FLIP(00) Mid-term Presentation

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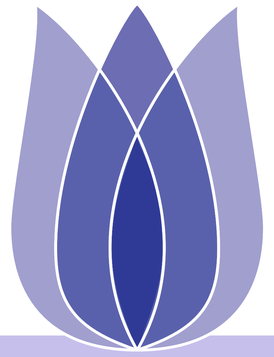

Outline

Introduction

Problem Description

- 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.

Problem Description

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Data Description

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.

	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

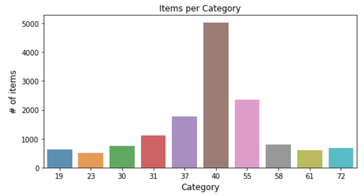
Figure 2: Data Description

- 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.

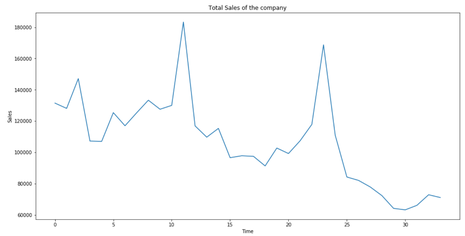
			date		item_price	item_cnt_day
			min	max	mean	sum
date_block_num	shop_id	item_id				
0	0	32	2013-01-03	2013-01-31	221.0	6.0
		33	2013-01-03	2013-01-28	347.0	3.0
		35	2013-01-31	2013-01-31	247.0	1.0
		43	2013-01-31	2013-01-31	221.0	1.0
		51	2013-01-13	2013-01-31	128.5	2.0
		61	2013-01-10	2013-01-10	195.0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

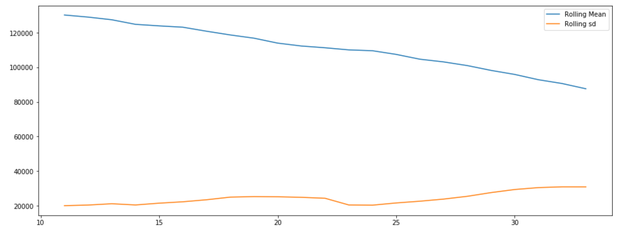
Exploratory Data Analysis



(a) Items per Category



(b) Total Sales of the company



(c) Rolling Mean and std

Figure 4: EDA

Summary

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

Stationarity

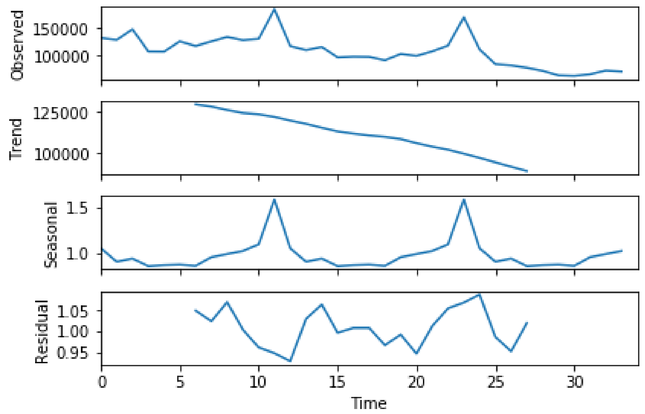


Figure 5: Seasonality and Trend

```
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

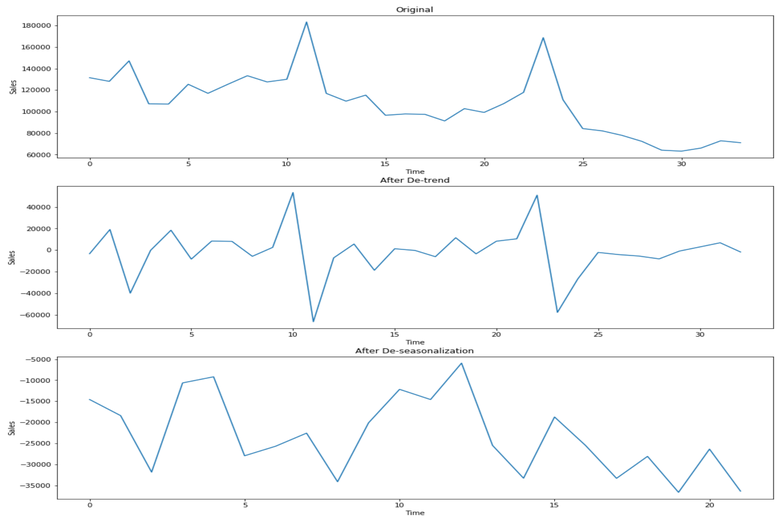


Figure 7: Remove seasonality and trends

- 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.

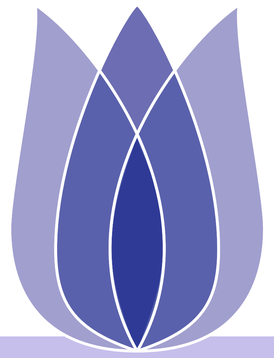
Conclusion

Summary

- 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.

Future research

- 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