
array([[  3.48622000e+05,   2.01500000e+03,   3.00000000e+00, ...,
          1.02000000e+03,   1.29300000e+03,   1.29000000e+03],
       [  3.48623000e+05,   2.01500000e+03,   3.00000000e+00, ...,
          1.83200000e+04,   2.41160000e+04,   2.13070000e+04],
       [  3.48624000e+05,   2.01500000e+03,   3.00000000e+00, ...,
          2.45652000e+05,   2.86179000e+05,   2.85904000e+05],
       ...,
       [  3.51526000e+05,   2.01500000e+03,   5.00000000e+00, ...,
          1.13270000e+04,   1.07320000e+04,   1.57090000e+04],
       [  3.51527000e+05,   2.01500000e+03,   5.00000000e+00, ...,
          3.37000000e+02,   1.95000000e+02,   2.00000000e+02],
       [  3.51528000e+05,   2.01500000e+03,   5.00000000e+00, ...,
          2.59700000e+03,   3.98100000e+03,   4.48900000e+03]])
```

In [34]:

```
modified = np.zeros(test_m.shape[0])
```

In [35]:

```
year_pos = 1
week_pos = 2
shift_pos = 3
item_pos = 4
for i in tqdm(range(test_m.shape[0])):
    year1 = test_m[i][year_pos]
    week1 = test_m[i][week_pos]
    shift1 = test_m[i][shift_pos]
    item1 = test_m[i][item_pos]
    week2 = week1 - shift1
    year2 = year1
    #if (i == 3):
    #    print (week1, year1, item1, shift1)
    if (week2 <= 0):
        if (year1 == 2014):
            week2 = 52 - week1
        if (year2 == 2015):
            week2 = 53 - week1
        year2 = year1 - 1
    for j in range(0, test_m.shape[0]):
        #if (i == 3):
        #    print (j, ": ", test_m[j][year_pos], test_m[j][week_pos], test_m[j][item_pos])
        if (test_m[j][year_pos] == year2 and test_m[j][week_pos] == week2 and
            test_m[j][item_pos] == item1):
            if (modified[j] == 0):
                test_m[j][5:65] = test_m[i][5:65]
                modified[j] = 1
```

```
100%|██████████| 2016/2016 [00:05<00:00, 340.82it/s]
```

```
In [36]: test_m
```

```
Out[36]: array([[  3.48622000e+05,   2.01500000e+03,   3.00000000e+00, ...,
                   4.22000000e+02,   1.69000000e+03,   9.30000000e+02],
                [  3.48623000e+05,   2.01500000e+03,   3.00000000e+00, ...,
                   6.66100000e+03,   2.06100000e+04,   1.67910000e+04],
                [  3.48624000e+05,   2.01500000e+03,   3.00000000e+00, ...,
                   5.48460000e+04,   1.71320000e+05,   1.84820000e+05],
                ...,
                [  3.51526000e+05,   2.01500000e+03,   5.00000000e+00, ...,
                   1.13270000e+04,   1.07320000e+04,   1.57090000e+04],
                [  3.51527000e+05,   2.01500000e+03,   5.00000000e+00, ...,
                   3.37000000e+02,   1.95000000e+02,   2.00000000e+02],
                [  3.51528000e+05,   2.01500000e+03,   5.00000000e+00, ...,
                   2.59700000e+03,   3.98100000e+03,   4.48900000e+03]])
```

```
In [37]: print (len(modified))
         print (np.sum(modified))
```

```
2016
1335.0
```

Видим, что около 2/3 мы смогли преобразовать, как мы делали это в train, но для последней недели нет следующей, из которой мы бы могли взять информацию

```
In [38]: cols = test.columns
         cols
```

```
Out[38]: Index(['Num', 'year', 'week', 'shift', 'item_id', 'f1', 'f2', 'f3', 'f4', 'f5',
                'f6', 'f7', 'f8', 'f9', 'f10', 'f11', 'f12', 'f13', 'f14', 'f15', 'f16',
                'f17', 'f18', 'f19', 'f20', 'f21', 'f22', 'f23', 'f24', 'f25', 'f26',
                'f27', 'f28', 'f29', 'f30'],
               dtype='object')
```

```
In [39]: new_dataset_test = pd.DataFrame(test_m, columns=cols)
```

```
In [40]: new_dataset_test["modi"] = modified
```

In [41]:
```
new_dataset_test.head()
```

Out[41]:

	Num	year	week	shift	item_id	f1	f2	f3	f4	f5	...	f22	f23	f24	f25
0	348622.0	2015.0	3.0	3.0	20447918.0	1801.0	1045.0	1190.0	1310.0	1111.0	...	895.0	2140.0	1182.0	1020.0
1	348623.0	2015.0	3.0	3.0	20447902.0	9685.0	12917.0	11157.0	12105.0	11765.0	...	18270.0	15851.0	16920.0	18320.0
2	348624.0	2015.0	3.0	3.0	20447732.0	143105.0	202069.0	216920.0	236053.0	257198.0	...	240047.0	236630.0	206697.0	245652.(
3	348625.0	2015.0	3.0	3.0	20443951.0	20460.0	25580.0	27135.0	24059.0	27335.0	...	31175.0	23355.0	15358.0	18930.0
4	348626.0	2015.0	3.0	3.0	20443944.0	1853.0	2836.0	2807.0	2550.0	3951.0	...	50.0	20.0	20.0	30.0

5 rows × 36 columns

Мы уже обучили в самом начале ноутбука модель под неизменённый датасет, и теперь необходимо обучить модель на изменённый, в тестовой выборке будем предсказывать целевую переменную для неизменённых строк с помощью первой модели, а для изменённых с помощью второй

In [42]:
```
model_2 = RandomForestRegressor(n_estimators=100, min_samples_leaf=2, min_samples_split=2)
```

In [43]:
```
new_dataset_train.shape
```

Out[43]:
```
(68763, 35)
```

In [44]:
```
X1 = new_dataset_train.head(50000).drop(['y'], axis=1)
y1 = new_dataset_train.head(50000)['y']
X2 = new_dataset_train.tail(18000).drop(['y'], axis=1)
y2 = new_dataset_train.tail(18000)['y']
y1 = np.array(y1)
y2 = np.array(y2)
```

```
In [45]: model_2.fit(X1, y1)
```

```
Out[45]: RandomForestRegressor(bootstrap=True, criterion='mse', max_depth=None,
                    max_features='auto', max_leaf_nodes=None,
                    min_impurity_split=1e-07, min_samples_leaf=2,
                    min_samples_split=2, min_weight_fraction_leaf=0.0,
                    n_estimators=100, n_jobs=1, oob_score=False, random_state=None,
                    verbose=0, warm_start=False)
```

```
In [46]: res = model_2.predict(X2)
         smape(res,y2)
```

```
Out[46]: 1.0072707708915898
```

In [54]:

```
%%time
results = []
for n_e in [10, 20, 40]:
    for m_s_l in [1, 3, 5]:
        for m_s_s in [2, 3]:
            tmp = []
            for i in range(5):
                trainnnnn = shuffle(new_dataset_train)
                train1 = trainnnnn.head(45000)
                train2 = trainnnnn.tail(train.shape[0]-45000)
                X1 = train1.drop(['y'], axis=1)
                y1 = train1['y']
                X2 = train2.drop(['y'], axis=1)
                y2 = train2['y']
                y1 = np.array(y1)
                y2 = np.array(y2)
                model = RandomForestRegressor(n_estimators=n_e, min_samples_leaf=m_s_l, min_samples_split=m_s_s)
                model.fit(X1, y1)
                res = model.predict(X2)
                tmp.append(smape(res, y2))
            results.append((np.mean(tmp), n_e, m_s_l, m_s_s))
```

```
(.0)
    129
    130     def __call__(self):
--> 131         return [func(*args, **kwargs) for func, args, kwargs in self.items]
    132
    133     def __len__(self):

/Users/daniilkorbut/anaconda/lib/python3.5/site-packages/sklearn/ensemble/forest.py in
_parallel_build_trees(tree, forest, X, y, sample_weight, tree_idx, n_trees, verbose, class_weight)
    118             curr_sample_weight *= compute_sample_weight('balanced', y, indices)
    119
--> 120         tree.fit(X, y, sample_weight=curr_sample_weight, check_input=False)
    121     else:
    122         tree.fit(X, y, sample_weight=sample_weight, check_input=False)

/Users/daniilkorbut/anaconda/lib/python3.5/site-packages/sklearn/tree/tree.py in fit(self, X, y, sample_weig
ht, check_input, X_idx_sorted)
   1027             sample_weight=sample_weight,
   1028             check_input=check_input,
-> 1029             X_idx_sorted=X_idx_sorted)
```

In [48]:
```
new_dataset_test.head()
```

Out[48]:

	Num	year	week	shift	item_id	f1	f2	f3	f4	f5	...	f22	f23	f24	f25
0	348622.0	2015.0	3.0	3.0	20447918.0	1801.0	1045.0	1190.0	1310.0	1111.0	...	895.0	2140.0	1182.0	1020.0
1	348623.0	2015.0	3.0	3.0	20447902.0	9685.0	12917.0	11157.0	12105.0	11765.0	...	18270.0	15851.0	16920.0	18320.0
2	348624.0	2015.0	3.0	3.0	20447732.0	143105.0	202069.0	216920.0	236053.0	257198.0	...	240047.0	236630.0	206697.0	245652.
3	348625.0	2015.0	3.0	3.0	20443951.0	20460.0	25580.0	27135.0	24059.0	27335.0	...	31175.0	23355.0	15358.0	18930.0
4	348626.0	2015.0	3.0	3.0	20443944.0	1853.0	2836.0	2807.0	2550.0	3951.0	...	50.0	20.0	20.0	30.0

5 rows × 36 columns

In [49]:
```
np.sum(new_dataset_test['modi'] == modified)
```

Out[49]:
```
2016
```

In [50]:
```
del new_dataset_test['modi']
```

In [51]:
```
del new_dataset_test['Num']
```

In [52]:
```
new_dataset_test.head()
```

Out[52]:

	year	week	shift	item_id	f1	f2	f3	f4	f5	f6	...	f21	f22	f23	f24
0	2015.0	3.0	3.0	20447918.0	1801.0	1045.0	1190.0	1310.0	1111.0	870.0	...	1635.0	895.0	2140.0	1182.0
1	2015.0	3.0	3.0	20447902.0	9685.0	12917.0	11157.0	12105.0	11765.0	10823.0	...	18280.0	18270.0	15851.0	16920.0
2	2015.0	3.0	3.0	20447732.0	143105.0	202069.0	216920.0	236053.0	257198.0	267316.0	...	256605.0	240047.0	236630.0	206697.
3	2015.0	3.0	3.0	20443951.0	20460.0	25580.0	27135.0	24059.0	27335.0	23271.0	...	22093.0	31175.0	23355.0	15358.0
4	2015.0	3.0	3.0	20443944.0	1853.0	2836.0	2807.0	2550.0	3951.0	3398.0	...	30.0	50.0	20.0	20.0

5 rows × 34 columns

```
In [53]: new_dataset_test.iloc[0,:]
```

```
Out[53]: year           2015.0
         week              3.0
         shift             3.0
         item_id    20447918.0
         f1             1801.0
         f2             1045.0
         f3             1190.0
         f4             1310.0
         f5             1111.0
         f6              870.0
         f7             1180.0
         f8              960.0
         f9             1301.0
         f10            1367.0
         f11            1960.0
         f12            6460.0
         f13            1272.0
         f14            1030.0
         f15            1092.0
         f16            1390.0
         f17            1710.0
         f18            1510.0
         f19             580.0
         f20             969.0
         f21            1635.0
         f22             895.0
         f23            2140.0
         f24            1182.0
         f25            1020.0
         f26            1293.0
         f27            1290.0
         f28             422.0
         f29            1690.0
         f30             930.0
         Name: 0, dtype: float64
```

```
In [ ]:
```

In [54]:
```
%%time

preds = []
for i in range(len(modified)):
    if (modified[i]):
        res = model_2.predict(np.array(new_dataset_test.iloc[i,:]))
        preds.append(res)
    else:
        res = model_2.predict(np.array(new_dataset_test.iloc[i,:]))
        preds.append(res)

print (len(preds))
print (len(sample_submission))
```

```
2016
2016
CPU times: user 13.7 s, sys: 278 ms, total: 14 s
Wall time: 15 s
```

In [55]:
```
preds = np.array(preds)
preds
```

Out[55]:
```
array([[   1497.492     ],
       [  27029.30716667],
       [ 297065.0302619 ],
       ...,
       [  25297.52266667],
       [    322.        ],
       [   7222.58766667]])
```

In [56]:
```
preds = np.ravel(preds)
preds
```

Out[56]:
```
array([   1497.492     ,   27029.30716667,  297065.0302619 , ...,
         25297.52266667,     322.        ,    7222.58766667])
```

In [57]:
```
sample_submission['y'] = preds
```

In [58]:

```
sample_submission.head(5)
```

Out[58]:

	Num	y
0	348622	1497.492000
1	348623	27029.307167
2	348624	297065.030262
3	348625	29172.000286
4	348626	15.993333

In [59]:

```
print (sample_submission[sample_submission['y'] < 0])
```

```
Empty DataFrame
Columns: [Num, y]
Index: []
```

In [60]:

```
sample_submission['y'] = sample_submission['y'].map(lambda x: x if x > 0 else 0.0)
```

In [61]:

```
sample_submission.to_csv("my_submission6.tsv", sep=',', index=False)
```