The analysis of association between the variables in Croatian business survey for services sector

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Abstract

The aim of this paper was to analyse the association between the variables in Croatia's Business Survey for the Services Sector. The survey was conducted for the 3rd quarter of 2014. Since the Business Survey is a qualitative survey, nonparametric measures of association were used. The empirical analysis was divided into two parts.

The first part of the research includes the analysis of association between the variable liquidity as an important variable in the Croatian economy in recession conditions and the selected variables such as business position, demand and firm's total employment over the past 3 months, and expected business position, demand and firm's total employment in the next 3 or 6 months. In the second part, the relationships between past and expected business position, demand and firm's total employment were explored.

The results show that there are no statistically significant associations between variable liquidity and variables current and expected demand, firm's total employment and business position. On the other hand there are statistically significant relationships between current and expected business position, as well as between demand and total employment, past and expected.

Association between managers' estimates and expectations suggests that the same dynamic of variables is expected in the next 3 to 6 months. Since their assessment of current business position, employment and turnover are unfavorable, it can be concluded that Croatian economy is going to retain in recession in the next several months.

1. Introduction

Business Survey (BS) is a method of gathering information about the managers' perception of their environment. It represents qualitative assessments of managers' judgments about the past, present and future dynamics of the key variables from their economic surroundings. European Commission conducted BS in accordance with the Joint Harmonised EU Programme of Business and Consumer Surveys since 1962 for different sectors of national economies for all EU member states. The surveys are carried out on a monthly basis for each country for the different economic sectors. The national institutions are conducting surveys in the same way.

BS is a qualitative survey. It is based on questionnaires in which managers express their opinions about their past and present business situation and about their future plans and expectations concerning different economic sectors. Qualitative data on managers' opinions of their economic environment are translated into the quantitative composite indicators. These indicators are calculated for all analysed sectors: Industrial Confidence Indicator (ICI), Construction Confidence Indicator (BCI), Retail Trade Confidence Indicator (RTCI) and Services Confidence Indicator (SCI).

Croatia has been conducting the surveys in accordance with the harmonised EU methodology continually since 1995, while survey in the services sector began in 2008. However, in contrast to the EU member states, which conduct the surveys on a monthly basis, Croatia's surveys are conducted on a quarterly basis. Furthermore, the Croatian BS questionnaires, compared to the questionnaires applied in the EU countries, include additional question regarding managers' perception about the company's liquidity level. Thus, questionnaires contain question about the liquidity as follows: "Liquidity of your firm is: (1) good, (2) with temporary problems, (3) bad".

Consequently, our analysis includes the variable liquidity, important variable in the Croatian economy in a recession period. Thus, we do not only explore the association between the variables related to the present and past situation of the firms and variables related to the future plans and expectations, we additionally analyse the relationship between liquidity and other variables from the questionnaire, as well.

2. Data and Methodology

Croatia's BS questionnaire in the services sector has nine questions, *i.e.* nine qualitative variables, namely (for detailed definition of the variables see Čižmešija, 2008 and in EU User Guide, 2007): *Business position over the past 3 months (Q1*), *Turnover (demand) over the past 3 months (Q2), Expected turnover (demand) in the next 3 months (Q3), Firm's total employment over the past 3 months (Q4), Expected firm's total employment in the next 3 months (Q5), Expected prices in the next 3 months (Q6), Expected business position in the next 6 months (Q7), Ownership (Q8)* and *Liquidity (Q9).* All questions, except *ownership (Q8)* and *liquidity (Q9*) have a similar answers scheme: the answers are given according to a three-option scale: increase (1), remain unchanged (2) and decrease (3).

The survey for Croatia's service sector was conducted for the year 2014 in the 3rd quarter. The sample consists of 130 companies in the service sector and is representative for the entire Republic of Croatia. The source for the survey data is the periodical "*Privredni vjesnik*" – *Centre for Business Research.*

The aim of this paper is to analyse the association between the variable liquidity as an important variable in Croatia's economy in recession conditions and selected variables in BS for the Services Sector. More precisely, we are interested if there is an association between managers' assessments of liquidity and their judgments about the present and past business situation, demand and firm's total employment, as well as their expectations.

For these purposes nonparametric measures of association were used. Measures of association, as well as tests of their significance, provide means of summarizing the size of the association between two variables (more detailed in Gibbons 1993). These tests hypothesize that there is no relationship between the two variables, and that the measure of association equals zero. Among various tests of association, the Pearson *Chi*-square test is commonly used in empirical studies. It tests whether or not there is a significant statistical relationship between the variables in the cross classification table.

In the Pearson *Chi*-square test the null hypothesis (H_0) states that there is no association between two row and column classification variables. The alternative hypothesis (H_1) contradicts the null hypothesis. Formally, the hypotheses of the Pearson *Chi*-square test are:

$$\begin{aligned} H_0 &: p_{ij} = p_{i.} \cdot p_{.j} \quad \forall i, j, \\ H_1 &: \exists p_{ij} \neq p_{i.} \cdot p_{.j}, \end{aligned} \tag{1}$$

where p_{ij}, $p_{i.}$, $p_{.j}$, $i = 1,2,\cdots,r$, $j = 1,2,\cdots,c$ are the probabilities for cells (i,j), i=1,...,r; j=1,...,c of the two-dimensional discrete random variables, marginal column and marginal row

probabilities, respectively. If the components of two-dimensional discrete random variables are independent, each two-dimensional probability equals the product of the marginal column and the row probabilities (more detailed in Bahovec and Čižmešija, 2005). The expected frequencies are the frequencies that would be expected under the null hypothesis that there is no relationship between the variables. The Pearson *Chi*-square statistic is defined as:

$$\chi^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{(m_{ij}-e_{ij})^2}{e_{ij}} \quad , \tag{2}$$

where $m_{ij}\ \ i=1,2,\cdots,r,\ \ j=1,2,\cdots,c$ are empirical frequencies and $e_{ij},\ \ i=1,2,\cdots,r,\ \ j=1,2,\cdots,c$ are expected frequencies. The expected frequency in each cell should be at least 5. In order to meet this requirement, modalities with the expected frequencies that are less than 5 should be merged with neighbouring modalities. The null hypothesis is not rejected if the test statistic is less than *Chi*-square critical value at the given significance level α or, equivalently if the empirical significance level (*p*-value) is greater than the theoretical significance level α. The Likelihood ratio (ML) *Chi*-square tests the same hypothesis as the Pearson *Chi*-square test, except its computation is based on Maximum-Likelihood theory. In applied work, the ML *Chi*-square test statistic is usually very close in magnitude to the Pearson *Chi*-square statistic (Bishop, Fienberg & Holland, 1975; Fienberg, 1977).

Although, *Chi*-square test is very useful tool for testing for a relationship, it suffers from several weaknesses, *e.g.* it requires a relatively large sample, it does not reveal the nature and the strength of the relationship, the value of the *Chi*-square statistic may change depending on the number of cells in the table, etc.

In order to circumvent some of these problems, the *Chi*-square statistic can be adjusted to take account of differences in sample size and dimension of the table, as well as to evaluate the strength of association between the categorical variables. Some of the measures that are usually presented are *Phi*-square, the contingency coefficient and Cramer's V.

The *Phi*-square measure of association (more detailed in Siegel and Castellan, 1988), which adjusts the *Chi*-square statistic by the sample size, is defined as:

$$\phi = \frac{\chi^2}{n}, \tag{3}$$

where χ^2 is the *Chi*-squared statistic and n is the sample size. It measures the correlation between two categorical variables with values that range from 0 (no relation) to 1 (perfect relation). Another *Chi* -square based measure of association that adjusts for different sample sizes is the contingency coefficient, defined as:

$$C = \sqrt{\frac{\chi^2}{n+\chi^2}}\,. \tag{4}$$

Its minimum value is 0 and denotes complete independence of two variables. The coefficient is always less than 1 and varies according to the number of rows and columns. *C* is interpreted as a measure of the relative (strength) of an association between two variables.

The Cramer's V, *Chi*-square based measure of association, is defined as:

$$V = \sqrt{\frac{\phi}{t}} = \sqrt{\frac{\chi^2}{nt}}, \tag{5}$$

where t=minimum $(r-1,\ c-1)$, r is the number of rows, and c is the number of columns. Cramer's V is usually used to measure and compare the strength of association between any two

cross classification tables (tables of different dimension). Cramer's V equals 0 when there is no relationship between the two variables, and has a maximum value of 1, regardless of the dimension of the table or the sample size. In the case of 2x2 table the value of V equals the value of the square root of the ϕ.

3. Empirical Results

The empirical analysis is divided into two parts. The first part includes the analysis of association (independence) between variable liquidity and variables business position, demand and firm's total employment over the past 3 months (Table 1), and liquidity and expected business position, demand and firm's total employment in the next 3 or 6 months (Table 2).

Variables/Questions (the past 3 months)	*Chi*-square	*p*-value	*Phi*-square	Contingency coefficient
Business position, Q1	0.739	0.390	0.006	0.075
Turnover (demand), Q2	0.293	0.588	0.002	0.047
Firm's total employment, Q4	0.343	0.558	0.003	0.051

Table 1: Measures of association for relationship between the liquidity question and the questions about the past 3 months (Q1, Q2 and Q4)

Variables/Questions (expectations)	*Chi*-square	*p*-value	*Phi*-square	Contingency coefficient
Expected business position, Q7	0.602	0.438	0.005	0.068
Expected turnover (demand), Q3	0.007	0.936	0.000	0.007
Expected firm's total employment, Q5	0.121	0.727	0.001	0.031

Table 2: Measures of association for relationship between the liquidity question and the questions about the expectations (Q7, Q3 and Q5)

The presented results indicate that there are no associations between managers' assessments of liquidity and their assessments about the business situation, demand and firm's total employment over the past 3 months (Table 1), as well as liquidity and expected business position in the next 6 months and expected demand and firm's total employment in the next 3 months, (Table 2). All *Chi*-square test statistics are very small and consequentially the related empirical significance levels *(p*-value*)* are greater than any theoretical significance level. Hence, the null hypotheses of no association cannot be rejected. The conclusion is supported by low values of *Phi*-squares and contingency coefficients, as well (both are less than 0.1). Thus, the sample data indicate that there are no associations between managers' assessments of liquidity and their assessments of current and expected business position and demand and firm's total employment.

The second part includes the analysis of association (independence) between past and expected business position, demand and firm's total employment (Table 3).

Variables/Questions	*Chi*-square	*p*-value	*Phi*-square	Contingency coefficient
Business position, Q1 and Expected business position, Q7	4.299	0.038	0.181	0.179
Turnover (demand), Q2 and Expected turnover (demand), Q3	18.753	0.000	0.380	0.355
Firm's total employment, Q4 and Expected firm's total employment, Q5	3.192	0.074	0.157	0.145

Table 3: Measures of association for relationships between the questions about the past 3 months and the questions about the expectations

The results in Table 3 indicate that there is an association between managers' assessments of business position over the past 3 months and their assessments of expected

business position. The same conclusions are obtained for variables demand over the past 3 months and expected demand, as well as for firm's total employment over the past 3 months and expected firm's total employment. All *Chi*-square test statistics are large and the related empirical significance levels *(p*-value*)* are small. Consequently, the null hypotheses of no association are rejected. The values of *Phi*-squares and contingency coefficients for variables business position and employment show low association (<0.3), while the coefficients' values for variables demand and expected demand point out the moderate association between variables.

Thus, on the basis of the sample data it can be concluded that there is an association between managers' assessments of the present and the past business position and their judgments about expected business positions. The same holds for their assessments of the employment and expected employment, as well as for the firm's turnover and expected firm's turnover.

4. Conclusion

Business Survey (BS) is a qualitative survey and is based on questionnaires in which managers express their judgements about their past and present business situation and about their future plans and expectations concerning different economic sectors such as the manufacturing industry, retail trade, construction and services. Croatian BS questionnaires, compared to the questionnaires applied in other EU countries, include additional question about the company's liquidity level.

Consequently, the analysis presented in this paper is based on the variable liquidity, important variable in the Croatian economy during the recession, and explores the association between this variable and other variables from the questionnaire. Furthermore, the association between the variables related to the current firms' situation and variables related to their future plans and expectations were tested as well.

Based on the obtained results, it can be concluded that there are no statistically significant associations between managers' assessments of liquidity and their assessments of current and expected demand, firm's total employment and business position. However, it turns out that there is a statistically significant association between managers' assessments of the current business position and their judgments about expected business positions, between managers' assessments of the employment and expected employment, as well as for the firm's turnover and expected firm's turnover.

Croatia is an EU member country which is still in recession. The conclusion of the paper research confirms the presence of managers' pessimism. Since their expectations are unfavorable, it is not expected the improvement in economic activity in the next 3 to 6 months. This means that Croatia will until further remain in recession.

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