

FORECASTING ALCOHOL CONSUMPTION IN THE CZECH REPUBLIC

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Abstract

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The paper deals with a forecast of developments in alcohol consumption based on current alcohol consumption per capita (expressed in litres of pure alcohol), and time series extrapolations. Alcohol consumption is to be considered from the vantage point of knowing the specifics of the product and the consequences of its excessive consumption. The predictive methodology makes use of the Box-Jenkins method; the ARIMA model, taking into account the autocorrelation and partial autocorrelation process, which is a prerequisite for the successful identification of a time series model; model parameter estimation; appropriate transformations of time series; determining the order of differentiation and subsequent verification of the model. The chosen methodology for future trends in alcohol consumptions is a prerequisite for the proposed optional measures to control alcohol consumption in the Czech Republic. Due to the long term nature of the process to draw up and implement alcohol consumption regulation measures, the forecast covers the forthcoming 10 years.

Keywords: alcohol consumption, pure alcohol, trend forecast prediction, the ARIMA model

INTRODUCTION

The consumption of alcohol is a major social problem, because its use and overuse is linked with health, social, economic, cultural and political consequences, with a legislative context.

During the nineteenth and early twentieth century there was an upsurge of anti-alcohol movements in the greater part of Europe, which gradually diminished, and by the end of the twentieth century become almost insignificant. This reflects the current status, whereby the European Union comprises the region with the highest alcohol consumption in the world (Anderson, Baumberg, 2006). The average alcohol consumption across those 18 Member States of the EU for which statistics were available in 2012 was then around 10.6 litres of pure alcohol per adult (aged over 15) (OECD, 2015). Over the last three decades, alcohol consumption in some Member States has declined, while going up in others. In recent years we've seen changes in habits related to alcohol consumption, and an important role is played in this process by the convergence of alcohol consumption between Member States –

for example, rising wine consumption in countries previously known for drinking beer, and vice versa (OECD, 2012). Changes in alcohol consumption between countries and over time are caused not only by changes in alcohol consumption practices, but also by policy measures aimed to control alcohol consumption. In particular, restrictions on advertising, on sales and increased taxation are evidently effective tools for restricting alcohol consumption (Bennett, 2003 in OECD, 2012; WHO Europe, 2012a in OECD, 2012).

Apart from the legislative measures, alcohol consumption is affected by a whole host of other factors. Pettigrew and Donovan (2003) speak of the family (family structure, family relationships, family conflicts, parental awareness, parental supervision, parental communication skills, parental attitudes to alcohol, etc.); peers (peer-group alcohol consumption, peer pressure); personal characteristics (age, gender, masculinity, income, education, marital status, religion, self-esteem, alcohol tolerance, aversion to alcohol, motivation and expectations related to alcohol consumption,

health expectations, subject area knowledge of alcoholic beverages etc.); life experience (past experiences with alcohol, the death of a loved one, disability, unemployment, problems at school, etc.); moral values; socio-cultural factors, situational specifics; structural factors (price, affordability/availability, packaging size); advertising, marketing; media and local climate. As seen from the above, alcohol consumption is impacted by a number of incidental factors. Alcohol consumption and the consequences of its overuse can be addressed from different perspectives. All involved should, however, have objective information, not only about the current state of the consumption of different types of alcoholic beverages, but also about the expected developments in consumption. The forecasting of alcohol consumption values has to utilize the methods of time series analysis that benefit from theory-based assessments regarding the presence, in a given time series, of any trend, periodicity or stationarity, and so can help us choose the appropriate forecast model.

Excessive alcohol consumption causes damage not only to human health, but also to the social fabric (Anderson and Baumberg, 2006). Epidemiological studies confirm that apart from incorrect nutrition the risk factors to health in developed countries encompass the drinking of alcohol, while the effects of alcohol on population health are still being studied. Earlier research suggests (Gmel *et al.*, 2002; Evstifeeva *et al.*, 1997), that alcohol consumption negatively impacts overall mortality, both in connection with a number of diseases whose onset or progression involves alcohol consumption, and in connection with accidents. However, there are also studies (Howie *et al.*, 2011; Pearson, 1996; Doll, 1998 in Csémy, Sovinová, 2003), claiming that alcohol consumption to a moderate degree has positive effects on human health. In the social sphere, alcohol consumption can lead to phenomena ranging from public harassment, through marital breakdown, abuse and child abuse, crime, violence to homicide. In general it can be said that the higher the level of consumption, the more serious the concomitant offence or damage to health. (Anderson, Baumberg, 2006).

The Czech Republic is, by volume of alcohol consumption, among the front-runner countries of Europe. When compared with the European Union, the Czech Republic in 2012 exceeded the average consumption across the Member States by approximately 1 litre of pure alcohol per adult. Consumption was some 11.6 litres of pure alcohol per adult person (OECD, 2015). The Czech Statistical Office (2014) provides statistics on alcohol consumption per capita, i.e. including children and persons under the age of 15 years. According to these statistics in 2012 every member of the population (i.e. including children) averaged 9.9 litres of pure alcohol.

The aim of the present paper is to forecast future developments in alcohol consumption

i.e. to generate values of alcohol consumption for the next 10 years, grounded on knowledge of existing long-term alcohol consumption as well as the theory underlying time series analysis. Making use of the Box-Jenkins method for models aware of autocorrelation and partial autocorrelation processes is a prerequisite for choosing the right forecasting model, in view of the large number of incidental factors influencing alcohol consumption.

MATERIALS AND METHODS

The present paper analyses the consumption of alcohol during the selected period. We track developments in overall consumption, as well as developments by alcohol type – wine, beer, and spirits expressed in pure alcohol litre units.

One of the basic tasks of univariate analysis of economic time series is the creation of forecasts. On the basis of the ARIMA model a forecast is constructed with a minimum square error of prediction.

Assuming the model

$$\Phi_p(B)\Delta^d X_t = \Delta_q(B)a_t,$$

where $\Delta^d = (1 - B)^d$, i.e. the ARIMA model (p, d, q) the task is to predict future values X_{T+h} T is called the threshold of prediction and h is known as the horizon of prediction.

A linear process over time $(T + h)$ can be written under the ceteris paribus principle as

$$\begin{aligned} X_{T+h} &= a_{T+h} + \psi_1 a_{T+h-1} + \dots + \\ &+ \psi_{h-1} a_{T+1} + \psi_h a_T + \\ &+ \psi_{h+1} a_{T-1} + \dots = \psi(B) a_{T+h}, \end{aligned}$$

where $\psi(B) = \phi_p(B)^{-1} \Delta^{-d} \theta_q(B)$. The forecast value X_{T+h} for $h \geq 1$ is construed at time T .

The forecast prediction with minimum square error can be written in the form

$$X_T(h) = \psi_h * a_T + \psi_{h+1} * a_{T-1} + \psi_{h+2} * a_{T-2} + \dots$$

The Mean Square Error of the prediction is

$$MSE[X_T(h)] = E[X_{T+h} - X_T(h)]^2.$$

For a normal stochastic process the $(1 - \alpha)100\%$ prediction interval is delimited by borders

$$X_T(h) \pm \mu_{1-\alpha/2} \left[\sum_{j=0}^{h-1} \psi_j^2 \right]^{1/2} \sigma_a,$$

where $\mu_{1-\alpha/2}$ is the $100(1 - \alpha/2)\%$ quantile of the standard normal distribution.

For stationary processes this means that the confidence interval asymptotically approaches the two horizontally parallel lines. (Artl, Artlová, 2007)

Using the appropriate difference in the ARIMA model we set the stationarization and produce a stationary time series. Further tests are carried out to verify the ARIMA model. To test the statistical significance of the model used, we apply the F-test, to verify the significance of parameters in the model we use the t-test. The normal distribution of the error component is validated by the Chi-square test.

Moreover we use the Bayesian information criterion (BIC) to select the degrees p and q of an ARIMA model. First, we estimate several models with different p and q values. For each estimated model we provide the loglikelihoods as inputs to calculate the BIC measure of fit (which penalizes for complexity). To test for autocorrelation serial correlation of the error component we employ Ljung-Box statistics.

Findings

The problems associated with alcohol, the health consequences of excessive alcohol consumption, the treatment of alcohol addiction, consumption patterns, problems in the family, economic consequences and the legal-political context of this subject matter are topics of interest in many developed countries. In the Czech Republic the issue of alcohol consumption is not given systematic attention, the Czech Republic has not drawn up a policy concept for reducing social damage, and lacks an organizational structure for systematic work in this area. State care is of a rather random nature, prompted by ad hoc events (the methanol affair, traffic accident rates, etc.). Published scientific and professional articles deal with problems of alcohol consumption, and in particular of the consequences arising from it, some in detail and from a range of perspectives. The measures recommended as a result, are relatively long-term in nature and should be based not only on objective

alcohol consumption data, but also drawn from rigorous forecasts of future developments. This view is a contributing motivational factor to our presenting this paper.

Monitoring alcohol consumption and the consequences of its overuse had to be based on consumption data for individual types of alcoholic beverages with due regard for their differing alcohol content. Beer is the traditional drink in the Czech Republic and is considered part of the cultural heritage, while in Moravia this role is taken by wine and in certain regions by other spirits. Consumption of alcoholic beverages has always featured in our meals and dining habits. Attitudes to food, dining habits, as well as toward alcoholic drinks are undergoing fundamental change. Consumption of alcoholic beverages in its more individualized and technically modified form highlights the negative consequences of excessive consumption.

The definition of an alcoholic drink according to Act No. 379/2005 Coll. is a beverage of spirits, wine or beer, or any other drink as may be that contains more than 0.5 percent alcohol by volume. Basic consumption information about the respective types of alcoholic beverages i.e. spirits, wine and beer are given in litres per capita, in litres of pure alcohol per capita, and price information about the respective types of alcoholic drinks in CZK and their prices converted to pure alcohol values are listed in Tab. I.

All data on prices per litre of pure alcohol are based on the assumption that spirits contain pure alcohol at 39.5–40.5 %, wines at 11.35–12.42 % and beer at 2.8–3.4 % of pure alcohol. This data was derived from consumption data of the respective alcoholic drinks in litres and from consumption in pure alcohol values.

From the values on alcohol consumption obtained over the 23 years of the time series (1989–2012), it is

I: Development of consumption and prices of alcoholic beverages in the Czech Republic

	Measuring unit	1989	1993	1997	2001	2005	2009	2012
Alcoholic beverages in total	litres	170.8	176.7	185.6	181.3	188.1	177.6	175.2
Equivalent pure alcohol	litres	8.2	9.2	9.8	9.9	10.2	10.4	9.9
Spirits (40 %)	litres	6.3	7.8	8.3	8.2	7.8	8.2	6.7
Equivalent pure alcohol	litres	2.5	3.1	3.3	3.3	3.1	3.3	2.7
Price (per litre)	CZK	-	-	140.61	166.77	186.13	201.47	221.81
Price (per litre of pure alcohol)	CZK	-	-	353.66	414.4	468.33	503.37	555.76
Wine (12 %)	litres	13.5	15.3	15.9	16.2	16.8	18.7	19.8
Equivalent pure alcohol	litres	1.6	1.8	1.9	2.0	1.9	2.1	2.3
Price (per litre)	CZK	-	-	54.32	66.1	59.62	57.18	64.93
Price (per litre of pure alcohol)	CZK	-	-	454.57	535.41	527.17	502	567.49
Beer (3 %)	litres	151	153.6	161.4	156.9	163.5	150.7	148.6
Equivalent pure alcohol	litres	4.1	4.3	4.6	4.6	5.2	5.0	5.0
Price (per litre)	CZK	-	-	13.76	15.58	16.82	18.2	20.88
Price (per litre of pure alcohol)	CZK	-	-	482.8	531.41	528.86	551.79	625.56

Source: CSO (2014)

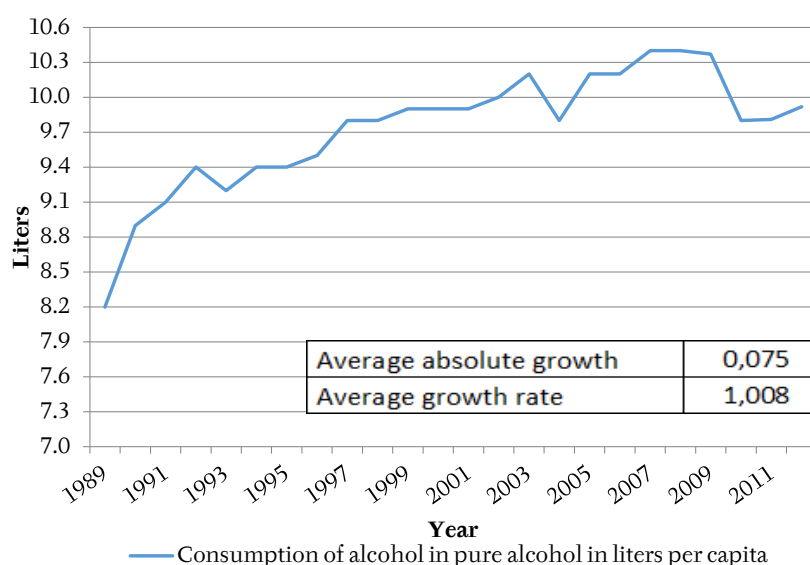
evident that the time series of alcohol consumption shows a slightly rising trend, with an average alcohol consumption increase coefficient of 0.8 % a year. The highest ever increase in consumption was recorded in the years 1989–1992. The growth in consumption can be linked to systemic changes in society. Growth in consumption and its decline relates to the same cause. A decline in consumption during the whole span of the reference period was first recorded in 1993, then in 2005, with the biggest drop in consumption recorded in 2009 (the onset of the economic crisis). No decline in consumption has ever reversed the trend, however, lending credence to the notion that all measures to reduce alcohol consumption have failed to achieve the desired effect. Fluctuations in consumption can be linked more to social influences or the economic situation than to education about the negative effects of excessive consumption of alcoholic drinks. The rising trend in consumption, with its occasional fluctuations is clearly evident in Fig. 1.

The alcohol consumption in Fig. 1 above is derived from the consumption of all types of alcoholic drinks – beer, wine and spirits. The observed time series shows differing trends in the consumption of the different types of alcoholic beverages. The largest average consumption growth coefficient was recorded for wine (1.5), followed by beer (0.8) and spirits (0.03). The average price increase coefficient by type of alcoholic beverage was highest for spirits (2.8), followed by wine (2.4) and beer (2.2).

Beer consumption per capita puts the Czech Republic highest in the world. Beer is the national drink. The historically highest beer consumption per capita recorded in the Czech Republic was in 2005 – some 164 litres of beer per capita. Thereafter we see a decline, with some fluctuations, with current consumption at around 130 litres of beer

per Czech Republic inhabitant per year. This level of beer consumption amounts to the greatest share of alcohol consumption (4.4–5.1 litres). We can regard the causes underlying the decline in consumption since 2005 to be primarily the changing lifestyle of the population over the long term, as well as the transient rise in excise tax on beer from 1 January 2010 and the continually rising beer prices. Conversely, an upward influence on beer consumption trends comes from structural changes in the product mix (a rising share of consumption coming from beer in cans, in PET bottles, tank-drawn beer, with decreasing consumption of keg beer, a growing demand for flavoured beers – mostly fruit, as well as a rising proportion of beer consumption by women). Over the last two years we can see that consumption is once again on the rise. The scale of the fall in consumption and the fluctuations in consumption do, in the long run, only amount to an overall stagnation in consumption. Over the reference period the rise in beer prices and the rate of its rise have been outpacing the increase in beer consumption.

There has been an increase in the consumption of **wine**, with a more pronounced increase after 2005 (regardless of the drop in alcohol consumption during the economic crisis period). Alcohol consumption in litres of pure alcohol is in absolute terms the lowest for all types of alcoholic beverages (from 1.8 to 2.3 litres). This is one of the reasons for wine being often referred to as socially acceptable. In the Czech Republic the average annual consumption of wine per capita is 8 litres, placing the CR 60th in the world. The popularity of wine is steadily growing. The reasons for the increasing wine consumption can be found in changing lifestyle, wine being a social drink, and the ever more popular view that consumption of wine to



1: Alcohol consumption in litres of pure alcohol per capita in the time-series 1989–2012
Source: Czech Statistical Office (2014)

a certain degree has a positive effect on one's health. A positive aspect is the growing consumption of quality wines. Wine prices have risen, most notably during the period when consumption declined. The absolute price increment amounts to 200 CZK per litre of pure alcohol.

An unequivocal decrease in consumption was recorded for **spirits** with a concomitant price increase. From the beginning to the last year of the time-series the price almost doubled. The increasing prices of spirits are largely a consequence of the rise in excise duty and VAT. Nevertheless, excise tax in the Czech Republic is among the lowest in Europe. Level consumption was recorded from the beginning of the time series until 2005, when consumption went into decline (from 3.3 to 2.7 litres). A significant role was played in the consumption of spirits by the methanol affair in 2012. The legislative measures it led to have positively affected the market in spirits and their consumption. Consumption of spirits after 2012 fell to the lowest value over the whole reference period. A closer investigation into the consumption of variety shows a redirection toward branded spirits, of assured quality. It should be noted that the highest proportion of illegal sales is to be expected for this type of alcohol.

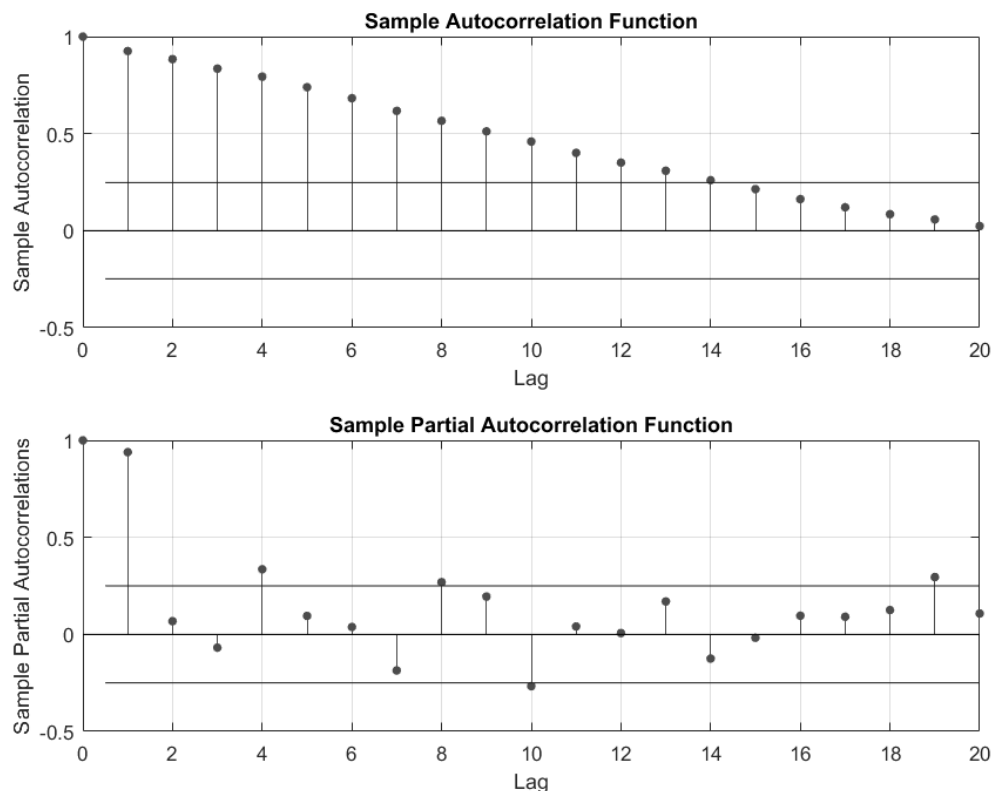
Because of the possible impacts of overuse of alcohol and the proposals for remedial measures all the forecasts of future developments are based on alcohol consumption expressed in litres of pure alcohol. From the Box-Jenkins method for value

prediction, the ARIMA (Autoregressive Integrated Moving Average) model was chosen.

Fig. 2 shows ACF and PACF of the source data. The sample ACF decreases relatively slowly which is consistent with ARIMA model. The presence of trend in the data is evident in Fig. 1. The sample PACF decays relatively slowly which is consistent with an MA processes. The ARIMA lags cannot be selected solely by looking at the ACF and PACF, but it seems no more than four AR or MA terms are needed. Therefore we identify the best lags using BIC. We fit all combinations of $p = 1, \dots, 5$ and $q = 1, \dots, 5$ (a total of 25 models) and store the loglikelihood objective function and number of coefficients for each fitted model. The calculated BIC for each fitted model are presented in Tab. II. The number of parameters in a model is $p + q + 1$ (for the AR and MA coefficients, and constant term). The rows correspond to the AR degree (p) and the columns correspond to the MA degree (q). The smallest BIC value is 49.6287 in the (4,2) position. This corresponds to an ARIMA(4,1,2) model presented in Tab. III.

We show significant AR processes of order 2 and 4, MA processes of order 2. We also confirm that there are no serial correlations in the residuals at the 5 % significance level. Short term forecasting of alcohol consumption is presented in Fig. 2. Robustness of the results are confirmed by the Autocorrelation and Partial Autocorrelation functions of the residuals (Fig. 3).

Having identified the model and fulfilled all conditions justifies our using the ARIMA model for



2: Autocorrelation and Partial Autocorrelation Functions of the source data

II: BIC matrix

		MA degree (q)				
		1	2	3	4	5
AR degree (p)	1	70.9389	75.1365	74.7090	70.7281	80.6265
	2	58.9589	51.0399	51.2316	55.7929	59.9279
	3	62.7610	54.3247	58.7772	59.2826	67.4769
	4	67.1335	49.6287	51.3539	62.8960	61.0929
	5	71.4720	53.9673	51.2594	52.6127	59.7697

III: The ARIMA model

	Estimations	St. Error	T-Stat
Constant	0.2153	0.0552	3.9009
AR{1}	-0.0363	0.0826	-0.4394
AR{2}	-0.7028	0.0613	-11.4583
AR{3}	-0.1302	0.0692	-1.8817
AR{4}	-0.2796	0.0541	-5.1735
MA{1}	0.1080	0.0884	1.2213
MA{2}	1.0000	0.0899	11.1175
Variance	0.0765	0.0193	3.9735
Ljung Box Statistic	37.2441		

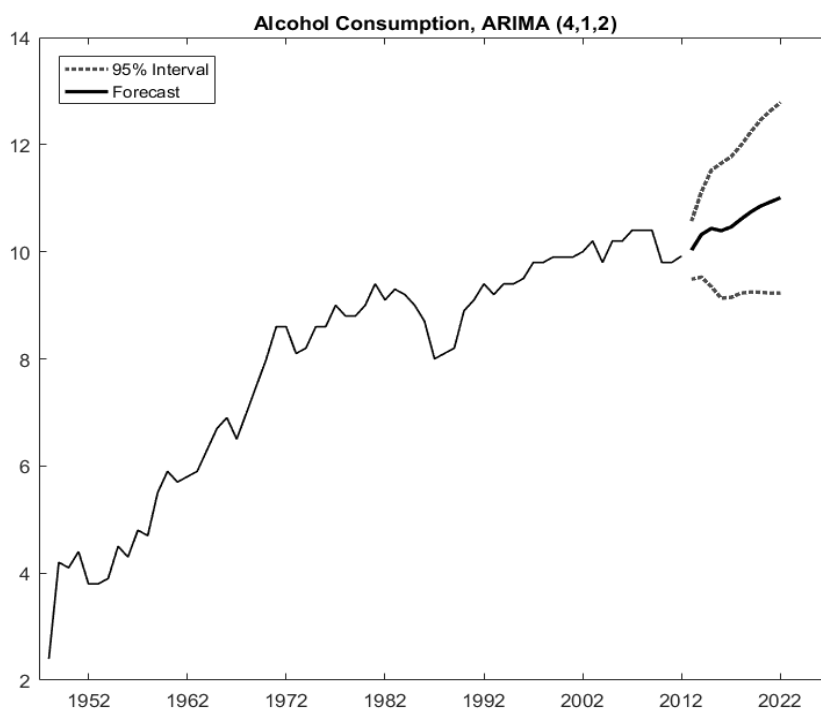
alcohol consumption forecasting. The prospective values for the years 2013–2022 are shown in the form of interval estimates, with 95 % confidence limits (Fig.3).

A positive outcome of the forecasts is that a rise in consumption is not expected. This is seen from Fig. 1, which captures the developments of alcohol consumption to date, though had we forecast alcohol consumption values using traditional forecasting methods, we would have come to diametrically different predicted values, with a rising alcohol consumption trend.

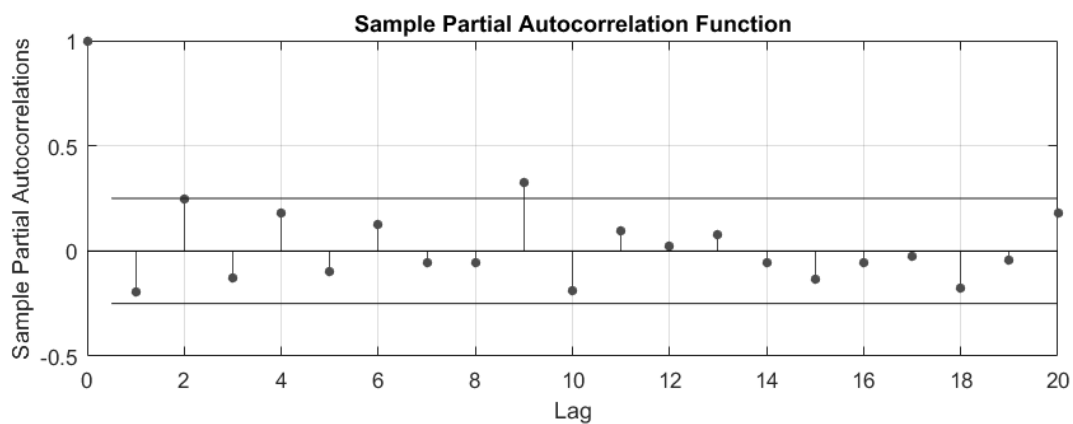
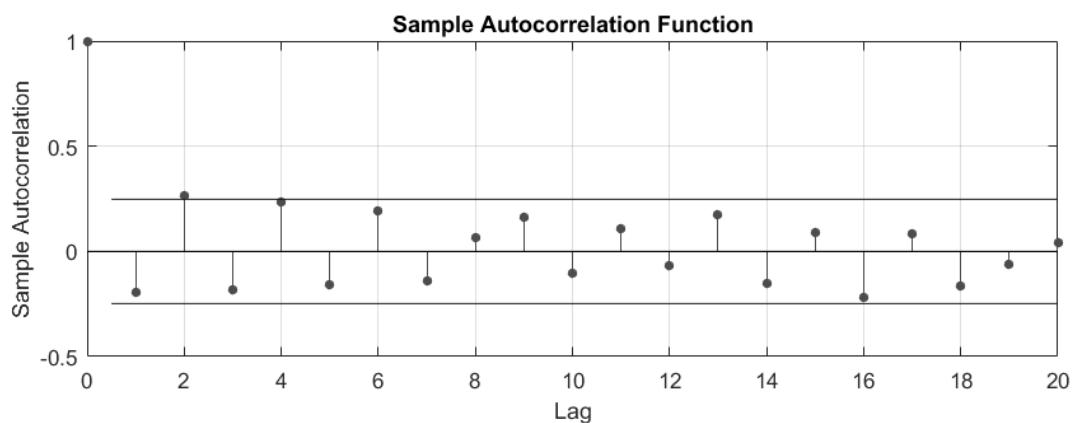
We can surmise that values predicted by the Box-Jenkins method represent a stagnation of consumption. A lengthening outlook forecast window (up to 10 years) opens up to a near tripling of the values. Nevertheless, the present authors regard the forecast as fit for the purpose that such forecasts can serve. All the proposed measures for regulating alcohol consumption have a relatively lengthy time horizon over which to gauge the effectiveness of the measures proposed.

CONCLUSION

The obtained forecast values as referred to in the paper increase after the year 2013. We expect that consumption of alcohol (litres of pure alcohol per capita) do not match and are not in line with the programme 'Health for all in the 21st century', where under objective number 12 it states that alcohol consumption per adult person over 15 years of age should not exceed 6 litres per year. The findings of the investigation make it clear that this objective is not being met, but at the same time we should clearly point out the need to define more effective measures both at the legislative level, but also specifically focused on selected segments of the alcohol consuming demographic. The forecast values can serve as the launch-pad argument when it comes to monitoring the economic impacts of alcohol overuse, pricing policy, the use of marketing tools, measures to control alcohol availability and marketing reach in society. There are ways to express the costs associated with alcohol consumption. The Czech Statistical Office processes the health records (SHA) in accordance with OECD methodology, albeit these are only a small part of the total economic costs. The first comprehensive attempt to express costs for society as a whole can be deemed to be the study by Záborský (2011), while other relevant figures can be drawn from the EBC (European Brain Council, 2014), who estimate direct medical costs for the Czech Republic in 2010 to be 266 million EUR, direct non-medical costs to be 250 million EUR and indirect costs to be 261 million EUR. By conversion we can derive the total annual costs in the Czech Republic to be 20 billion CZK, which greatly exceeds the sum obtained through excise duties on alcohol, which come to some 7 billion per year (Customs Office yearbook). At the same time the predicted values raise a host of questions to which the answers must be sought in the findings of primary investigations among alcohol consumers. What are the reasons for use and especially overuse



3: Forecast alcohol consumption



4: Autocorrelation and Partial Autocorrelation Functions of the residuals

of alcohol; what is the relationship between price and consumption; how is consumption affected by the income status of households, loss of employment, health, and family problems, and the social status attained. Segmentation of the alcoholic drink consumer demographic would help to design and implement more effective corrective measures to limit alcohol consumption. We should remind ourselves that the given findings do not in any way reflect the influence of the alcohol black market.

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REFERENCES

- ADAMEC, V., STŘELEČEK, L., HAMPEL, D. 2013. *Ekonomie I: učební text*. 1st edition. Brno: Mendelova univerzita v Brně.
- ANDERSON, P., BAUMBERG, B. 2006. *Alcohol in Europe: a public health perspective: a report for the European Commission*. [Online]. Luxembourg: European Commission. Available at: ec.europa.eu/health/archive/ph_determinants/life_style/alcohol/documents/alcohol_europe_en.pdf. [Accessed: 2015, August 18].
- ARTL, J., ARTLOVÁ, M. 2007. *Ekonomické časové řady: [in czech: Vlastnosti, metody modelování, příklady a aplikace]*. 1st edition. Praha: Grada Publishing.
- CSÉMY, L., SOVINOVA, H. 2003. *Kouření cigaret a pití alkoholu v České republice: Spotřeba alkoholu v České republice*. [Online]. Praha: Státní zdravotní ústav. Available at: www.szu.cz/uploads/documents/czzp/aktuality/Koureni_20a_20Alkohol.pdf. [Accessed 2015, August 18].
- ČESKÝ STATISTICKÝ ÚŘAD. 2014. *Spotřeba alkoholických nápojů a cigaret na 1 obyvatele v České republice*. [Online]. Available at: https://www.czso.cz/documents/10180/20541931/3201814_0303.pdf/95c5e22a-6bf2-4152-b107-5ff82c1622ff?version=1.0 [Accessed 2015, August 21].
- EUROPEAN BRAIN COUNCIL. 2014. [Online]. Available at: <http://www.europeanbraincouncil.org/>. [Accessed 2015, October 6].
- EVSTIFEVA, T. V., MACFARLANE, G. J., ROBERTSON, CH. 1997. Trends in cancer mortality in central European countries: The effect of age, birth cohort and time-period. *European Journal of Public Health*, 7(2). [Online]. Available at: eurpub.oxfordjournals.org/content/eurpub/7/2/169.full.pdf. [Accessed 2015, August 20].
- GMEL, G., GUTJAHR, E., REHM, J. 2002. How stable is the risk curve between alcohol and all-cause mortality and what factors influence the shape? A precision-weighted hierarchical meta-analysis. *European Journal of Epidemiology*, 18(7): 631–642 [Online]. DOI: 10.1023/a:1024805021504. [Accessed 2015, August 20].
- HOWIE, E. K., SUI, X., LEE, D., HOOKER, S. P., HÉBERT, J. R., BLAIR, S. N. 2011. Alcohol Consumption and Risk of All-Cause and Cardiovascular Disease Mortality in Men. *Journal of Aging Research*, 2011: 1–10. [Online]. DOI: 10.4061/2011/805062. [Accessed 2015, August 20].
- OECD. 2012. *Health at a Glance: Europe 2012*. Paris: OECD Publishing. [Online]. Available at: dx.doi.org/10.1787/9789264183896-en. [Accessed 2015, August 18].
- OECD. 2015. *Tackling Harmful Alcohol Use: Economics and Public Health Policy*. OECD Publishing. [Online]. Available at: dx.doi.org/10.1787/9789264181069-en. [cit. 2015-08-18]
- OECD. 2015. *Non-Medical Determinants of Health: Alcohol consumption* [Online]. Available at: stats.oecd.org/index.aspx?DataSetCode=HEALTH_STAT#. [Accessed 2015, August 18].
- PEARSON, T. A. 1996. Alcohol and Heart Disease. *Circulation*, 94(11): 3023–3025. [Online]. DOI: 10.1161/01.cir.94.11.3023. [Accessed 2015, August 20].
- PETTIGREW, S., DONOVAN, R. 2003. *A Literature Review of the Factors that Influence Alcohol Consumption and the Effectiveness of Past Interventions*. Perth, Western Australia: Curtin University of Technology. [Online]. Available at: www.academia.edu/2811592/A_Literature_Review_of_the_Factors_that_Influence_Alcohol_Consumption_and_the_Effectiveness_of_Past_Interventions. [Accessed 2015, August 19].
- ZÁBRANSKÝ, T., BĚLÁČKOVÁ, V., STEFUNKOVÁ, M., VOPRAVIL, J., LANGROVÁ, M. 2011. *Společenské náklady užívání alkoholu, tabáku a nelegálních drog v ČR v roce 2007: zpráva z výzkumu: Centrum adiktologie, Psychiatrická klinika, 1. LF UK v Praze a VFN v Praze*. Praha: Centrum adiktologie, Psychiatrická klinika, 1. lékařská fakulta v Praze a Všeobecná fakultní nemocnice v Praze.
- ČESKÁ REPUBLIKA. 2005. *Zákon č. 379/2005 Sb. o opatřeních k ochraně před škodami působenými tabákovými výrobky, alkoholem a jinými návykovými látkami a o změně souvisejících zákonů*. Available at: portal.gov.cz/app/zakony/zakonPar.jsp?idBiblio=60445&nr=379-2F2005&rpp=15#local-content.

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