FLIP(00) Mid-term Presentation

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- This is a problem with time-series prediction. There are six data sets with a total of 11 attributes. The following is some requirements.

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- This is a problem with time-series prediction. There are six data sets with a total of 11 attributes. The following is some requirements.
  - According to the given train data set, training a model and then using the model to predict total sales for every product and store in the next month.

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■ Attribute Information

1. There are six data sets with a total of 11 attributes.

Attribute name	description
ID	An Id that represents a (Shop, Item) tuple within the test set.
shop_id	Unique identifier of a shop.
item_id	Unique identifier of a product.
item_category_id	Unique identifier of item category.
item_cnt_day	Number of products sold. You are predicting a monthly amount of this measure.
item_price	Current price of an item.
date	Date in format dd/mm/yyyy.
date_block_num	A consecutive month number, used for convenience. January 2013 is 0, February 2013 is 1,..., October 2015 is 33.
item_name	Name of item.
item_category_name	Name of item category.
shop_name	Name of shop.

Figure 1: Attributes name and description

2. The detailed description of the data is shown in the following table.

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	date	date_block_num	shop_id	item_id	item_price	item_cnt_day
0	02.01.2013	0	59	22154	999.00	1.0
1	03.01.2013	0	25	2552	899.00	1.0
2	05.01.2013	0	25	2552	899.00	-1.0
3	06.01.2013	0	25	2554	1709.05	1.0
4	15.01.2013	0	25	2555	1099.00	1.0
5	10.01.2013	0	25	2564	349.00	1.0

(a) sales_train.csv

	item_category_name	item_category_id
0	PC - Гарнитуры/Наушники	0
1	Аксессуары - PS2	1
2	Аксессуары - PS3	2
3	Аксессуары - PS4	3
4	Аксессуары - PSP	4
5	Аксессуары - PSVita	5

(b) item_categories.csv

	ID	shop_id	item_id
0	0	5	5037
1	1	5	5320
2	2	5	5233
3	3	5	5232
4	4	5	5268
5	5	5	5039

(c) test.csv

	item_name	item_id	item_category_id
0	! ВО ВЛАСТИ НАВАЖДЕНИЯ (ПЛАСТ.) D	0	40
1	!ABBYY FineReader 12 Professional Edition Full...	1	76
2	***В ЛУЧАХ СЛАВЫ (UNV) D	2	40
3	***ГОЛУБАЯ ВОЛНА (Univ) D	3	40
4	***КОРОБКА (СТЕКЛО) D	4	40
5	***НОВЫЕ АМЕРИКАНСКИЕ ГРАФФИТИ (UNI) ...	5	40

(d) items.csv

	shop_name	shop_id
0	!Якутск Орджоникидзе, 56 фран	0
1	!Якутск ТЦ "Центральный" фран	1
2	Адыгея ТЦ "Мега"	2
3	Балашиха ТРК "Октябрь-Киномир"	3
4	Волжский ТЦ "Волга Молл"	4
5	Вологда ТРЦ "Мармелад"	5

(e) shops.csv

Figure 2: Data Description

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- The data is very clean and complete, so we only need to change the data type after importing.
- We also need to reorganize the table structure to make it more readable. An sample is given below.

			date		item_price	item_cnt_day
			min	max	mean	sum
date_block_num	shop_id	item_id				
0	0	32	2013-01-03	2013-01-31	221.0	6.0
		33	2013-01-03	2013-01-28	347.0	3.0
		35	2013-01-31	2013-01-31	247.0	1.0
		43	2013-01-31	2013-01-31	221.0	1.0
		51	2013-01-13	2013-01-31	128.5	2.0
		61	2013-01-10	2013-01-10	195.0	1.0
		75	2013-01-17	2013-01-17	76.0	1.0
		88	2013-01-16	2013-01-16	76.0	1.0
		95	2013-01-06	2013-01-06	193.0	1.0

Figure 3: sample

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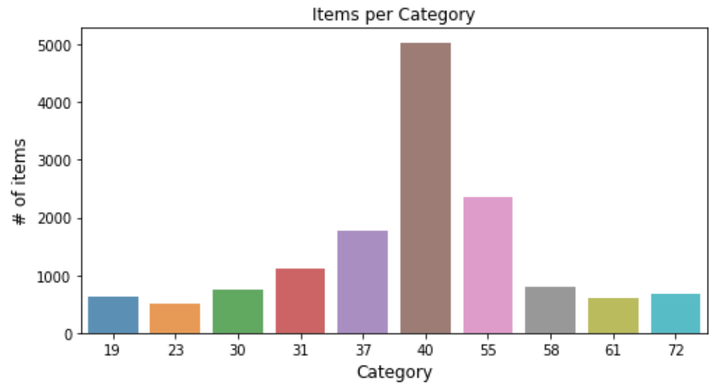
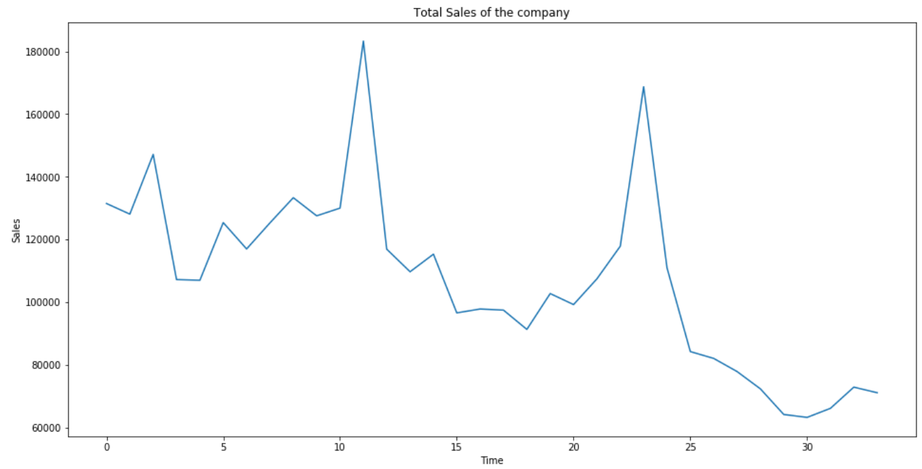
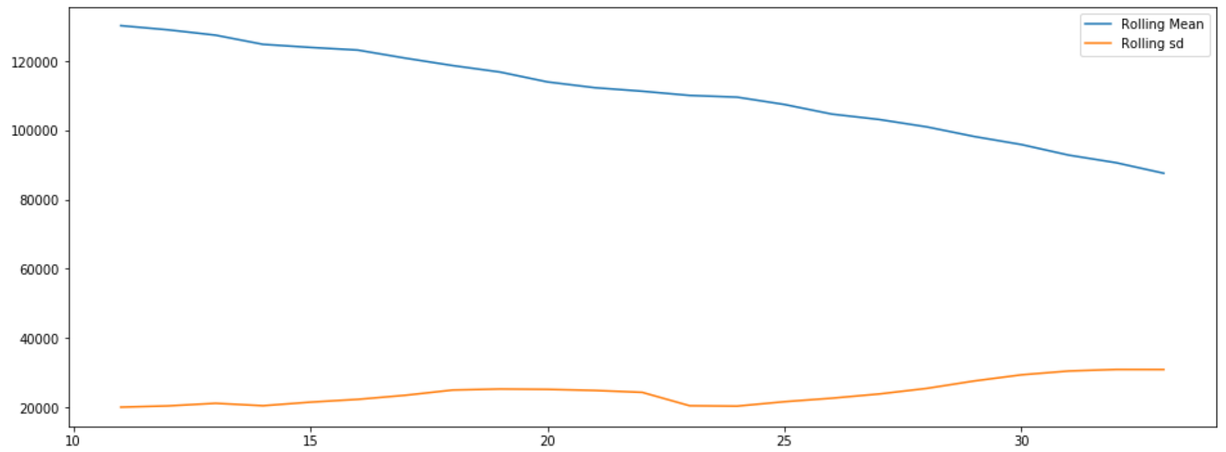


(a) Items per Category



(b) Total Sales of the company



(c) Rolling Mean and std

Figure 4: EDA

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- There is an obvious "seasonality" (Eg: peak sales around a time of year) and a decreasing "Trend".

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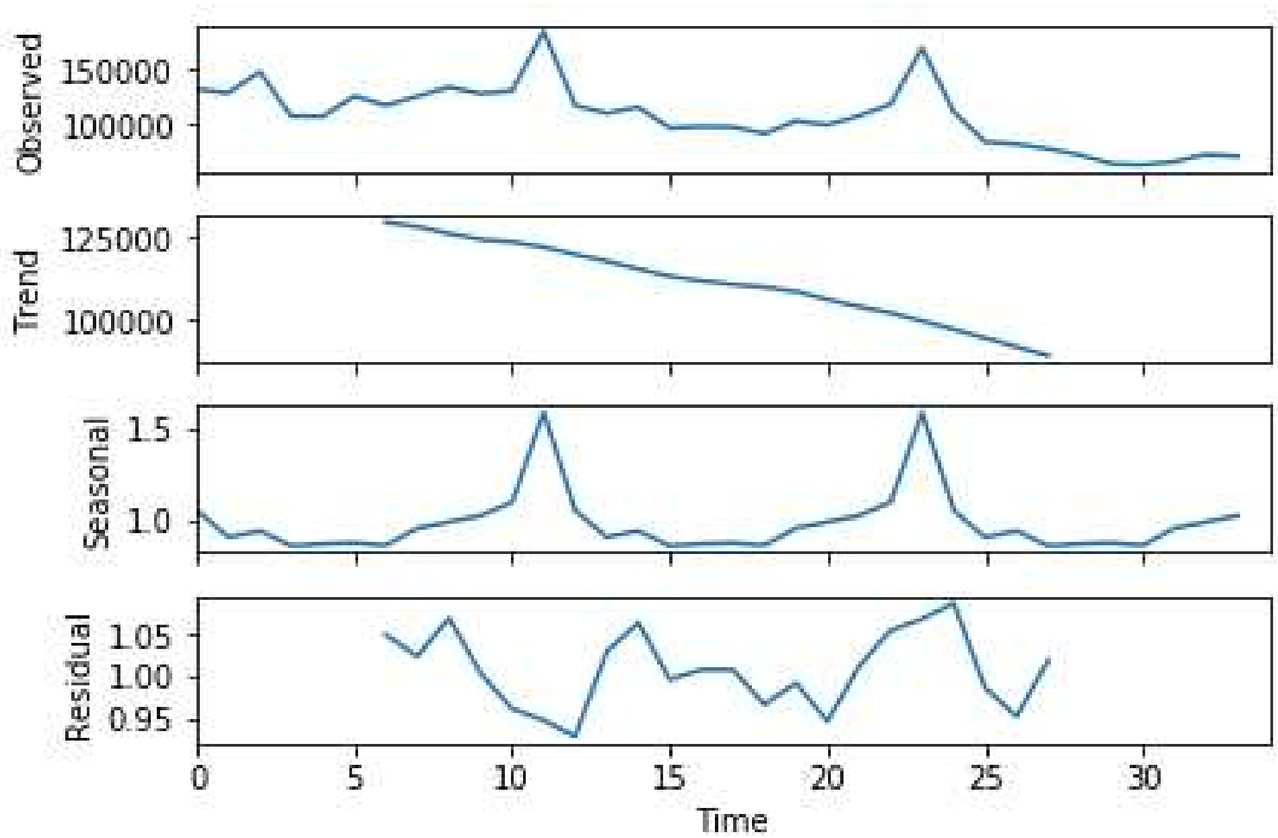

Figure 5: Seasonality and Trend

Stationarity Test

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```
Results of Dickey-Fuller Test:
Test Statistic                  -2.395704
p-value                          0.142953
#Lags Used                       0.000000
Number of Observations Used     33.000000
Critical Value (1%)             -3.646135
Critical Value (5%)             -2.954127
Critical Value (10%)            -2.615968
dtype: float64
```

Figure 6: Stationarity Test

Remove seasonality and trends

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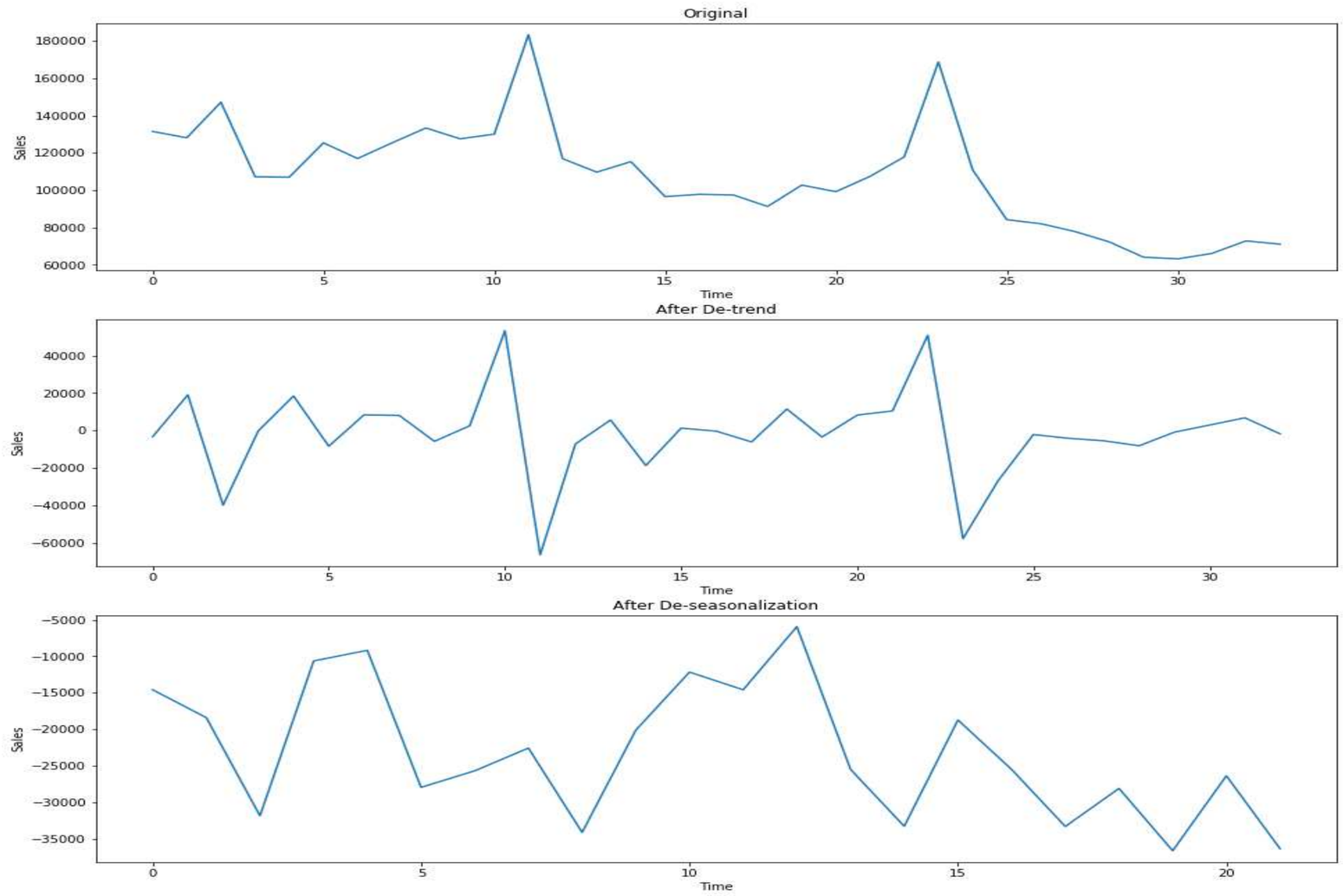

Figure 7: Remove seasonality and trends

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- Now let's check the new P-value.

```
Results of Dickey-Fuller Test:
Test Statistic                  -3.270101
p-value                          0.016269
#Lags Used                       0.000000
Number of Observations Used     21.000000
Critical Value (1%)             -3.788386
Critical Value (5%)             -3.013098
Critical Value (10%)            -2.646397
dtype: float64
```

Figure 8: new stationarity test

- After the transformations, our p-value for the DF test is well within 0.05. Hence we can assume Stationarity of the series.

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- From the above result presentation, we can find that
  There are seasonality and trend in data.

- From the Stationarity test, we can find that
  After removing seasonality and trends, the time series becomes smooth.
  So we can use traditional time series prediction methods for prediction.

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- Predict by traditional time series prediction models such as AR, MA and ARMA.
- Using more models to predict, such as random forests and neural networks.
- Find the most effective model and get my own kaggle ranking.

Thank you & Question