Application of network data in CPI

YiBing Sun

Department of City Statistics, NBS

Outline

1 Backgound

2 Web crawler and the Data characteristics

3 The price index model based on the web crawler and the empirical

4 Advantages and disadvantages

Background

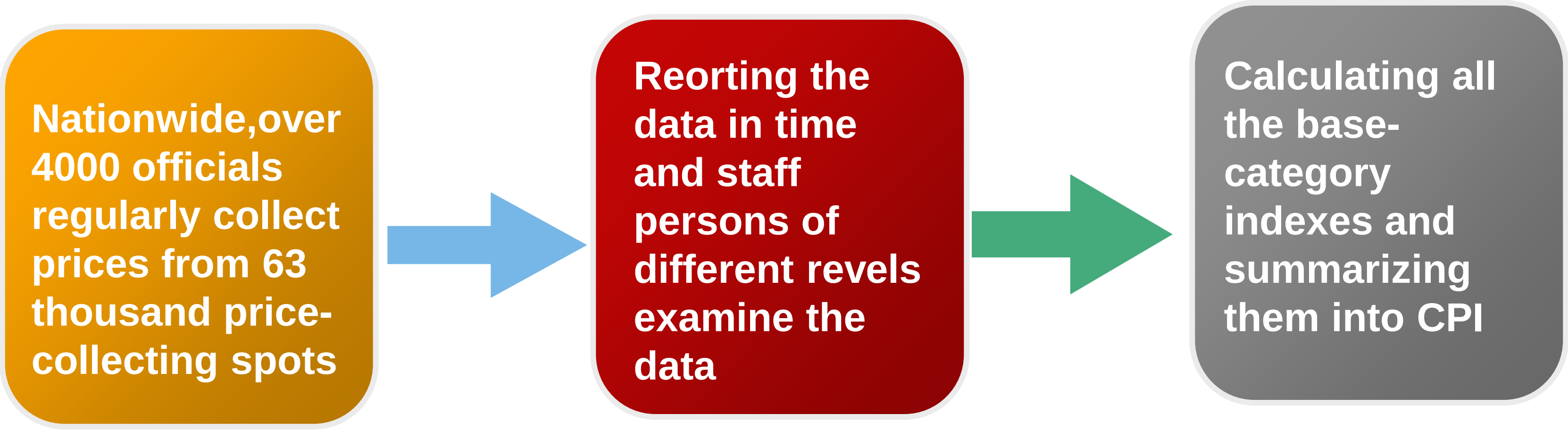
- Necessary
  - In recent years, E-commerce websites such as B2C (www.amazon.com, www.jd.com) and C2C (www.ebay.com, www.taobao.com) development is very rapidly,greatly influencing the individual consuming behavior.
  - The big data in Cyberspace itself suggests the official statistical department apply the data to CPI。
- Difficulties the official statistics department has
  - Compared with E-commerce companies(data owner),the official statistical department (external data achiever) has difficulties in obtaining real data such as transaction price and sales volume.
  - It is difficult to determine the real network sales behavior.
  - It is difficult to determine the sales between e-commerce and traditional retail business.

Background

Current working mode of CPI in official statistics department

Current working mode of CPI in China

- **Data Collection：**Personal Visit。
- **Weight number acquistion：**From Household Income and Survey (133 thousand urban and rural Households in this turn)。
- **Formula：** Chained Laspeyres Formula。
- **Quality adjustment：**The international general method。



Nationwide,over 4000 officials regularly collect prices from 63 thousand price-collecting spots

Reorting the data in time and staff persons of different revels examine the data

Calculating all the base-category indexes and summarizing them into CPI

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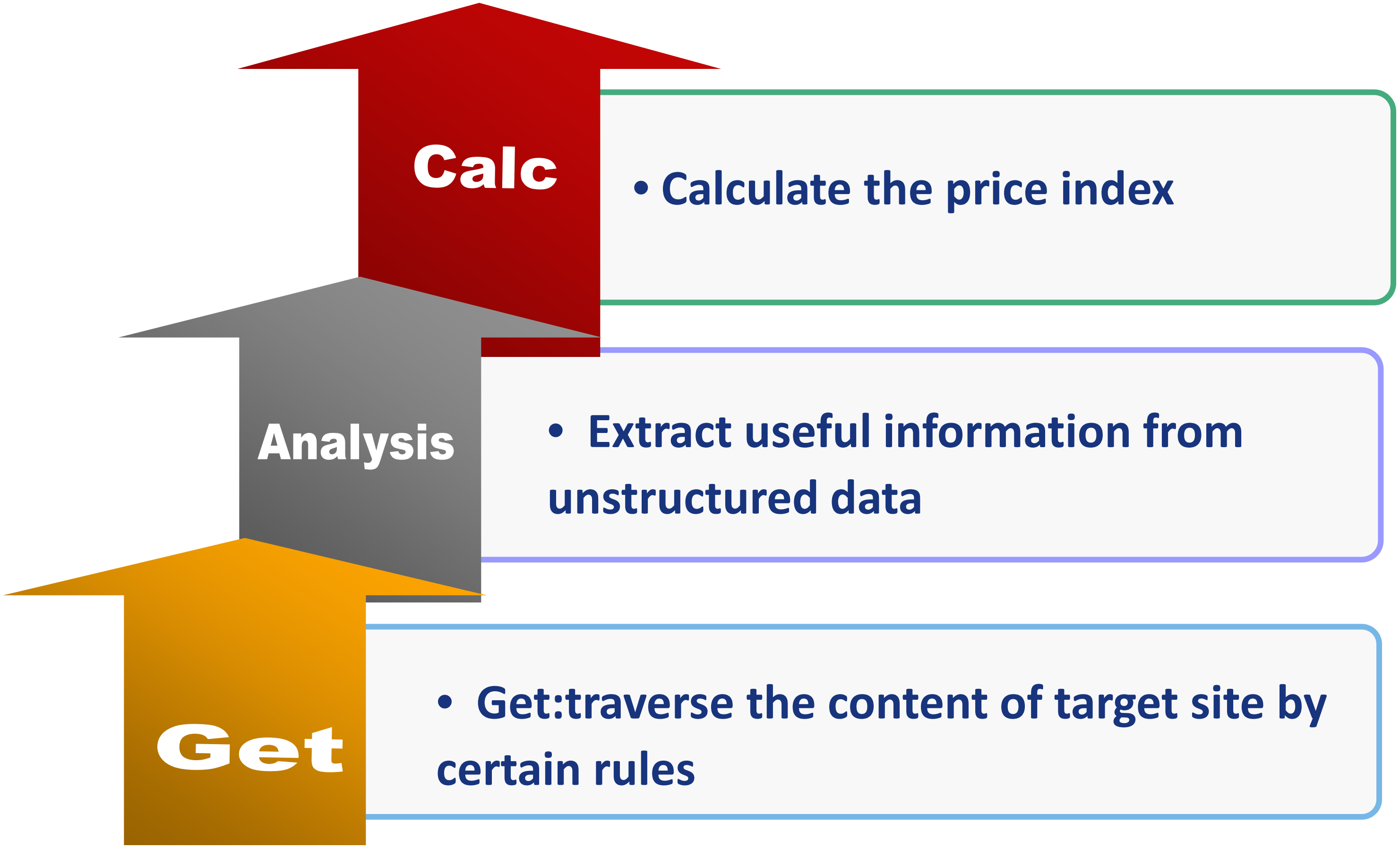
Web crawler and the Data characteristics

External data achiever：work flow based on web crawler



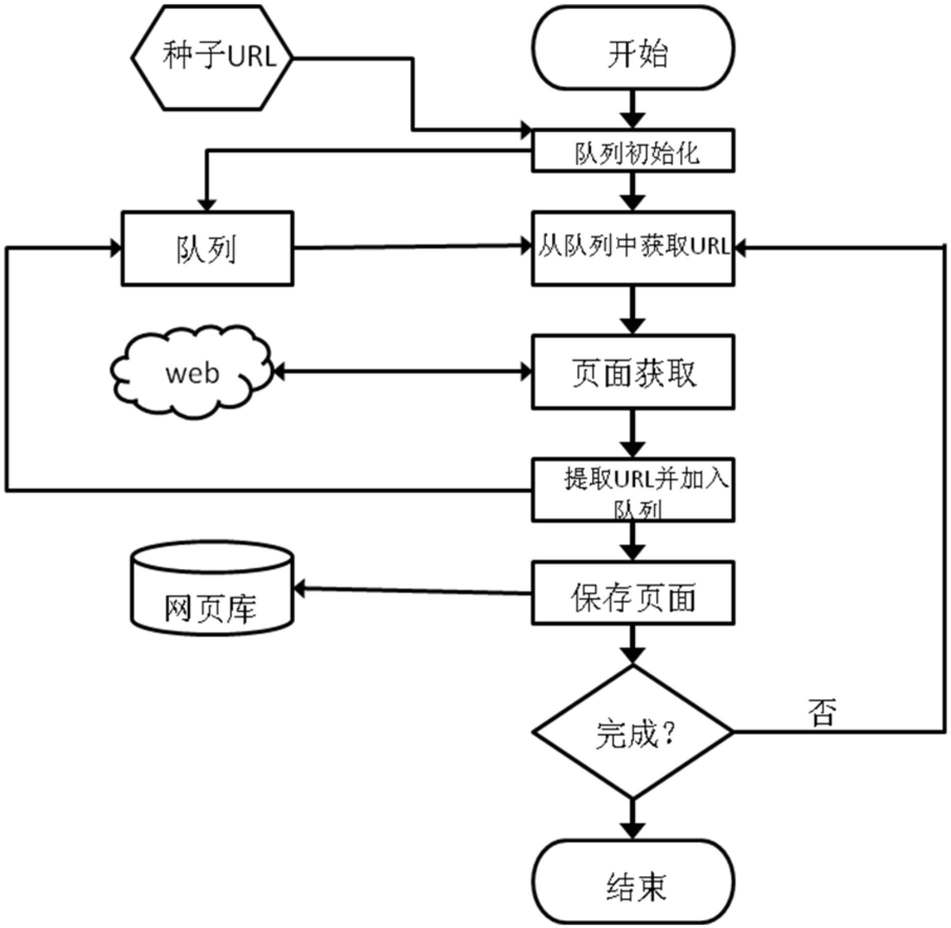
- Calculate the price index

- Extract useful information from unstructured data

- Get:traverse the content of target site by certain rules

Web crawler:traversing the target web site by certain rules, and fetching useful information according to specified format.

Web Crawler



Writing web crawler program used by Perl language in the environment of Linux.

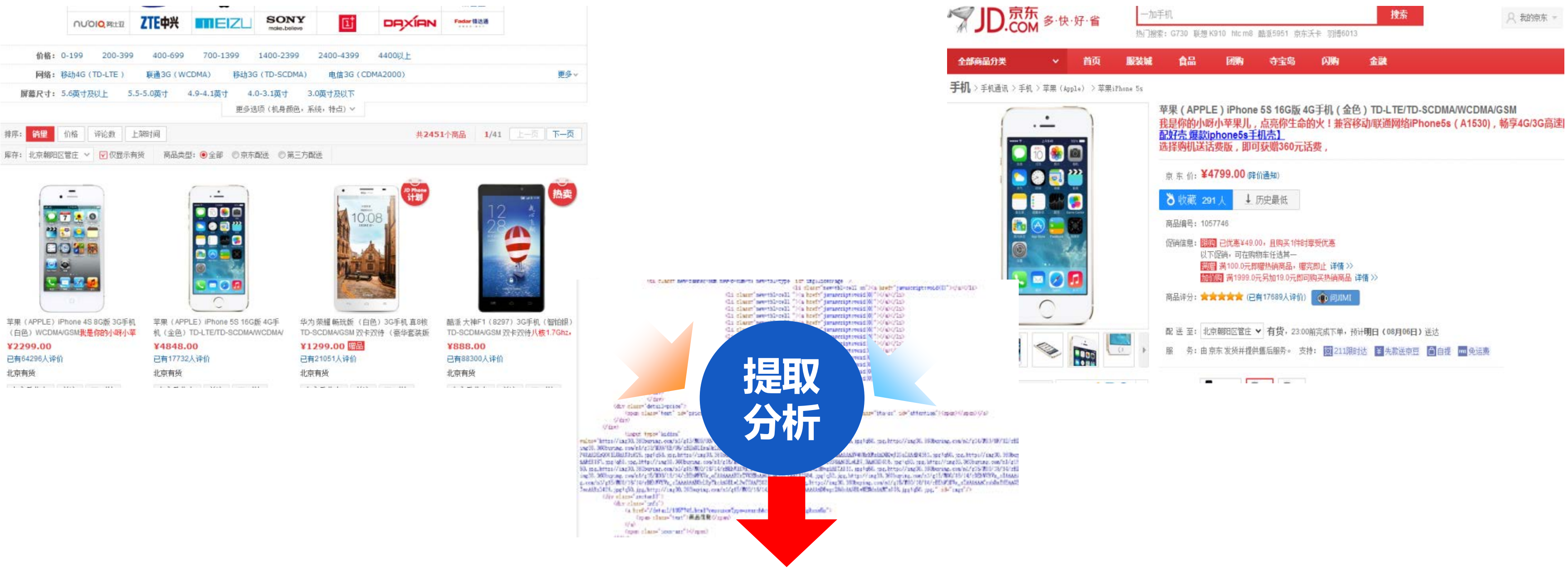
Regular expression could be used to analyze the HTML files which web crawler has fetched.

For example: daily data around 200MB Mobile in phone category of www.JD.com.

Example

www.jd.com **Mobile Phone index Html**

Mobile Phone Html



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example

	Mobile Phone	Price (yuan)	In stock	Good comment	General comment	Bad comment
1	Samsung B309i	168.00	yes	26939	1415	428
2	iPhone4S 8GB	2448.00	yes	54243	2453	1822
3	Galaxy S4 I9300	1899.00	yes	39131	1873	982

Difference between the two kinds of data

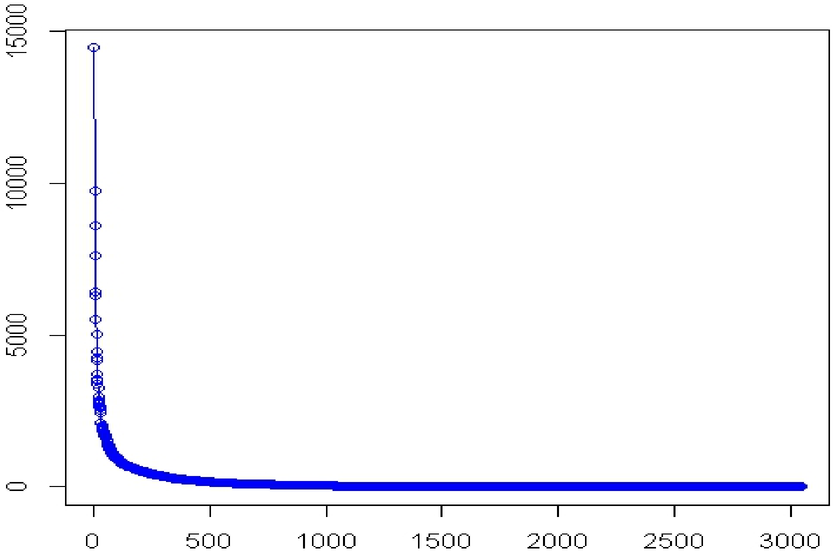
Difference between the two kinds of data

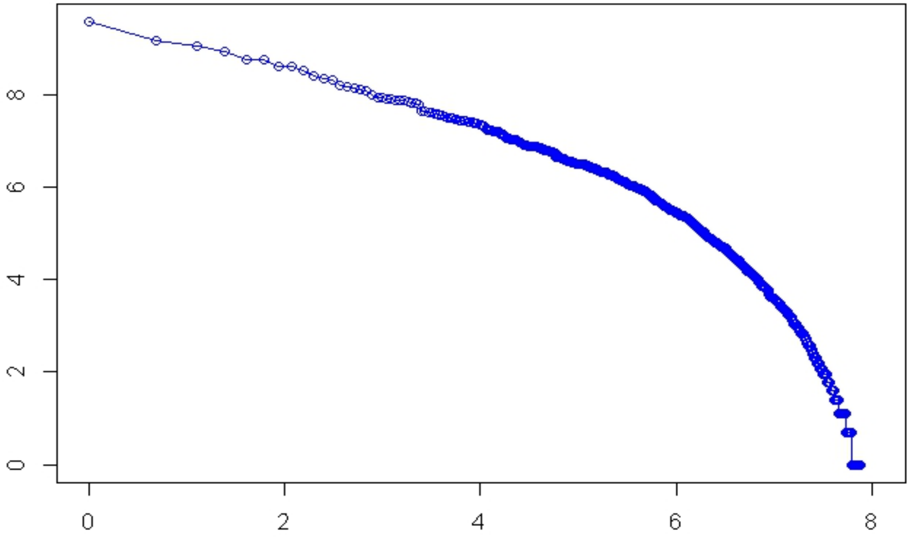
	Web crawler	In field
frequency	1 day	3-5 days
number	Abundant goods number. The types of mobile phone can reach 3000 in one E-commerce website.	5-10 items
Trend of price	volatility	stable
Sale strategy	E-commerce companies often adopt “buy and give” method to promote sales ,difficult to knon real price	Decide whether the price is real or not by examining sales activity in field.

Using cluster analysis to analyze 2 kinds of prices, E-commerce and traditional trail sales have totally different pricing strategy.

How to deal with the challenges brought by “Miaosha” “low price at fixed time”?

Long tail





X:Orderd number order by the volume of comments

Y: the volume of comments

In normal coordinate

X:Orderd number order by the volume of comments

Y: the volume of comments

In double logarithmic coordinate

Data shows that the number of comments of E-commerce is power-law distributed. According to statistics, the sales volume in Amazon is also power-law distributed. Therefore, it is reasonable to think in a particular period of time, the number of comments is similar to the number of sales.

difficulties in web crawler technology

difficulties in web crawler technology

The website E-commerce companies design is very complicated. The useful information is limited. Some websites even design price tag pictures to prevent others from obtaining data

E-commerce companies often redesign their website to attract more customers. But since web crawler technology heavily depends on text parsing strategy, it is necessary to update its strategy according to the change of websites.

Difficulties in fetching data due to website safety strategy.

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price index (based on web crawler)

In accordance with the current methods, Jevons formula is adopted to calculate the basic category price index(such as mobile phone).

scheme 1：the top 5 mobile phones
scheme 2：all the mobile phones （3000）

3 indexes（last month =100）

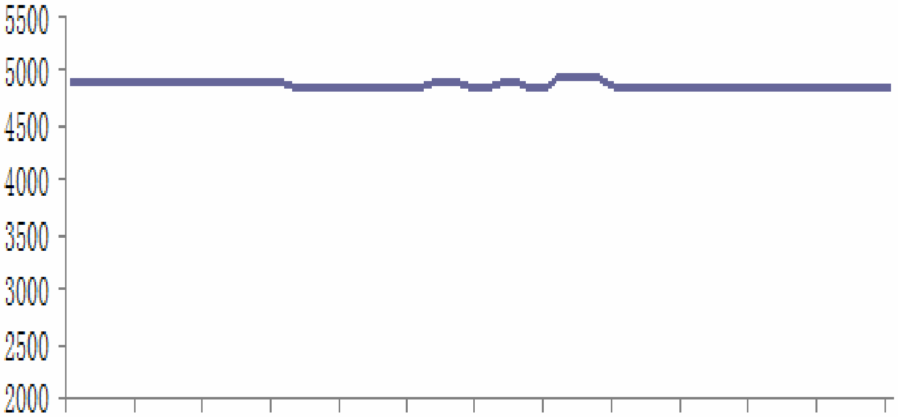
	Index （scheme 1）	Index （scheme 2）	Index （mobile phone index in china cpi）
2014.06	99.0	95.9	99.8
2014.07	99.6	97.7	99.9
2014.08	99.7	96.0	99.6
2014.09	99.5	96.5	99.5

The calculation method based on the web crawler is feasible

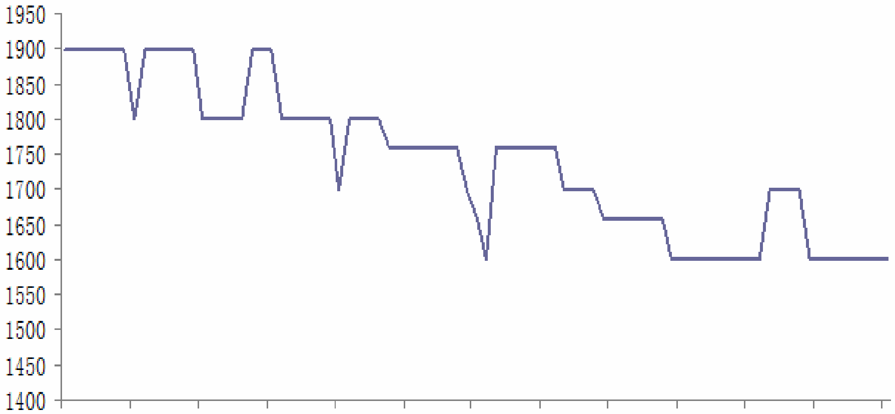
1.The calculation method based on the web crawler is feasible.

2.Why is it that data from scheme 2 is obviously lower than that from scheme 1 and official data?

Take the cell phone for example. The prices of those popular phones like iPhone5S are high and stable for a long time while those small brands try to occupy the market by reducing prices rapidly. Regardless of the equal weight , the price reducing effect is enlarged, resulting in data distortion.



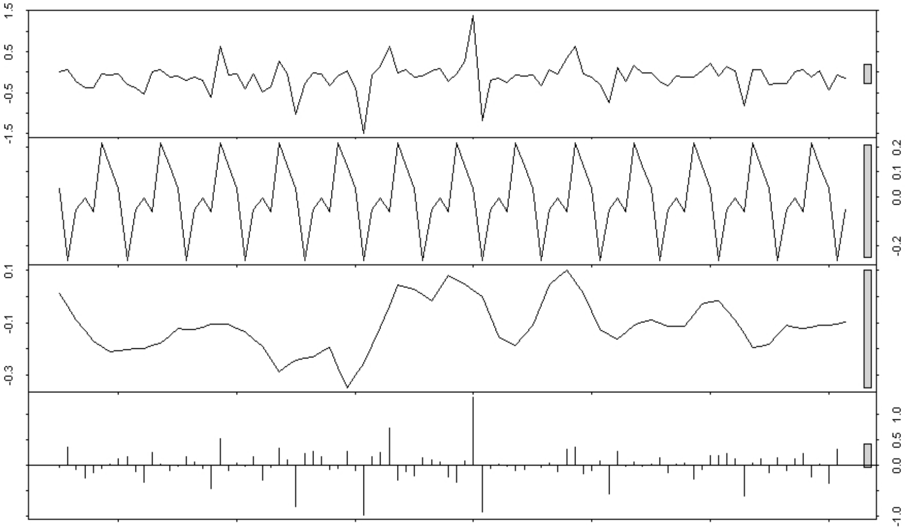
2014.05-2014.09 iPhone 5S



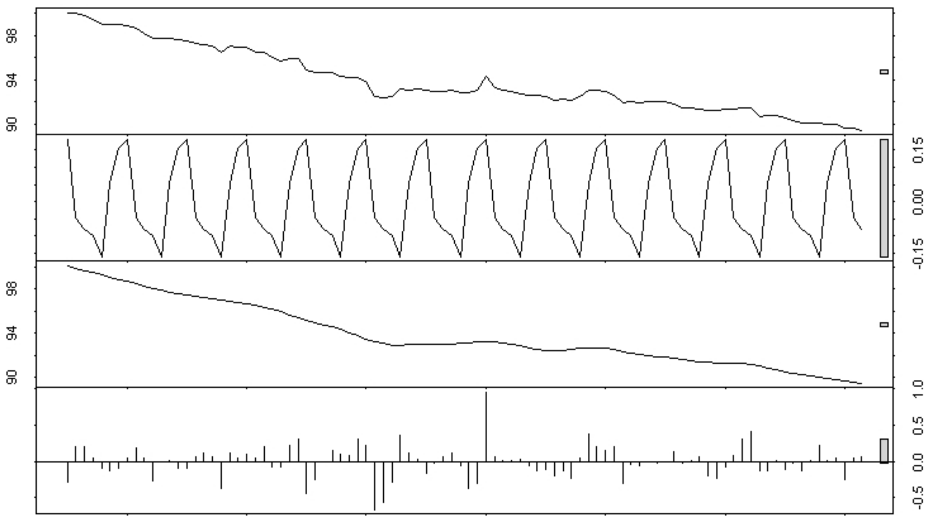
2014.05-2014.09 HTC D816W

Price fluctuation can be observed within shorter period of time

Seasonal adjustment（one week） used by STL method



Index data （last day =100） in scheme 2
Index data(last day =100) = seasonal data + trend data + remainder data



Fixed base price number(2014.05.11=100) in scheme 2
Fixed base price number = seansonal data + trend data + remainder data

1. Similar to the " weekend effect" in traditional retailing, the targeted E-commerce companies have regular sales activity in a week, which is also in accordance with the original data analyzing.

2. The fact that cell phone prices are going down is obviously observed through fixed base index of price in scheme 1 and scheme Two.

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Advantages

- Official statistical department could widen price-collecting methods through web crawler technology (no legal issues).

- Compared with price-collecting in field, web crawler technology saves time and labor, achieving all-sided statistics.

- Price fluctuation can be observed within shorter period of time

disadvantages

- **How to distinguish real transaction ?**

  - Sales online may involve returns of goods and the real sales volume could be negative. Sometime, it is not representative in statistical sense

  - **How to deal with the problem of representativeness?**

Less is More!The current basic class-index-number calculating method is equal weight . Take all the goods into calculating, weight must be considered otherwise representativeness is lost.

Thank You！