Using Statistical Data to Better Understand Business Environment – Case Study on Export and Import Data at County Level

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ABSTRACT

Statistical data, at a low aggregate level and with high frequency, is an essential tool for business decision makers. One example in this respect is monthly data on exports and imports in thousands of EUR, at county level, provided by the National Institute of Statistics Romania. This data is not offered in a seasonally adjusted form, although most of it exhibits seasonality. This paper proposes a simple and cost-free methodology to seasonally adjust these data, making it more suitable for business decision.

Keywords: *seasonal adjustment, imports, exports, policy makers*
JEL Classification: *R15, F5*

1. INTRODUCTION

Statistical data is crucial for policy makers and also for business decisions. Nowadays, there arise more complex problems that need more complex solutions. Statistics proved to be not only valuable, but a basis for decision making (Barroso, 2011). As Keller-McNulty (2007) emphasizes, it is important not only to present the statistical data, but also to pay attention to the way the data is presented, i.e. adapted to the target audience. This may be extremely helpful for policy makers, who need well-structured data, put into a decision context by statisticians. Regarding statistical data, both public and private sectors should take into account some issues: the use of some methods

of research and analysis that used to be effective in the past, but are currently ineffective, major revisions due to data becoming gradually available, pressure from data users for timely data publication, the negative impact of rapid price change on economic data series (Duncan, 1975).

In order to be relevant, data must be at aggregated at the level of the smallest geographical unit for which it is meaningfully possible. As Straughn (2014) argues, there is a considerable demand, not only for better, but also for diversified and especially detailed statististical data in all stages of the policy-making process. According to the same author, the success of government and business policies is related to the availability and reliability of data and information. Disaggregated data leads to better forecasts and decisions, as patterns are more clearly detectable (Martinsen et al., 2014). There are more benefits of considering disaggregated information. For example, one can better understand data and identify hidden patterns by taking advantage of new methods, tools and techniques for statistical data analysis (Lau, 2014). Azzone (2018) highlights the importance of accurate and complete data in the process of supporting public policies. In general, the quality of actions depends on the quality of information (Weiss et al., 1986).

Monthly data on imports and exports according to the Combined Nomenclature is denominated in thousands of euros at county level provided by the National Institute of Statistics are very useful in this respect. Information about import and export is very important for economic development, encouraging competitiveness and innovation. For example, as Sharma and Mishra (2015) state, labor productivity improves if companies are involved in international trade. One of the reasons would be self-selection, i.e. firms should be among the most productive ones for entering export markets (Bernard et al., 2007). Dissagregated data on imports and exports provide useful information for policy makers who can create effective trade policies (Prodromidis, 1975).

Unfortunately, data on imports and exports is not presented in a seasonally adjusted form. Seasonal adjustment is very important for accurately assessing growth in these series. Systematic influences affect the analysis of these series, making interpretation of the evolution almost impossible (Australian Bureau of Statistics, 2005). Seasonal adjustment removes seasonal and calendar influences, which can alter the movements of the series (Foldesi et al., 2007). Consequently, one can compare short-term and long-term movements in this sector (Mazumder and Chakraborty, 2013).

This paper proposes a methodology for seasonal adjustment of these data that can be used by decision makers in order to better assess growth in this area. In order to illustrate our methodology, data on imports and exports for Bucharest will be used.

2. METHODOLOGY

In order to seasonally adjust this data, we used JDemetra+ 2.2, the software officially recommended by Eurostat. (the official communication in this regard can be found on the CROS portal at the following address ***https://ec.europa.eu/eurostat/cros/content/release-jdemetra-version-22-software-officially-recommended-seasonal-and-calendar-adjustment-official-statistics-eu_en*** accessed, March 13, 2018). As Buono and Ladiray (2017) point out, this software can be used in time series analysis not just for seasonal adjustment, as it can be adapted trough plugins to any needs. JDemetra+ 2.2 is freely available on GitHub.

Firstly, we assessed the presence of seasonality in these series. Although, JDemetra+ 2.2 offers a wide variety of tests in this respect, the CFA Institute recommends detecting seasonal patterns through studying autocorrelations at seasonal lags (CFA Institute, 2016). Consequently, the autocorrelation at seasonal lags test will be used for identifying seasonality.
Secondly, one must note that calendar adjustment is an essential component in the overall seasonal adjustment process (Eurostat, 2015).Therefore, we defined a national calendar for Romania, using all the legal holidays, including the Julian Easter.

Thirdly, we used the automatic procedure built into Tramo-Seats. JDemetra+ offeres built-in specifications for two of the most used statistical packages for seasonal adjustment: Tramo-Seats and X13 (Grudkowska, 2015). Based on the literature review comparing these two packages performed by Mirica et al. (2016), it can be stated that Tramo-Seats offers more flexibility, especially when modelling series with a large irregular component. Before running the automatic procedure, we customised for calendar the most complex specification in this package, RSAfull (Grudkowska, 2015).

3. RESULTS

As one may observe from table 1, 68 series out of 114 series on imports (approximately 60%) present seasonality. Moreover, 35 out of 114 series on exports (approximately 30%) present seasonality. For these series, the automatic procedure built-in in the RSAfull customised for the Romanian calendar can be used. As not all the series are affected by seasonality, we will assess only the quality of the seasonal adjustment process, not the consistency, as performed by Mirica et al. (2017).

Series on imports and exports that present seasonality

Table 1

	Imports	Exports
	Test on autocorrelation at seasonal lags value and result	Test on autocorrelation at seasonal lags value and result
Total	30.2*	39.2*
I. Live animals and animal products	19.9*	9.2*
01. Live animals	0.0	0.2
02. Meat and edible offal	17.7*	1.8
03. Fish and crustaceans	37.3*	0.0
04. Milk and dairy products; eggs; honey	7.88**	8.3**
05. Other products of animal origin	0.0	4.8
II. Vegetable products	40.4*	48.8*
06. Live trees and flowers	72.2*	3.0
07. Edible vegetables, roots and tubers	41.3*	11.9*
08. Edible fruit	22.4*	15.8*
09. Coffee, tea, spices	14.8*	5.5
10. Cereals	21.9*	25.4*
11. Products of milling industry	12.1*	0.0
12. Seeds and oleaginous fruits, industrial and medicinal plants	31.2*	31.7*
13. Gums, resins and other vegetable saps	0.97	0.0
14. Straw materials	0.12	3.7
III Animal or vegetable fats	8.4**	6.9**
15. Animal or vegetable fats	8.4**	6.9**
IV. Prepared foodstuffs	3.9	0.0
16. Preparations of meat and fish	13.6*	25.2*
17. Sugar and sugar confectionery	0.63	5.3
18. Cocoa and cocoa preparations	56.6*	63.9*
19. Preparations of cereals	40.6*	7.7**
20. Preparations of vegetables and fruits	36.2*	3.3
21. Miscellaneous edible preparations	26.3*	3.3
22. Alcoholic and non-alcoholic beverages	34.9*	10.5*
23. Residues and waste from the food industry	0.2	0.9
24. Tobacco and manufactured tobacco substitutes	0.0	0.3
V. Mineral products	3.6	3.5
25. Salt; sulphur, stones; plaster, lime and cement	24.6*	6.5**
26. Ores, slag and ash	0.0	0.0
27. Mineral fuels and mineral oils; bituminous substances	3.4	3.5
VI. Products of the chemical industry	14.0*	13.5*
28. Inorganic chemicals	0.0	0.0
29. Organic chemicals	0.0	0.0
30. Pharmaceutical products	2.7	1.2
31. Fertilisers	14.7*	8.7**
32. Tanning or dyestuff extracts	39.2*	5.0
33. Essential oils	24.7*	0.5
34. Soap; washing preparations	2.3	0.1
35. Albuminoidal substances	13.9*	0.0
36. Pyrotechnic products and explsives	0.0	12.2*
37. Photographic or cinematographic goods	21.3*	1.2
38. Miscellaneous chemical products	62.1*	58.2*
VII. Plastics, rubber and articles thereof	25.6*	25.7*
39. Plastics and articles thereof	27*	52.6*
40. Rubber and articles thereof	22.1*	11.6*

	Imports	Exports
VIII. Raw hides and skins and leather, furs and manufactures thereof	10.7*	16.0*
41. Raw hide and skins and leather	48.1*	18.5*
42. Leather goods	0.7	0.0
43. Furskins and manufactures thereof	25.0*	0.7
IX. Wood products, excepting furniture	9.9*	20.7*
44. Wood, timber and articles of wood	7.9**	20.9*
45. Cork and article of cork	15.7*	0.0
46. Manufactures of straw, of esparte or of other plainting materials	4.1	0.0
X. Paper and articles of paper	20.5*	7.1**
47. Pulp	3.8	0.0
48. Paper and article of paper	26.4*	3.3
49. Printed books and newspapers	5.7	0.0
X. Textiles and textile articles	33.2*	0.0
50. Silk	10.2*	0.5
51. Wool	43.2*	2.8
52. Cotton	62.6*	0.0
53. Other vegetable textile fibres	14.7*	0.0
54. Man-made filaments	44.6*	1.4
55. Man-made staple fibres	2.7	1.0
56. Wadding, felt, special yarns	13.3*	4.7
57. Carpets	0.5	31.8*
58. Special woven fabrics	23.8*	13.4*
59. Impregnated fabrics	2.7	5.7
60. Knitted or crocheted fabrics	31.3*	7.4**
61. Knitted clothing and accessories	53.6*	3.6
62. Not knitted or crocheted clothing and accessories	62.7*	29.3*
63. Other textile articles	4.3	13.6*
XII. Footwear/headgear/umbrellas/walking-/seat-sticks/whips/riding-crops, parts; prepared feathers/ articles; artificial flowers; articles of human hair	57.2*	61.1*
64. Footwear, gaiters and the like; parts of such articles	58.1*	61.1*
65. Headgear and parts thereof	0.8	2.8
66. Umbrellas, sun umbrellas, walking sticks, seat-sticks, whips, riding-crops and parts thereof	10.2*	3.2
67. Prepared feathers and down and articles thereof; artificial flowers; articles of human hair	2.2	0.0
XIII. Articles of stone, plaster, cement, asbestos, mica or similar materials; ceramic products; glass and glassware	0.0	0.0
68. Articles of stone, plaster, cement, asbestos, mica or similar materials	18.2*	0.0
69. Ceramic products	2.2	0.0
70. Glass and glassware	0.0	0.1
XV. Base metals and articles of base metal	18.2*	11.0*
72. Iron and steel	28.1*	6.0**
73. Articles of iron or steel	0.0	2.7
74. Copper and articles thereof	22.5*	0.7
75. Nickel and articles thereof	0.0	0.6
76. Aluminium and articles thereof	1.1	11.4*
78. Lead and articles thereof	0.07	0.0
79. Zinc and articles thereof	2.2	0.3
80. Tin and articles thereof	2.9	0.2
81. Base metals nes.; cermets; articles thereof	0.0	0.3

	Imports	Exports
82. Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	1.2	1
83. Miscellaneous articles of base metal	6.8**	18.1*
XVI. Machinery/mechanical appliances; electrical equipment; parts; sound recorders/reproducers, tv image, sound recorders/reproducers, parts/accessories	21.6*	28.7*
84. Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	19.5*	22.2*
85. Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television recorders and reproducers, parts and accessories	17.3*	16.5*
XVII. Vehicles, aircraft, vessels and associated transport equipment	25.3*	21.3*
86. Railway or tramway locomotives, rolling stock, track fixtures and fittings, and parts thereof; mechanical etc. Traffic signal equipment of all kinds	2.1	0.1
87. Vehicles (other than railway or tramway rolling stock), and parts and accessories thereof	31.3*	23.2*
88. Aircraft, spacecraft, and parts thereof	4.3	0.0
89. Ships, boats and floating structures	0.1	0.3
XVIII. Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	50.9*	0.0
90. Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	46.6*	0.0
91. Clocks and watches and parts thereof	14.7*	2.0
92. Musical instruments; parts and accessories thereof	7.46**	1.1
XX. Miscellaneous manufactured articles	34.9*	0.0
94. Furniture; bedding, cushions etc.; lamps and lighting fittings nes.; illuminated signs, nameplates and the like; prefabricated buildings	27.3*	0.0
95. Toys, games and sports equipment; parts and accessories thereof	43.4*	6.5**
96. Miscellaneous manufactured articles	0.0	1.2
XXII. Goods non-included in Combined Nomenclature other sections	8.4**	0.0
99. Special Combined Nomenclatures codes	0.0	5.2

*Seasonality present; **Seasonality perhaps present

Source: designed by the authors using JDemetra+

Table 2 displays the results of the seasonal adjustment process performed using the RSAfull specification for imports. As one can observe, only in 7 cases out of 68 the results have a poor quality (severe).

The quality of the seasonal adjustment process for imports. Source: designed by the authors using JDemetra+

Table 2

	Imports Tramo Seats Automatic procedure Customised for the Romanian calendar
Total	Good
I. Live animals and animal products	Good
02. Meat and edible offal	Good
03. Fish and crustaceans	Good
II. Vegetable products	Good
06. Live trees and flowers	Good
07. Edible vegetables, roots and tubers	Good
08. Edible fruit	Good
09. Coffee, tea, spices	Good
10. Cereals	Severe
11. Products of milling industry	Good
12. Seeds and oleaginous fruits, industrial and medicinal plants	Good
16. Preparations of meat and fish	Good
18. Cocoa and cocoa preparations	Good
19. Preparations of cereals	Good
20. Preparations of vegetables and fruits	Good
21. Miscellaneous edible preparations	Severe
22. Alcoholic and non-alcoholic beverages	Severe
25. Salt; sulphur, stones; plaster, lime and cement	Good
VI. Products of the chemical industry	Good
31. Fertilisers	Good
32. Tanning or dyestuff extracts	Severe
33. Essential oils	Good
35. Albuminoidal substances	Good
37. Photographic or cinematographic goods	Severe
38. Miscellaneous chemical products	Good
VII. Plastics, rubber and articles thereof	Good
39. Plastics and articles thereof	Good
40. Rubber and articles thereof	Good
VIII. Raw hides and skins and leather, furs and manufactures thereof	Good
41. Raw hide and skins and leather	Good
43. Furskins and manufactures thereof	Good
IX. Wood products, excepting furniture	Good
44. Wood, timber and articles of wood	Good
45. Cork and article of cork	Severe
X. Paper and articles of paper	Good
48. Paper and article of paper	Good
X. Textiles and textile articles	Good
50. Silk	Good
51. Wool	Good
52. Cotton	Good
53. Other vegetable textile fibres	Severe
54. Man-made filaments	Good
56. Wadding, felt, special yarns	Good
57. Carpets	Good
58. Special woven fabrics	Good
60. Knitted or crocheted fabrics	Good
61. Knitted clothing and accessories	Good

62. Not knitted or crocheted clothing and accessories	Good
XII. Footwear/headgear/umbrellas/walking-/seat-sticks/whips/ riding-crops, parts; prepared feathers/articles; artificial flowers; articles of human hair	Good
64. Footwear, gaiters and the like; parts of such articles	Good
65. Headgear and parts thereof	Good
66. Umbrellas, sun umbrellas, walking sticks, seat-sticks, whips, riding-crops and parts thereof	Good
68. Articles of stone, plaster, cement, asbestos, mica or similar materials	Good
XV. Base metals and articles of base metal	Good
72. Iron and steel	Good
74. Copper and articles thereof	Good
XVI. Machinery/mechanical appliances; electrical equipment; parts; sound recorders/reproducers, tv image, sound recorders/ reproducers, parts/accessories	Good
84. Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	Good
85. Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television recorders and reproducers, parts and accessories	Good
XVII. Vehicles, aircraft, vessels and associated transport equipment	Good
87. Vehicles (other than railway or tramway rolling stock), and parts and accessories thereof	Good
XVIII. Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	Good
90. Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	Good
91. Clocks and watches and parts thereof	Good
XX. Miscellaneous manufactured articles	Good
94. Furniture; bedding, cushions etc.; lamps and lighting fittings nes.; illuminated signs, nameplates and the like; prefabricated buildings	Good
95. Toys, games and sports equipment; parts and accessories thereof	Good

Table 3 displays the results of the seasonal adjustment process made using the RSAfull specification for exports. As one can observe, only in 5 cases out of 35 the results have a poor quality (severe) and in one case the results are uncertain.

The quality of the seasonal adjustment process for exports. Source: designed by the authors using JDemetra+

Table 3

	Exports Tramo Seats Automatic procedure Customised for the Romanian calendar
Total	Good
I. Live animals and animal products	Severe
II. Vegetable products	Good
07. Edible vegetables, roots and tubers	Severe
08. Edible fruit	Good
10. Cereals	Good
12. Seeds and oleaginous fruits, industrial and medicinal plants	Severe
16. Preparations of meat and fish	Good
18. Cocoa and cocoa preparations	Severe
22. Alcoholic and non-alcoholic beverages	Good
VI. Products of the chemical industry	Good
36. Pyrotechnic products and explsives	Uncertain
38. Miscellaneous chemical products	Good
VII. Plastics, rubber and articles thereof	Severe
39. Plastics and articles thereof	Good
40. Rubber and articles thereof	Good
VIII. Raw hides and skins and leather, furs and manufactures thereof	Good
41. Raw hide and skins and leather	Good
IX. Wood products, excepting furniture	Good
44. Wood, timber and articles of wood	Good
X. Paper and articles of paper	Good
57. Carpets	Good
58. Special woven fabrics	Good
62. Not knitted or crocheted clothing and accessories	Good
63. Other textile articles	Good
XII. Footwear/headgear/umbrellas/walking-/seat-sticks/whips/ riding-crops, parts; prepared feathers/articles; artificial flowers; articles of human hair	Good
64. Footwear, gaiters and the like; parts of such articles	Good
XV. Base metals and articles of base metal	Good
76. Aluminium and articles thereof	Good
83. Miscellaneous articles of base metal	Good
XVI. Machinery/mechanical appliances; electrical equipment; parts; sound recorders/reproducers, tv image, sound recorders/ reproducers, parts/accessories	Good
84. Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	Good
85. Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television recorders and reproducers, parts and accessories	Good
XVII. Vehicles, aircraft, vessels and associated transport equipment	Good
87. Vehicles (other than railway or tramway rolling stock), and parts and accessories thereof	Good

4. CONCLUSIONS

The automatic procedure in JDemetra+ was proved to produce a high rate of good results in the case of mass production. As the interface of JDemetra+ is very user-friendly, and documentation is available, no specific training is required for a user to perform seasonal adjustment using the automatic procedure.

However, in the case of problematic series, where the results showed poor quality, specialized advice is needed to properly seasonally adjust these series. Many resources for this purpose are available, as there is a wide community using JDemetra+.

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