ISSS608 Visual Analytics Project

Money No Enough:

A Deep Dive into Singapore's Shopping Basket

A Visual Exploration of Singapore's Consumer Price Index Over the Years

Impetus

A DEEP DIVE INTO SINGAPORE

- The Consumer Price Index (CPI) is designed to measure the average price changes of a fixed basket of consumption goods and services commonly purchased by the resident households over time. It is an important barometer of overall economic health and is widely used in many countries as a measure of consumer price inflation and a proxy for the cost of living.
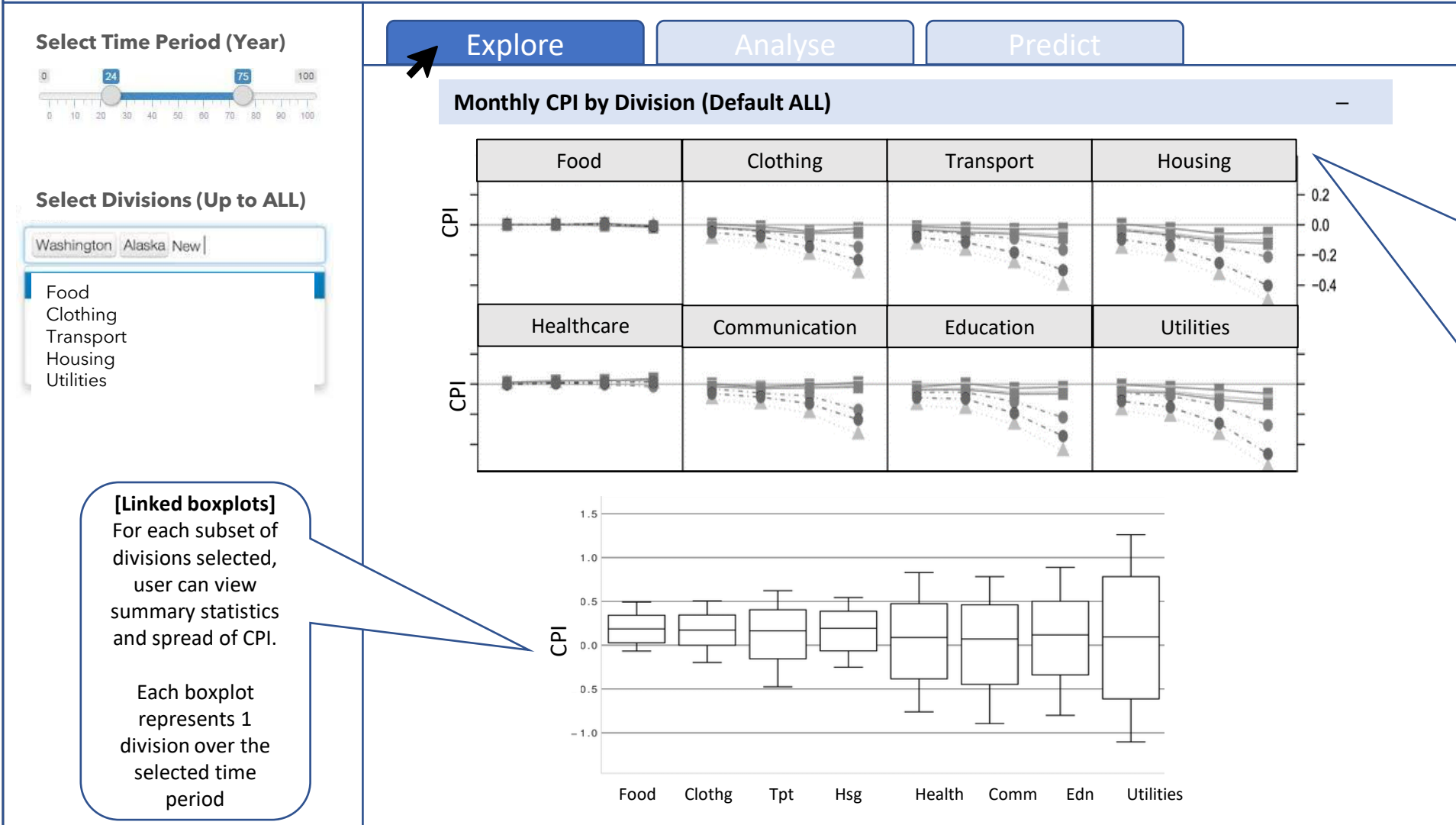
INTRO

- Over the past 2 years, the COVID-19 pandemic has severely affected the global supply and movement of goods; and affected the way people are able to access and consume services. We would like to make use of a range of visualisation techniques and visual analytics to reveal the impact of this unprecedented global crisis on the cost of living in Singapore.

- With this R Shiny, users will be able to:

  1) Explore the CPI changes in Singapore at the Division level (e.g. Food, Transport, Utilities, Housing, Healthcare) from 2012 to 2021.
  2) Visualise:
     a. Rate CPI change of different Divisions over time
     b. Changes in average retail prices of food items over time
  3) Analyse the Autocorrelation and Seasonality Effects of CPI at the Division level
  4) Predict future CPI of different Divisions

EXPLORE: HIGH LEVEL OVERVIEW OF CPI DISTRIBUTION BY DIVISION

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Select Time Period (Year)

0   24   75   100

0 10 20 30 40 50 60 70 80 90 100

Select Divisions (Up to ALL)

Washington Alaska New |

Food
Clothing
Transport
Housing
Utilities

| Explore | Analyse | Predict |

Monthly CPI by Division (Default ALL)   −

| Food | Clothing | Transport | Housing |
| Healthcare | Communication | Education | Utilities |

0.2
0.0
−0.2
−0.4

[Linked boxplots]
For each subset of divisions selected, user can view summary statistics and spread of CPI.

Each boxplot represents 1 division over the selected time period

User can explore can compare time series of different divisions.

Default view will be ALL 12 divisions and 4 years (2018-2021)

User can zoom in to different time periods or different subset of division categories by using the slider and drop down menu (multi-select)

1.5
1.0
0.5
0.0
0.5
1.0

CPI

Food Clothg Tpt Hsg Health Comm Edn Utilities

EXPLORE: VISUALISING CHANGE

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Select Time Period (Year)

Explore	Analyse	Predict

Percentage Change of Monthly CPIs   —

Label

📅 Select Division ▲

Food
Clothing
Transport
Housing
Utilities
.
.

User can select multiple Divisions to **view rate of change** of CPI for those Divisions over the time period

Avg Price of Selected Retail Item   —

📅 Category ▾

📅 Select Item ▾

For the sunburst, we will be using Tab 2: **Average Retail Prices Of Selected Consumer Items, Monthly**

[Within Food Division] User can select different Categories/items to **view cyclical patterns of change for the retail price of that item** over the time period

Dec   Jan

Nov

Feb

Oct

Mar

Year	High	Low
2012	30.41	23.96
2011	26.91	22.91
2010	24.92	19.94
2009	21.86	19.42
2008	21.44	18.92
2007	23.22	18.35
2006	20.72	17.89
2005	20.88	17.04
2004	19.83	16.54

TIME SERIES ANALYSIS: AUTOCORRELATION AND SEASONALITY

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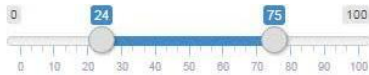
Explore | **Analyse** | Predict

Correlation Analysis −

Select Primary Category

Washington Alaska New |

- Food
- Clothing
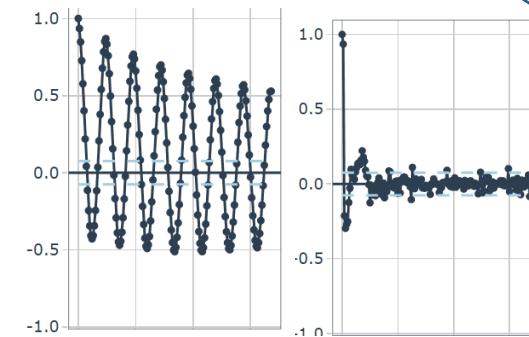- Transport
- Housing
- Utilities

Select Time Period (Year)

0 ... 24 ... 75 ... 100

Selected Item Category

Auto & Partial Correlation

Analyse relation between selected category's current value vs past values Partial Correlation controls for other lags

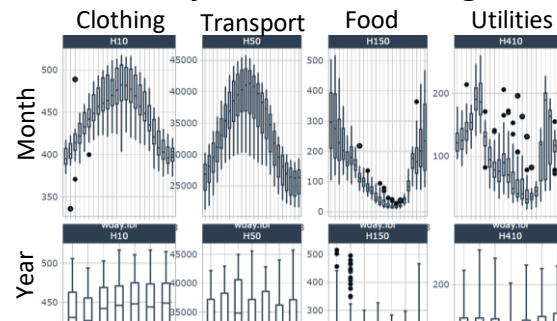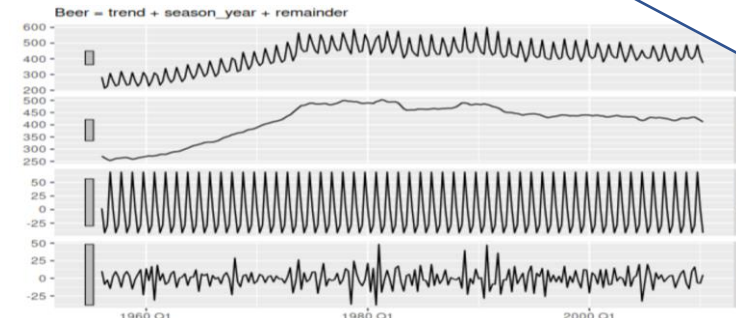### Seasonality Analysis −

Select Comparables (up to 3)

Washington Alaska New |

- Food
- Clothing
- Transport
- Food
- Utilities

Compare impact of seasonality on different category types e.g. clothing vs transport

Seasonality of different categories

Clothing   Transport   Food   Utilities

Month

Year

Seasonal and Trend Decomposition

Beer = trend + season_year + remainder

Decompose time series to separately observe the "season" and "trend" components from the "observed" values leaving the "remainder".

TIME SERIES ANALYSIS: FORECASTING

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Explore   Analyse   **Predict**

Select Time Period (Year)

0   24   75   100
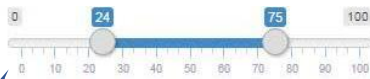
Forecast CPI (ALL)

Forecast Plot

Legend
- ACTUAL
- 1_ARIMA(0,2,1)
- 2_ARIMA(0,2,1) W/ XGBOOST ERRORS
- 3_ETS(M,N,N)
- 4_LM
- 5_EARTH

Observe changes in predictions based on different time periods used View forecasted data up to selected end date
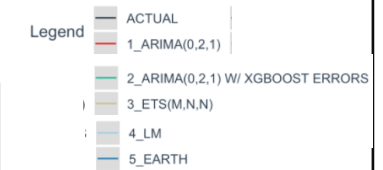
Forecast selected category —

Select Category

Washington | Alaska | New
- Food
- Clothing
- Transport

Select Forecast Model

Washington | Alaska | New
- ARIMA
- LM

Forecast Plot

Legend — ACTUAL — 1_ARIMA(0,2,1) W/ XGBOOST ERRORS

Accuracy Table

.model_id	.model_desc	.type	mae	mape	mase	smape	rmse	rsq
1	ARIMA(0,2,1)	Test	1.18	23.86	16.75	20.69	1.34	0.39
2	ARIMA(0,2,1) W/ XGBOOST ERRORS	Test	1.58	31.77	22.43	26.81	1.70	0.39
3	ETS(M,N,N)	Test	0.47	9.55	6.69	9.01	0.53	NA
4	LM	Test	2.05	40.22	29.04	50.45	2.06	0.39
5	EARTH	Test	3.17	63.55	44.93	46.38	3.44	0.42

Choose best model for selected category based on accuracy