Descriptive and Predictive analytics with customs data: Case of Republic of North Macedonia

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Zoran Gligorov M.Sc

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1. Types of Big Data Analytics:
   - Descriptive analytics
   - Predictive analytics

2. Descriptive analytics:
   - MFN tariff rates
   - Preferential tariff rates

3. Predictive analytics:
   - Seasonal Naïves
   - Exponential smoothing
   - Autoregressive integrated moving average-ARIMA

4. Conclusions
1. Types of Big Data Analytics

Big data is defined as collections of datasets whose volume, velocity or variety is so large that it is difficult to store, manage, process and analyze using traditional databases and data processing tools (Prajapati, 2013)

Big data definitions (evolution):
- 3Vs (Volume, Velocity and Variety)
- 4Vs (Volume, Velocity, Variety and Veracity)
- 5Vs (Volume, Velocity, Variety, Veracity and Value)

Types of Big Data Analytics

- Descriptive analytics
- Predictive analytics
### Descriptive analytics

Simple average MFN tariff rate 8.6%

#### Descriptive statistics of MFN tariff rates

<table>
<thead>
<tr>
<th>Description</th>
<th>Agricultural products</th>
<th>Non-agricultural products</th>
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<tbody>
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2. Descriptive analytics

Histogram of MFN tariff rates by HS division
# 2. Descriptive analytics

## Descriptive statistics of MFN tariff rates

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*Definition of groups used from World Tariff Profiles 2018*
2. Descriptive analytics

Box-plot of MFN tariff rates
2. Descriptive analytics

Simple averages preferential tariff rates: EU-3,1%, EFTA -3,9%, Turkey 4,2% and Ukraine 4,2%

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2. Descriptive analytics

Histogram of preferential tariff rates by HS division
2. Descriptive analytics

Descriptive statistics of preferential tariffs with EU

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2. Descriptive analytics

Box-plots of preferential tariff rates
3. Predictive analytics

Automated forecasting with data-driven methods:
- Seasonal Naïves;
- Exponential smoothing and
- ARIMA.

Automated Forecasting Network with R and R Studio
3. Predictive analytics

Weekly revenue collection (VAT import, Gross Excise and Customs duties)
3. Predictive analytics

Snaive forecast
3. Predictive analytics

Exponential smoothing forecast
3. Predictive analytics

ARIMA forecast

ARIMA VAT IMPORT forecast

ARIMA EXCISE GROSS forecast

ARIMA CUSTOMS DUTIES forecast
## 3. Predictive analytics

### Residuals diagnostics and Evaluations forecast accuracy

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4. Conclusions

• By using the descriptive analysis, we completely determined the nominal customs duties in the Republic of North Macedonia, according to both MFN-tariff rates and the preferential tariff rates. At the same time, we hereby concluded that the average tariff rate calculated as simple average is not the best indicator for the level of tariff rates protection, and therefore the measurement of the level of nominal customs duties should not be based solely on this measure, but for the purpose of its correct determination, it is rather necessary to take into account the other measures of the descriptive statistics as well (measures of the central tendency, measures of dispersion, asymmetry and roundness) that should be complementarily used with graphical visualization (Box-plot, Histogram etc.).

• By using the predictive analytics, we created an automated forecasting network in which we made more projections of univariate times series (VAT, Excise and Customs duties), whereby we selected the models such as: ETS (M, A, N), ARIMA (5,1,0) (0,1,0) [52] and ARIMA (1,1,1) (0,1,1) [52] respectively, based on the slightest error (RMSE), as well as the residual tests. We concluded that this approach provided us with fast and flexible manner of projecting the revenues, which is especially useful when simultaneously forecasting multiple time series, whereby the main focus is placed on evaluating the models and their errors, rather than the modeling itself.

• Finally, we can conclude that from the aspect of Big data analytics, the Ministry of Finance has already adapted its working methods and practices, so it is quite ready to welcome the new digital era that has just begun with CDEPS. New completely paperless work environment will provide much more data in a digital form and therefore a much greater opportunity to perform analyzes for the purpose of conducting sound fiscal policy.
Thank you for attention!

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zoran.gligorov@finance.gov.mk