Collecting Clothing Data from the Internet

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Aim of the paper

Our aim is to describe Statistics Netherlands' experiences with the collection of prices on clothing items from the Internet for CPI purposes

We do not compare different approaches to estimating price indexes for clothing nor do we propose a particular method (though we do present tentative index numbers)

Outline

Background

Data collection via web scraping (‘Internet robots’)

Dynamics of items observed

Classification

Tentative price index numbers

Issues and risks

Conclusions

Background

Potential advantage of online data

Efficiency - collecting prices by visiting stores is costly

Other potential advantages

Inclusion of online purchases – currently not well covered

Extending sample sizes (‘big data’)

Higher frequency of price observation

Biggest disadvantage

Data on quantities/expenditure unobservable

Background

Pilot project

Clothing only

Single retailer “S”- has also many physical stores across the Netherlands

Both prices and some characteristics are observed through web scraping

Note: more Internet robots running – largest web store, various housing websites

Web scraping

Information on website of “S”

Item prices

Short item descriptions

Long item descriptions and photos

Web scraping strategy: visit as few web pages and use as little information as possible

will make software robust against website changes

makes software administration simpler

reduces ‘respondent burden’ (web server requests)

Web scraping

Data extracted

ID: unique web address of item

Type: information on ‘department’ (women, men, children)

Name: item name; not necessarily a unique identifier

Short description: item description, used for classifying

Price: ‘offer’ price of item

IDs are unique identifiers and stable across time

Some data cleaning needed

Web scraping

Daily observation (early in the morning)

Start: 31 January 2012

Data is still being collected

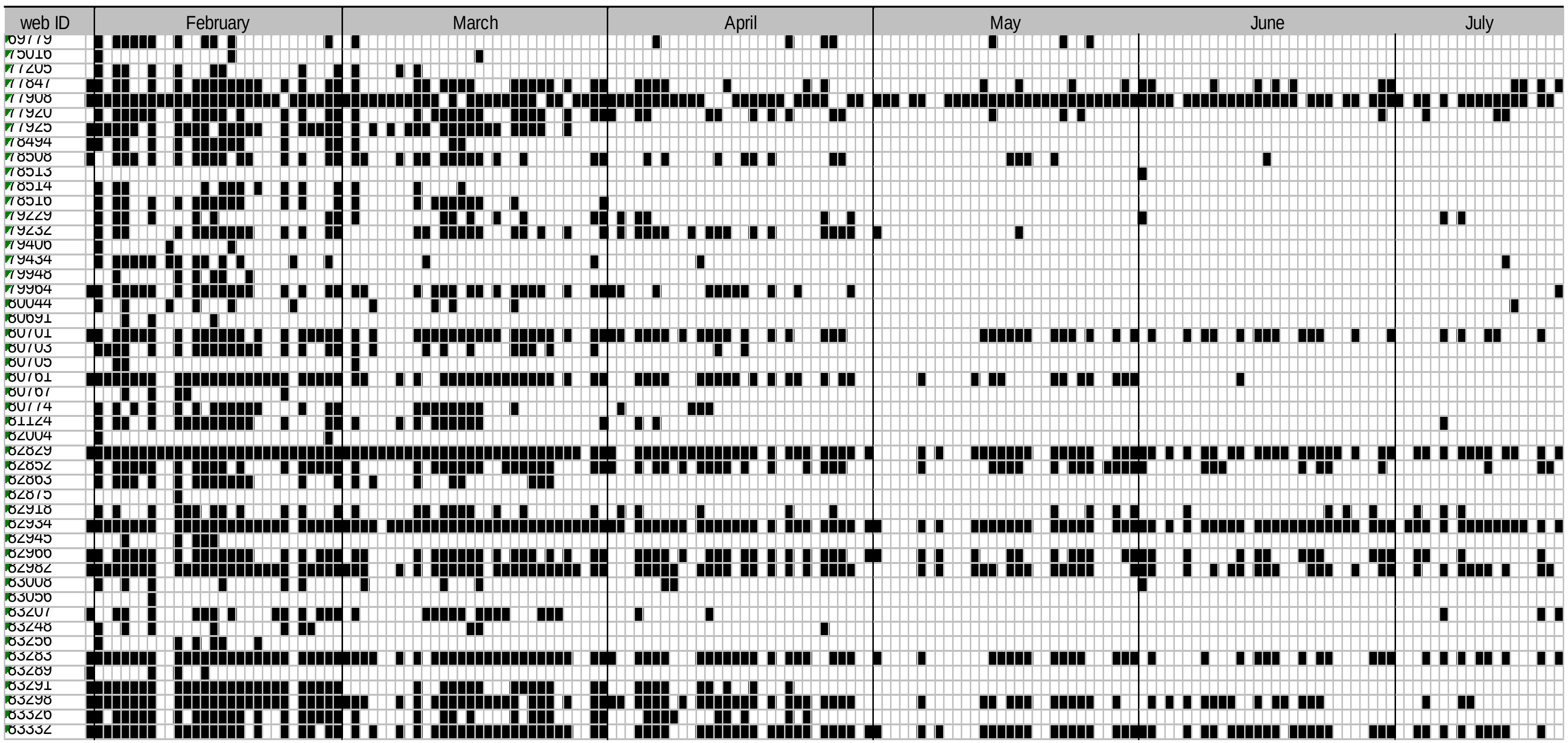
Robot needed fixing 10 times because of website changes;

3 major changes (repair took us almost two days)

Experiences led us to build in standard checks during data collection (rather than checking for errors afterwards)

Dynamics of items observed

Selection of items observed daily (February – July 2012)



Dynamics

Most items observed during a relatively small number of days

items may be temporarily out of stock, or

they can still be purchased but have been replaced by similar items, perhaps with a different color

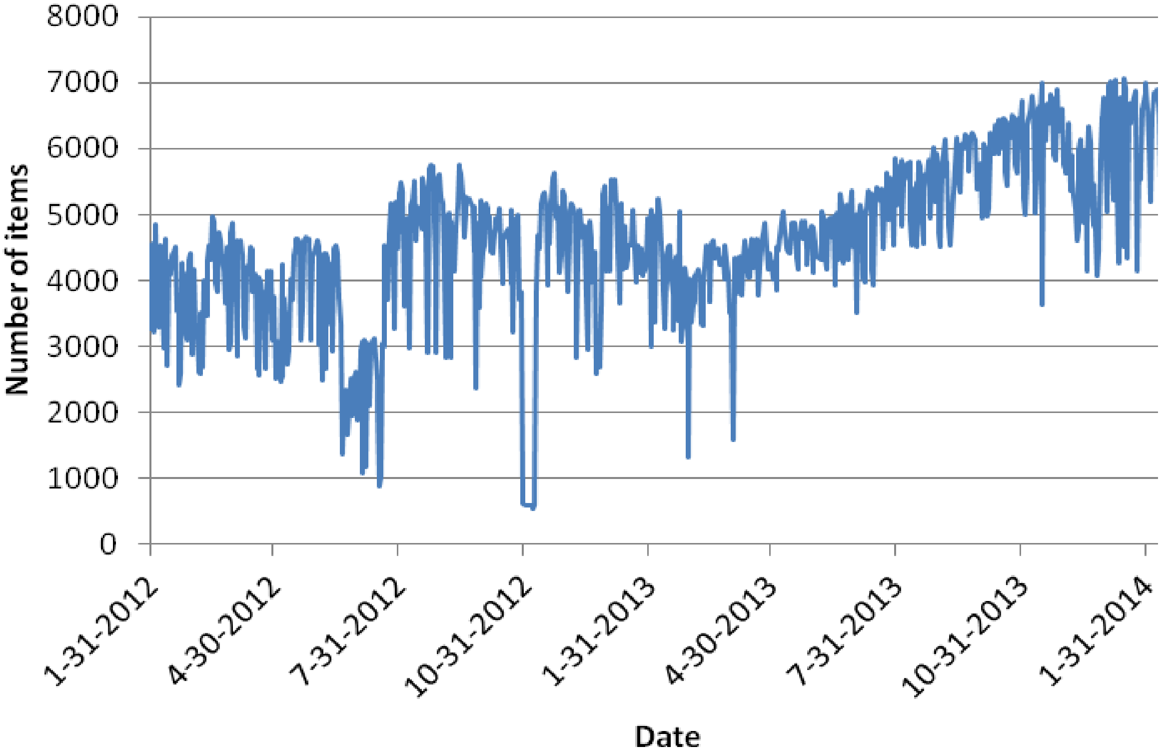
In general:

Set of items observed can be affected by the way in which the robot navigates through the website, so ….

…. it is not necessarily true that via web scraping we observe the entire population of items available

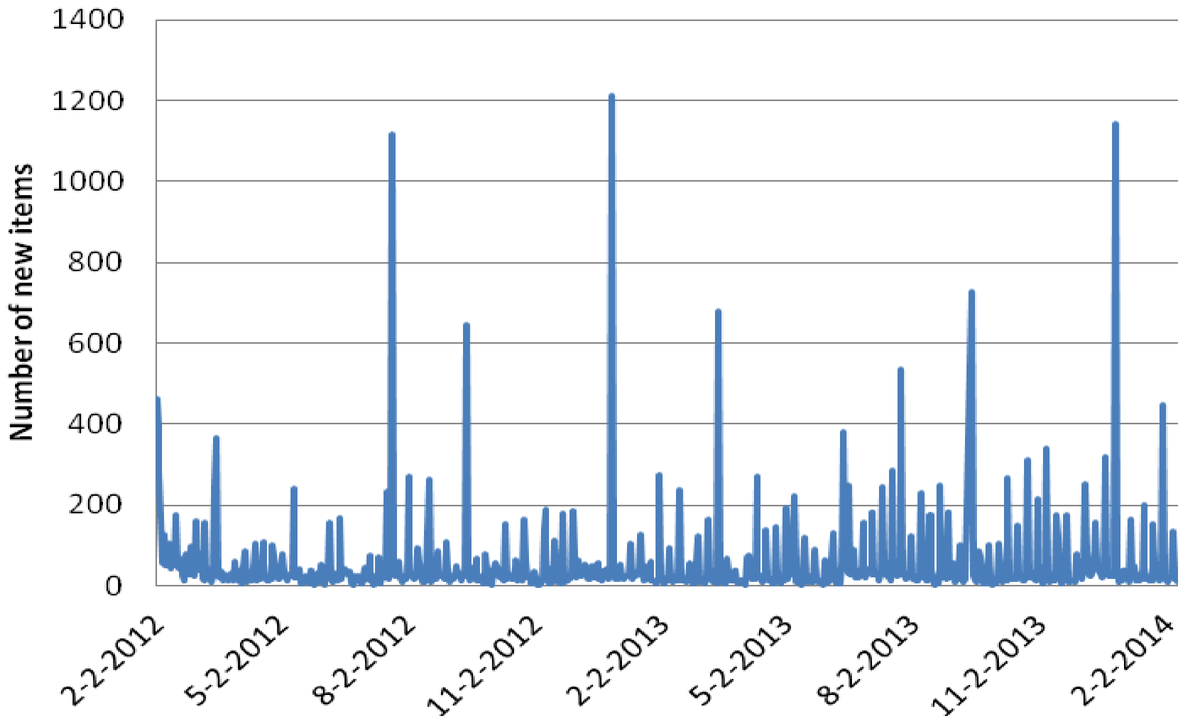
Dynamics

Daily number of items observed



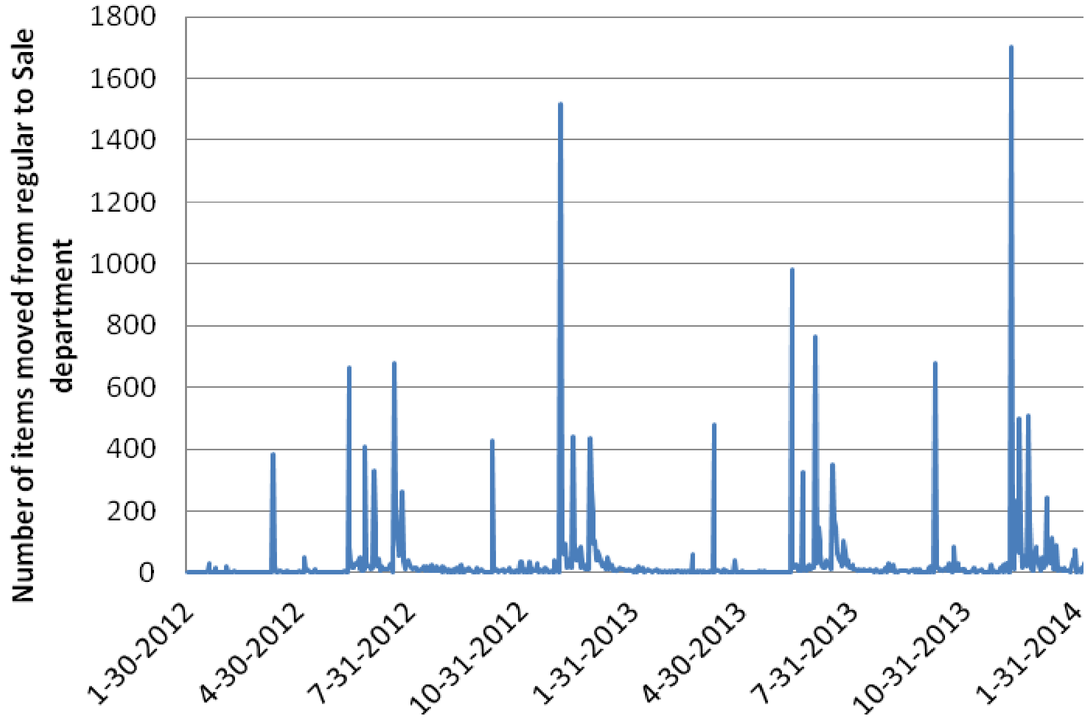
Background

Daily number of 'births'



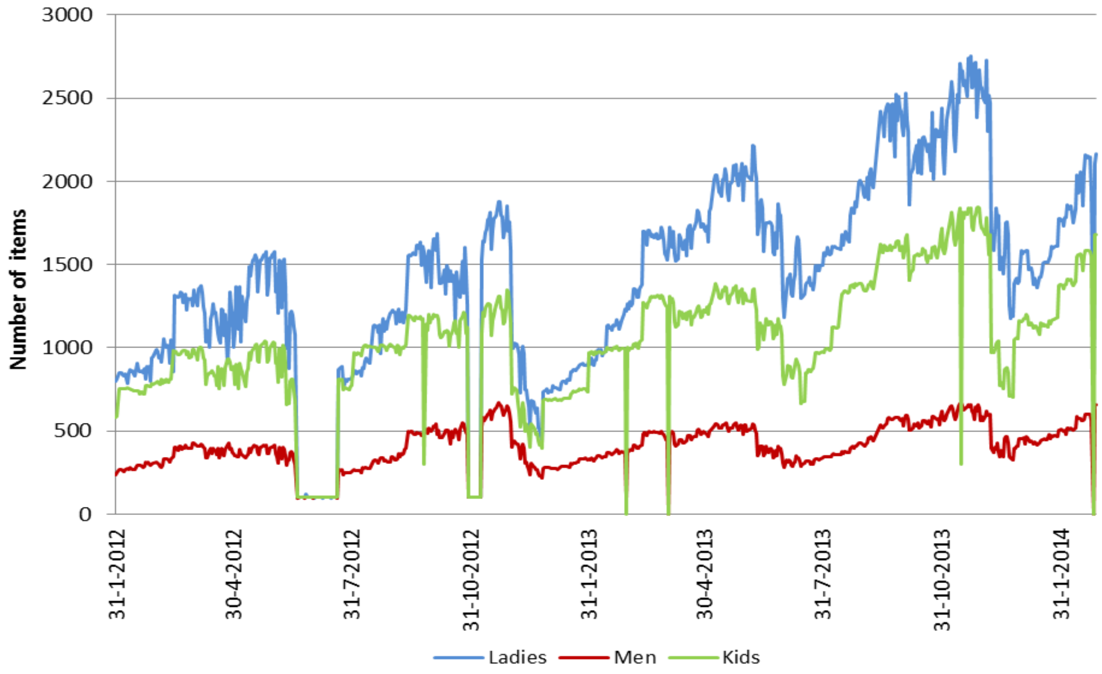
Background

Daily number of 'regular items' that become 'sales items'



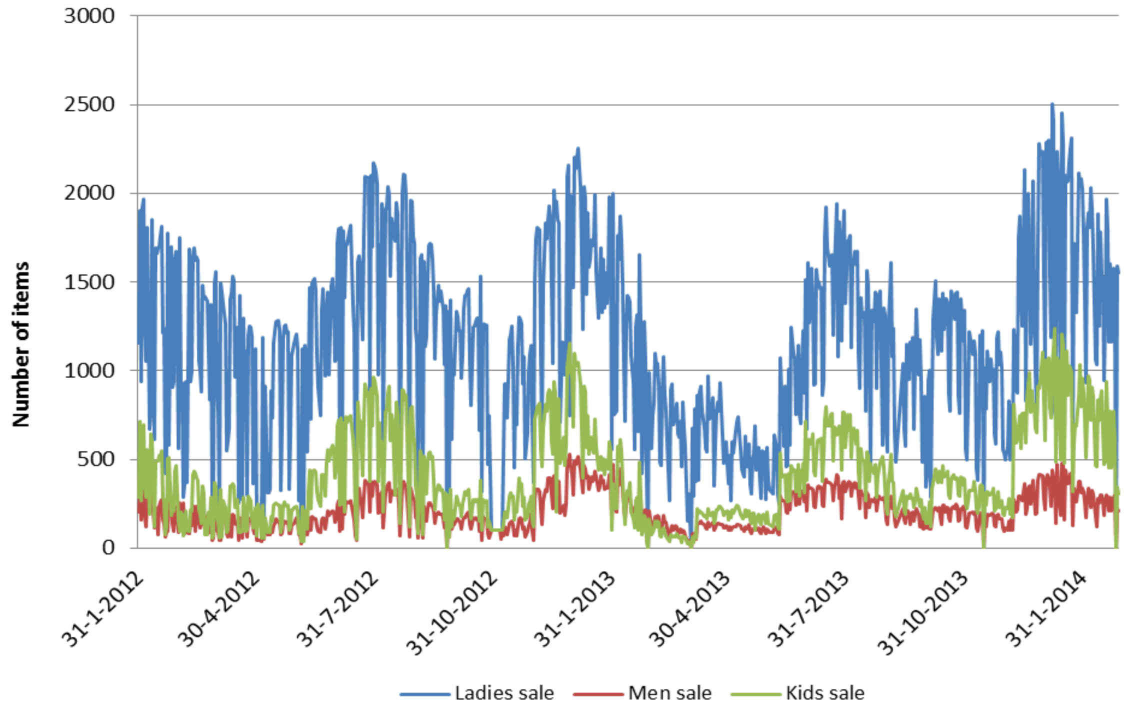
Dynamics

Daily number of ‘regular items’



Dynamics

Daily number of 'sales items'



Dynamics

Summary of findings

The robot currently does not observe the entire collection on a daily basis

Number of items observed fluctuates substantially from day to day

As expected, the number of regular items and that of sales items exhibit a seasonal pattern

Sales periods as identified on the website correspond to sales periods observed in physical shops

Classification

Classification system for clothing was developed

automatic coding; 98% correct matches

using short item descriptions

should apply to any (web) store

similar breakdown for each ‘department’; matrix structure

Further breakdown possible by using long item descriptions

lot of work; cannot be read and processed directly

might be store-specific

Classification

More detailed classification

Will increase homogeneity, but ….

…. can become unstable over time: many new and disappearing product categories

Collecting additional information (using long item descriptions) still useful

to control for compositional change, or more generally

to control for quality change using hedonics or otherwise

Tentative monthly price indexes

Elementary index numbers calculated at lowest level of existing classification, e.g. for women's tops, men's jeans, girls' dresses, men's jackets

Ratios of unweighted average prices – daily observation, so items that are observed more frequently within a month have a bigger weight

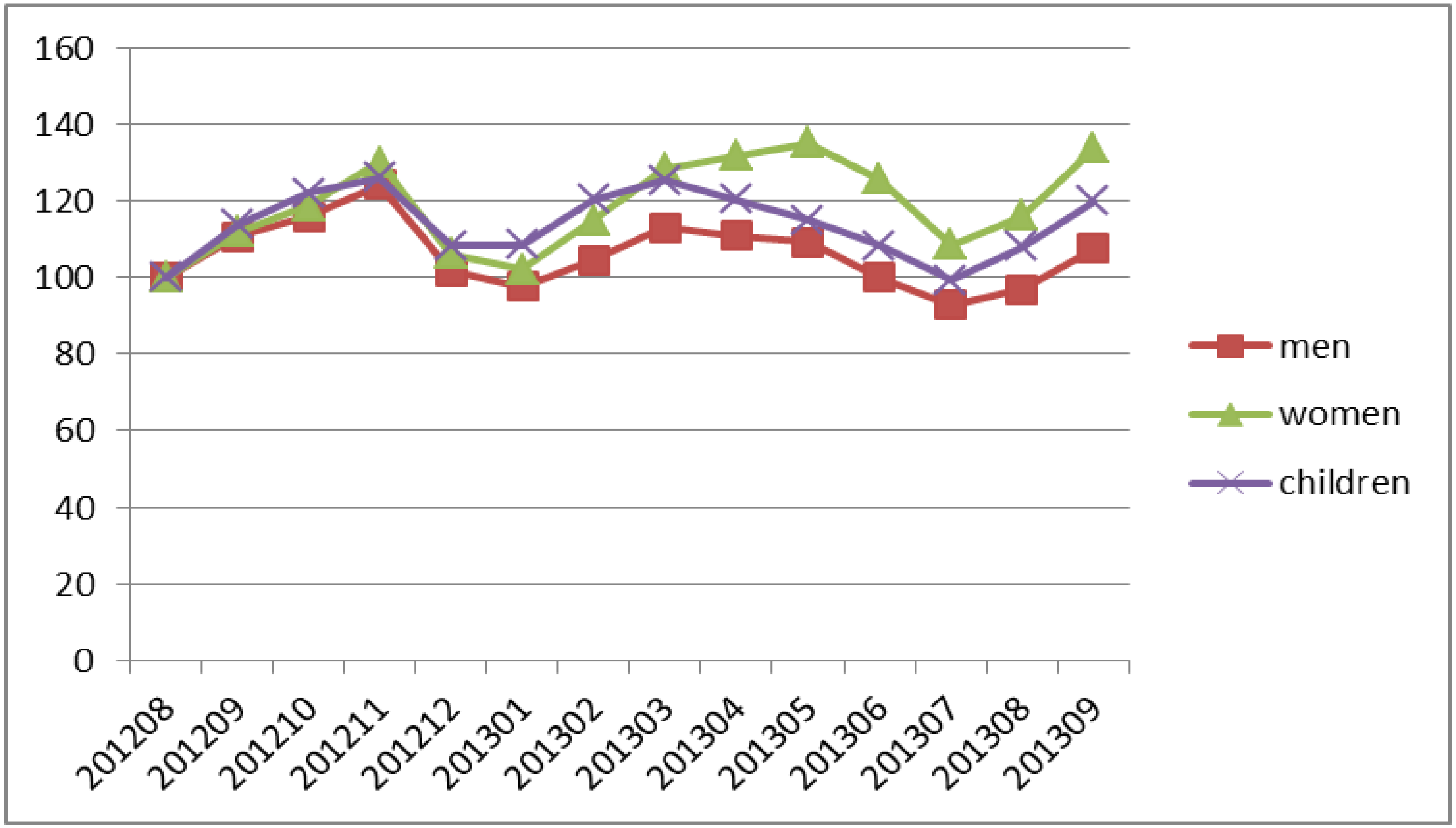
[simulation with using only data from three Mondays each month were very similar]

Upper level aggregation: fixed annual weights from external source

Indexes at department level exhibit a seasonal pattern

Tentative monthly price indexes

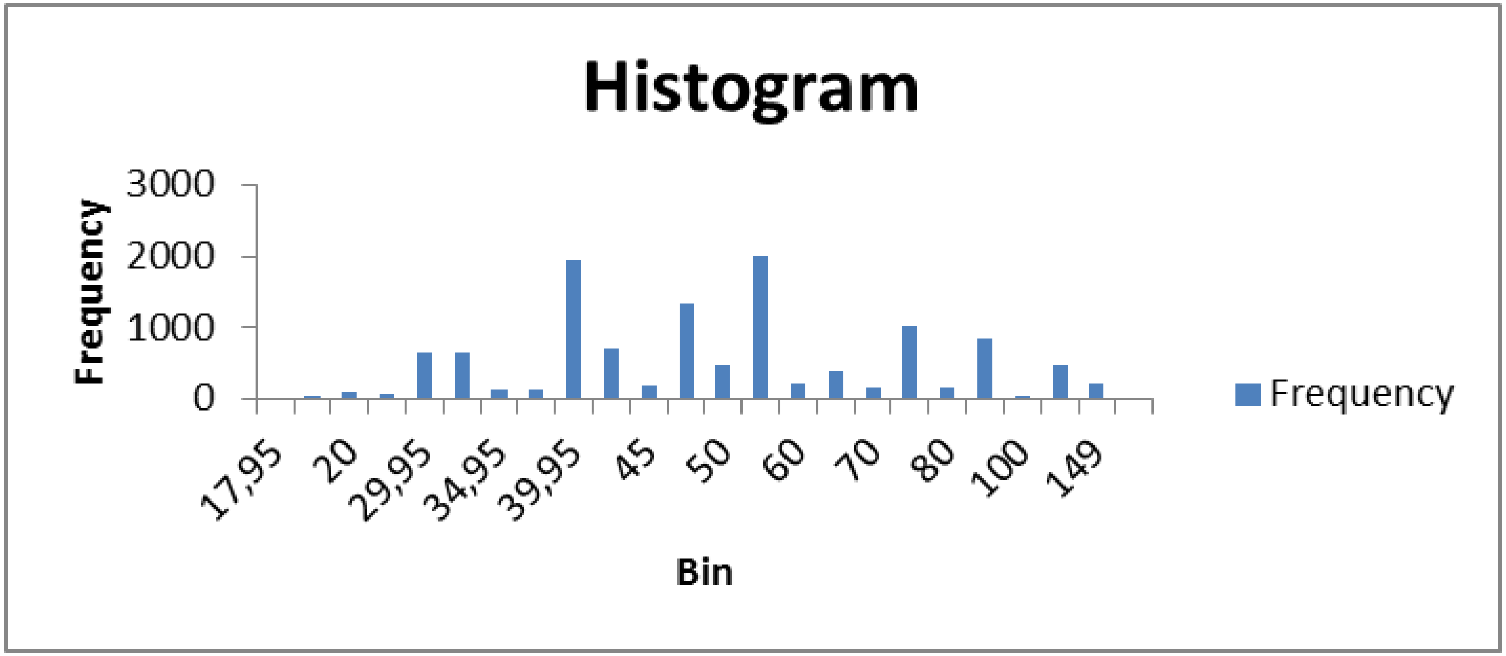
Price indexes for three departments



Tentative monthly price indexes

Elementary aggregates not homogeneous!

Frequency distribution of prices for men’s jackets



Issues and risks

Methodological issues

Potential representativity issue as not all items are observed on a daily basis

Less important on a monthly basis

Collection in physical stores could be a subset of the collection shown on website (though not for “S”)

Does an average of daily price observations approximate a unit value including both regular and sales prices?

Impossible to check because scanner data for “S” is unavailable

Issues and risks

Additional information on characteristics required to refine classification or to adjust for compositional/quality change

> However, information needed possibly depends on method chosen:
>
> ‘Big data’ and hedonic quality adjustment versus small samples and manual item selection / quality adjustment

Prices information on website tends to be ‘correct’ (though some data checking is always useful)

Issues and risks

Potential risks of data collection via web scraping

Changes in structure of the website that affect information needed for navigation or data extraction

Retailer may close its website for the robot, e.g. when web scraping adversely affects the website’s performance

> Good working relationship with the retailer should prevent this

Conclusions

Main advantages of web scraping

Low collection costs

Use of ‘big data’ to circumvent small sample problems

Data quality tends to be good

Some characteristics can be easily observed

Main disadvantages

No weighting information

Characteristics information may be insufficient

Website changes can lead to data problems

Choice of web scraping strategy affects data observed