Retail Debit Card Usage in Iceland (Time Series)

1)Data Source: fme package

2)Introduction:

Card use in Iceland is the highest in the world, reflecting the extension of card payments into new areas.

As there is no gyro system, cards take the place of direct debits for recurring payments.

3)Dataset Description:

Monthly data of Retail debit card usage in Iceland

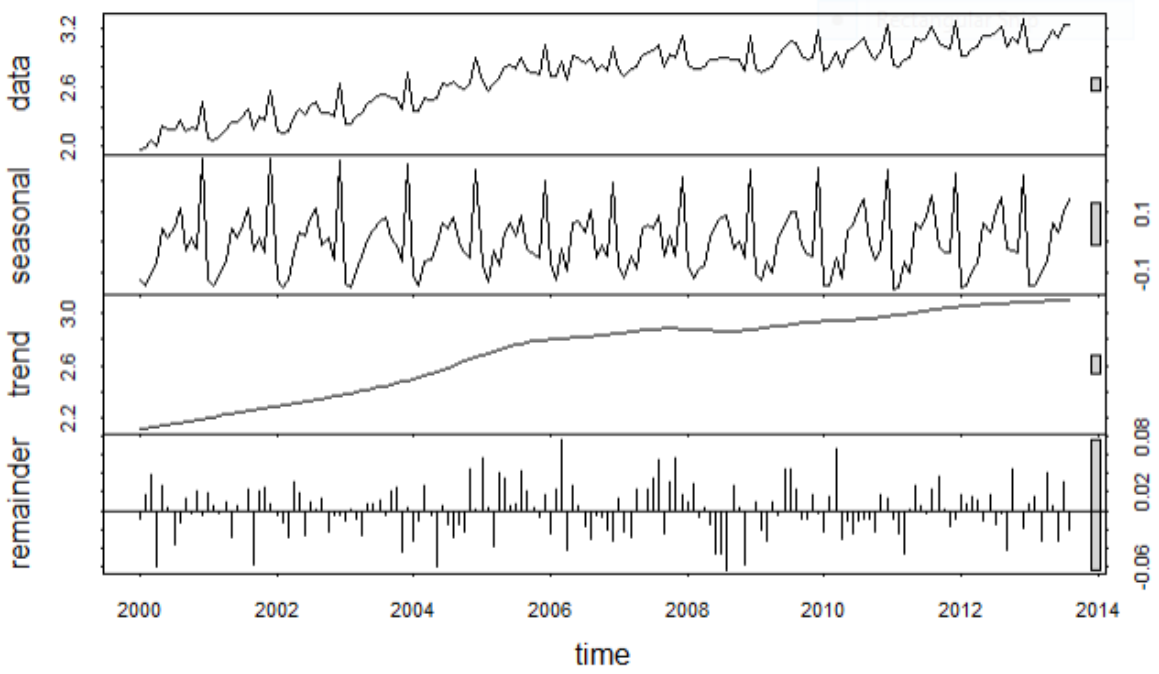
Data Time frame: January 2000 to December 2012, 13 years monthly data

4)Aim:

Our aim is to find the best suitable model for forecasting the retail debit card usage in Iceland

5)Decomposition:

In order to get a better understanding of the trend and seasonality we decompose the data



Observations after decomposing the data:

a) Data contains trend and seasonality

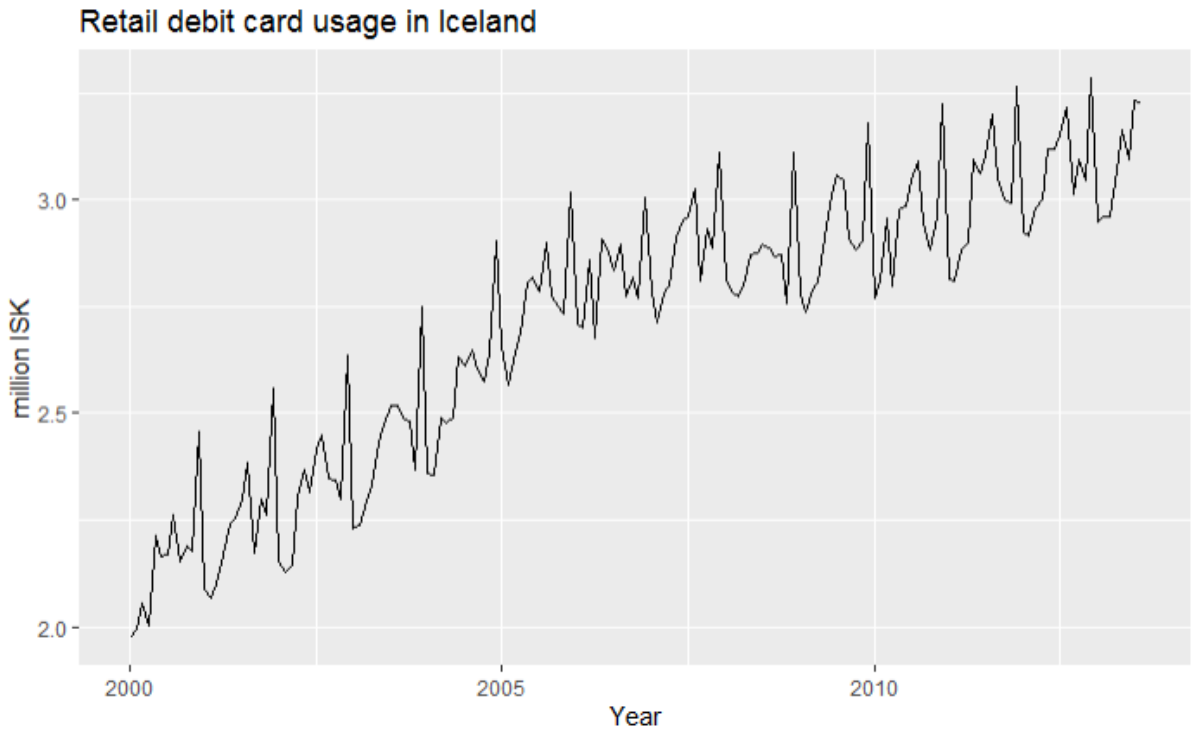
b) In the Retail debit card usage, variation in the seasonal pattern appears to be proportional

to the level of the time series which indicates multiplicative model is more appropriate.

6)Exploratory Analysis:

Simple Plot: Plotting the time series data

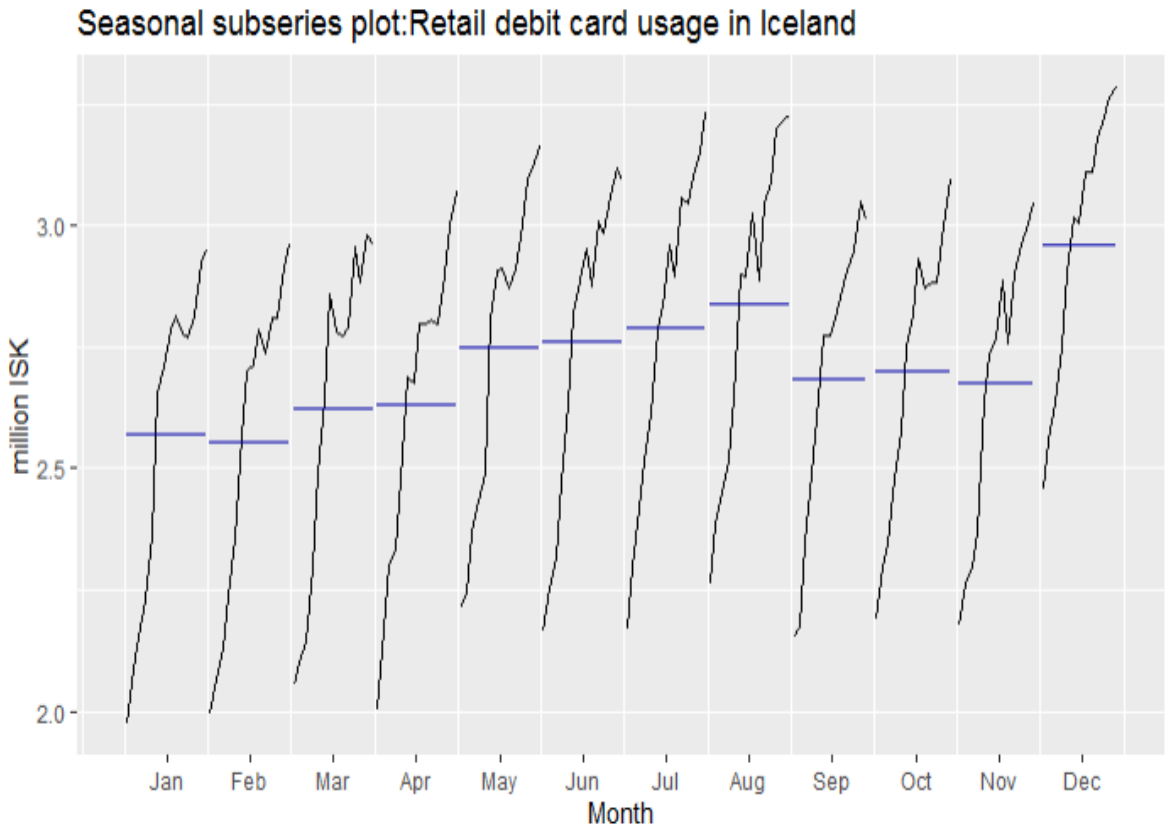
We observe an upward trend from the plot



a) Seasonal Subseries Plot:

We observe an upward trend in each month over the years with occasional troughs

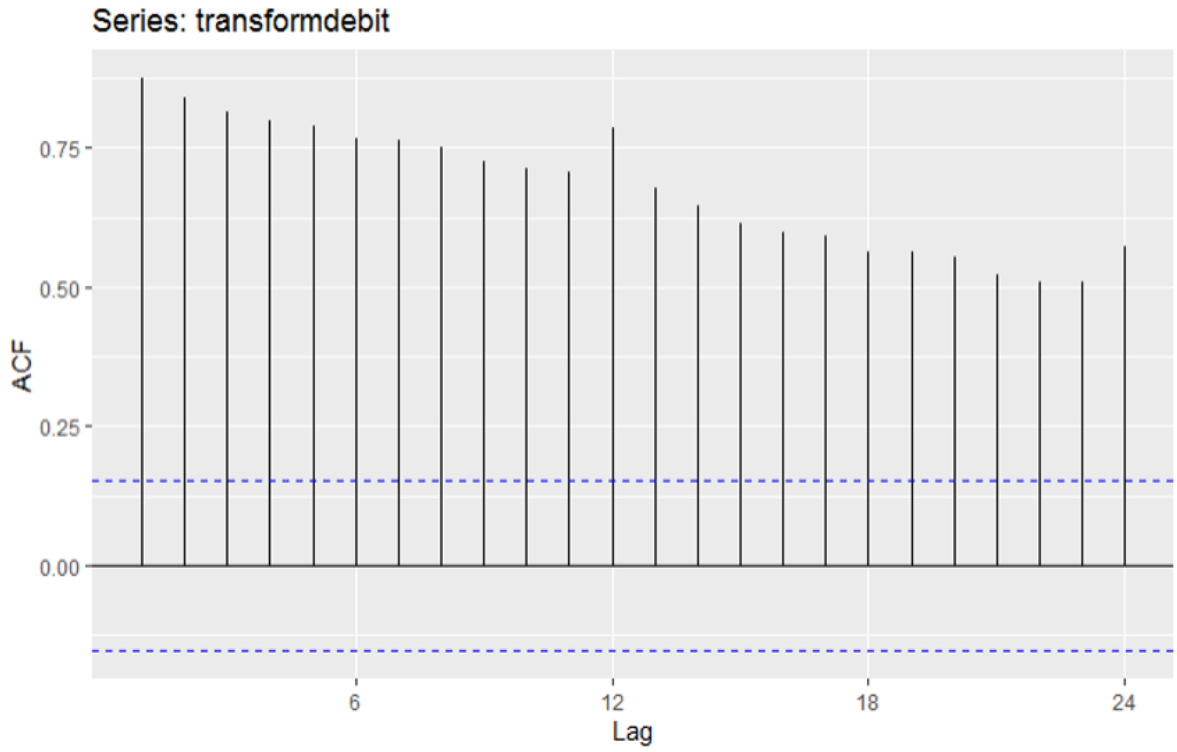
With December having the highest average usage



b) Correlogram:

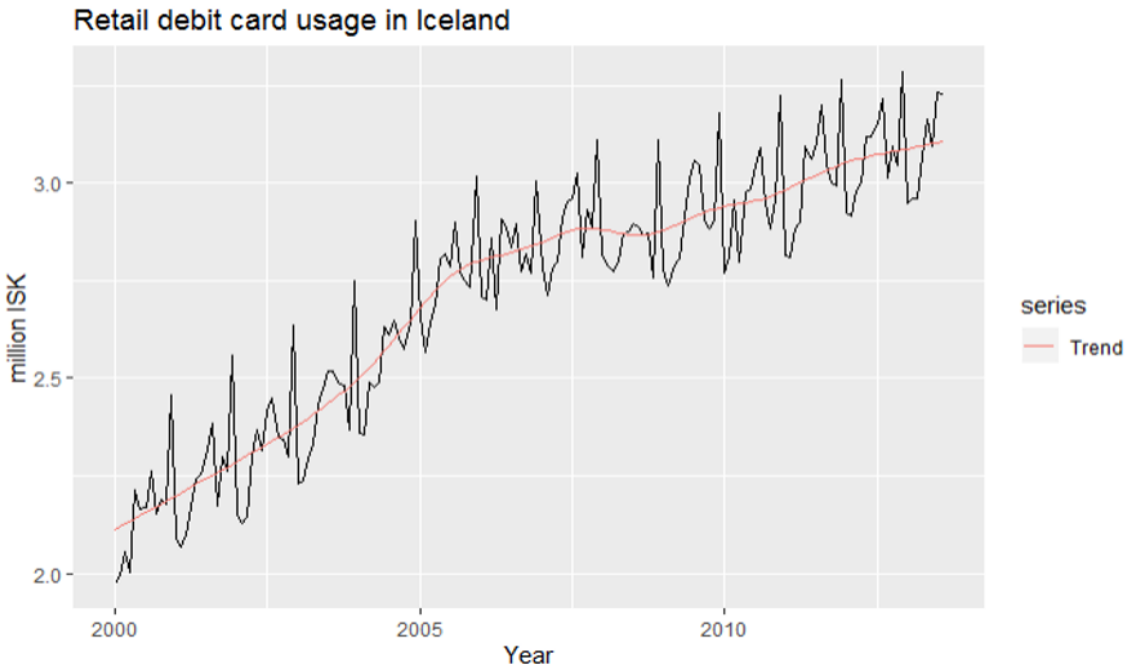
Correlogram indicates Strong Auto correlation.

It also indicates trend and seasonality.



c) Estimating the trend

Plot decomposed data on the original data to see the trend



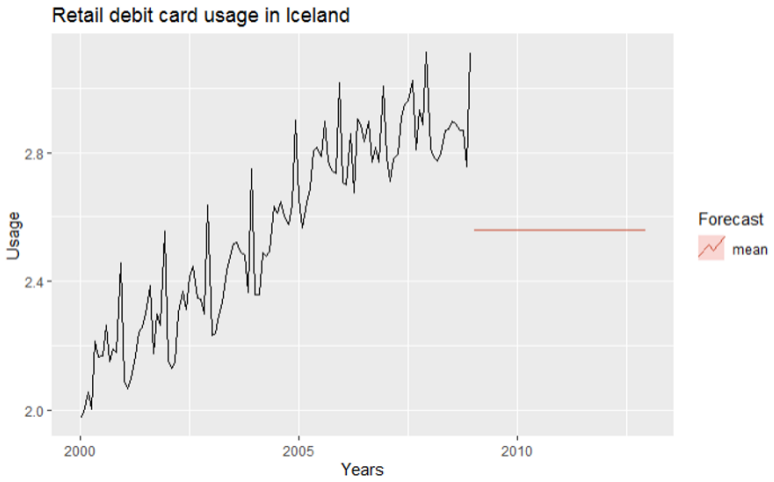
Train and Test:

- **Training data is used to estimate any parameters of a forecasting method.**
- **Test data is used to evaluate its accuracy.**
- **70% of our data to train the model and 30% to test the accuracy of the forecasts.**
- **Training data contains information from 2000 January to 2008 December.**
- **Test data contains information from 2009 January to 2012 December.**

Forecasting Methods

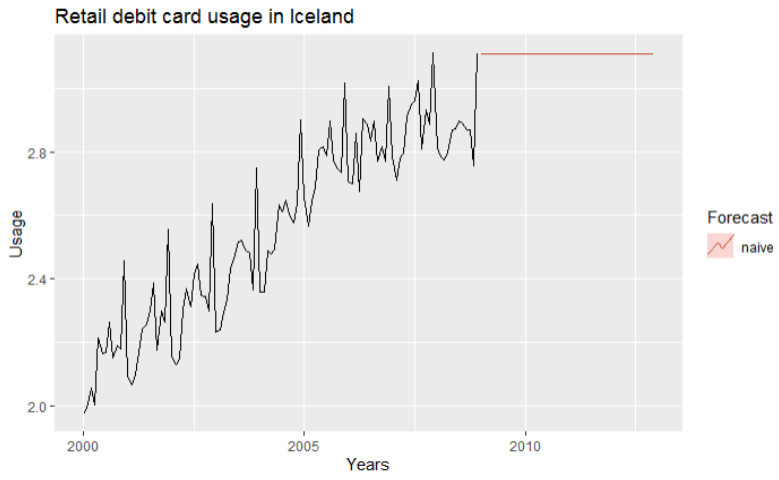
- **Average Method**
- **Naïve Method**
- **Snaive Method**
- **Drift Method**
- **Holt's Winter Method**
- **Arima Model**

a) Average Method



b) Naïve Method

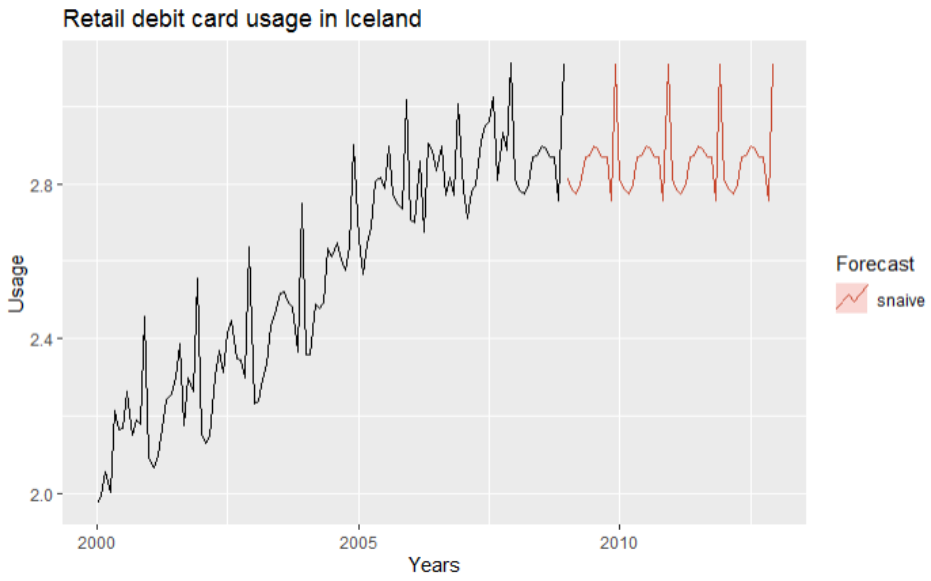
Since our data is not stationary, we apply Naive



c

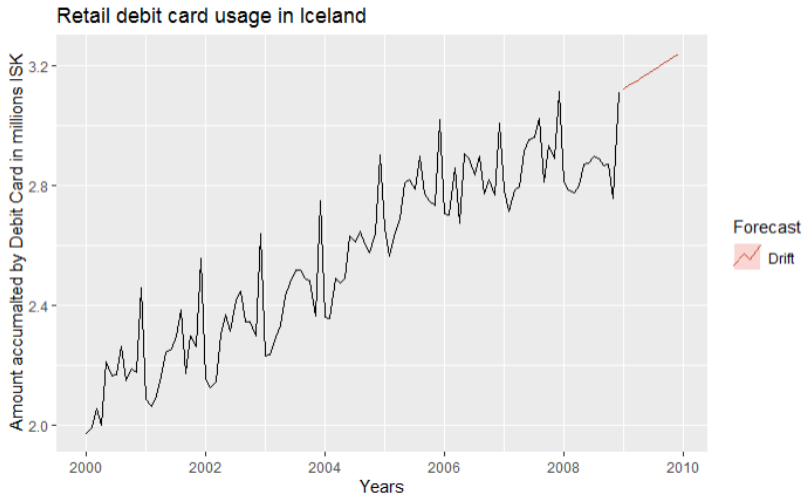
c)Seasonal Naïve Method

Since our data indicates Seasonality, we apply Seasonal Naive



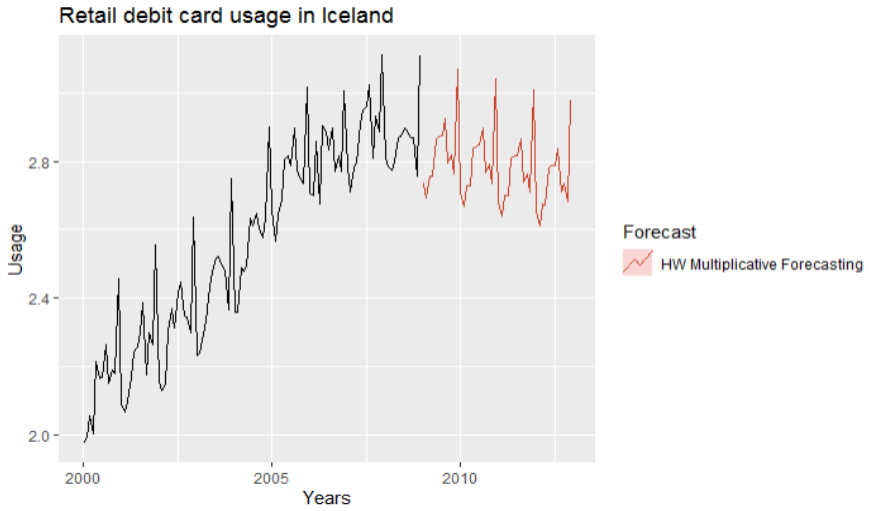
d) Drift Method

Forecasting by considering the amount of changes over the time



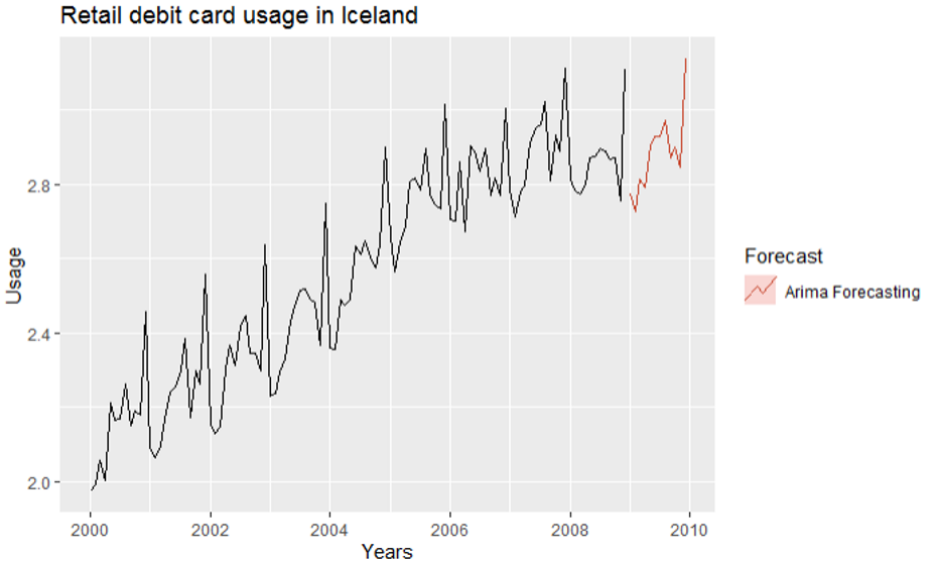
e) Holt's Winter Method

- **Since our data shows trend and seasonality, we apply Holt's winter method**
- **Variation in the seasonal pattern appears to be proportional to the level of the time series so we implemented multiplicative seasonality**



Arima

Since correlogram indicates strong auto correlation we apply Arima model



Conclusion

	ME	RMSE	MAE	MPE	MAPE	MASE	ACF1
Mean	0.4293887	0.4509969	0.4293887	4.32003249	4.320032	4.230253	0.3552437
Naïve	-0.12044462	0.1831133	0.1523619	-1.2366019	1.551399	1.5010398	0.3552437
Snaive	0.13028779	0.1612929	0.1355365	1.3063265	1.360615	1.335279	0.5477297
Drift	-0.2615186	0.281636	0.2615186	-2.67550613	2.675506	2.5764297	0.3756595
HWM	-0.020333003	0.05160896	0.04120125	-0.20614981	0.4163472	0.4059066	0.2924327
Arima	0.033700867	0.05492407	0.04099531	0.33924645	0.4141234	0.4038777	0.43069321
	-0.2615186	0.05160896	0.04099531	-2.67550613	0.4141234	0.4038777	0.2924327