BUSINESS SURVEY LIQUIDITY MEASURE AS A LEADING INDICATOR OF CROATIAN INDUSTRIAL PRODUCTION

Mirjana Čižmešija
Faculty of Economics and Business, University of Zagreb
J. F. Kennedy 6, 10 000 Zagreb, Croatia
E-mail: mcizmesija@efzg.hr

Nataša Kurnoga Živadinović
Faculty of Economics and Business, University of Zagreb
J. F. Kennedy 6, 10 000 Zagreb, Croatia
E-mail: nkurnoga@efzg.hr

Abstract

Business survey liquidity measure is one of the modifications of the uniform EU business survey methodology applied in Croatia. Consequent liquidity problem have been, since socialist times, one of the major problem for Croatia's business. The problem rapidly increased between 1995 and 2000 and now it again represents the main difficulty for the Croatian economy. In order to improve the forecasting properties of business survey liquidity measure, some econometric models ware applied. Based on the regression analysis we concluded that the changes in the liquidity variable can predict the direction of changes in industrial production with one quarter lead. The results also show that liquidity can be a proxy of the Industrial Confidence Indicator in the observed period. The empirical analysis was performed using quarterly data covering the period from the first quarter 2005 to the fourth quarter 2011. The data sources were *Privredni vjesnik* (a business magazine in Croatia) and the Croatian Bureau of Statistics.

Key words: *Business Survey, Industrial Confidence Indicator, liquidity, leading indicator, regression*

1. INTRODUCTION

Business Survey (BS) is one of the important data sources for macroeconomic analysis and forecasting. They are carried out to obtain information about managers' assessments of their current business situation and about their future plans and expectations. The Croatian Business Survey started operating in 1995 for manufacturing industry, construction and retail trade (and for services in 2008).

The surveys are designed, and composite indicators are calculated (on a quarterly basis), in accordance with the Harmonized EU Programme of Business and Consumer Surveys. BS can be used for getting answers to the questions outside harmonized methodology which may be of particular interest for the economy under observation. When Croatia's survey was launched, some modifications of the uniform methodology were permitted, so questionnaires contained additional questions like *liquidity* and *export order books* (Čižmešija, 2001). Liquidity as a variable is derived from the following question: "Liquidity of your firm is: (1) good, (2) with temporary problems, (3) bad". This variable is expressed as a difference (balance) between the weighted percentages of the positive ("good") and negative responses ("bed") of the firms to that question.

2. LIQUIDITY AND BUSINESS SURVEY LIQUIDITY MEASURE

Liquidity (solvency) is usually defined as the company ability to timely settle its short-term obligations. The ratios used to measure companies' liquidity are in business economics, besides the measures of profitability, the signals of corporate performance.

Arrears and consequent liquidity problem have been, since the socialist times, one of the major problems in the business operations of the Croatia's firms. Arrears mean that some of the firms do not meet their financial obligations on time and are late for more than 360 days. They reflect lack of financial discipline known as a part of "soft budget constraint". Such behaviour triggers a chain reaction in the economy as a whole turning sometimes profit making firms, illiquid.

Insolvency was one of the particularities of the transition countries like Croatia (when it started with the BS). Over time, the illiquidity, both at the micro and macro level was reduced to insignificance level. Now in the recession, liquidity problem was pronounced again, not only in transition countries, but also in the most European economies and thus Croatia.

So, during the time under observation (1995-2011) arrears were getting up and down. However, after the tax reform in 1998 which has substantially increased tax burden, and consequent increase in public expenditure, arrears have increased and in 1999 accounted for roughly 20% of GDP. It is worth mentioning that in this year the rate of change of GDP was negative. There is no doubt that fluctuations of the magnitude of liquidity problem have had a certain impact upon overall economic activity.

The value of unexecuted payment has been increasing especially since 2008, while the number of insolvent companies after intense growth in this period, in the first quarter of 2011 was reduced. It means that companies with the smallest debts were excluded from the evidence. Although the value of outstanding commitments in 2011 grew slower than the previous two years, it is still in the end of 2011 (data sources: Croatian Chamber of Economy) recorded HRK 41,7 bn outstanding commitments. The most significant part of the value of outstanding commitments are still those with the maturity longer than one year, which make more than 80% of the total outstanding commitments.

There are three basic ratios used to measure liquidity (Žager and Gulin, 2006): current ratio, quick ratio and financial stability ratio. Current ratio measures the relationship between current assets and the current liabilities. The expected value of current ratio is more than 2 and that means that companies should have two times more cash, receivables and inventory then its current liabilities. Quick ratio is defined as current assets (cash and receivables) to current liabilities. The optimal level of current ratio is more than 1 and that means that current liabilities should not exceed current assets (the sum of cash and receivables). Financial stability ratio compares noncurrent assets to equity and long-term liabilities. Its expected value is less than 1 and that means that the value of noncurrent assets is less than the sum of equity and long-term liabilities. Decreasing financial stability ratio indicates increasing liquidity and financial stability and that means that a part of current assets is financed by quality long term sources of assets.

Managers in Croatia's business survey based liquidity assessments of their companies on the values of three liquidity indicators and expressed it as mentioned above.

Their liquidity assessments, as a result of (in essence) qualitative surveys, are translated into quantitative expressed indicators. Firstly, balance must be calculated. Balance is the difference between weighted percentages of positive and negative answers to corresponding variable. In order to aggregate the results, confidence indicators can be calculated. So, in manufacturing industry Industrial Confidence Indicator (ICI) is calculated. It is a simple average of seasonally adjusted balances[1]of three variables (Čižmešija, 2008): order book, production expectation and stock of the finished products (with the negative sign).

The selection of variables which are components of confidence indicators is not strictly determined and unique. The EU harmonised methodology is a benchmark of worldwide used business survey methodology. The factor analysis (Čižmešija and Kurnoga Živadinović, 2002) indicated that, like in the other economies, three factors, i.e. components of the Industrial Confidence Indicator (ICI) as a leading indicator, determine changes in industrial production: order books, production expectations and stock of finished products. The results of the same analysis showed that liquidity was highly correlated with all the variables in the questionnaire. It is important to show here that *liquidity* can be a proxy of the ICI in the observed period.

[1] The European Commission and Croatia use the DAINTIES seasonal adjustment method.

3. METHODOLOGY AND DATA SET

Each variable in BS (such as assessments and expectations) and composite indicators can be a short-term forecasting indicator for the corresponding macroeconomic variable (Čižmešija, Erjavec and Bahovec, 2010). Research results conducted in Croatia (Bahovec, Cizmesija and Kurnoga – Zivadinovic, 2007 and 2008; Nikic, Sosic and Cizmesija, 2002 ; Sosic and Cizmesija, 2003; Bahovec and Cizmesija, 2003) show that Croatia's business survey results (expressed as ICI) correctly predict changes in Croatia's industrial production with one or two quarters ahead in around 60% of cases.

Managers' subjectivity which is included in BS is one of the reasons that BS indicators are primly used to forecast the direction of changes in referent economic series, not to forecast the value of changes (European Economy, 2007). Consequently, it is of interest here to track the direction of changes in a variable liquidity and in the referent series, namely industrial production. In order to investigate the importance of the business survey liquidity measure and its forecasting properties, when predicting changes in the Croatian industrial production, especially in recession, we applied some econometric models.

The empirical analysis was performed using quarterly data covering the period from the first quarter 2005 to the fourth quarter 2011. The data sources were *Privredni vjesnik* (a business magazine in Croatia) and the Croatian Bureau of Statistics. Industrial production is expressed (in accordance with the EU methodology) as the growth rate of industrial production compared to the same period of the previous year, (y-o-y)[2]. The variable RATE stands for Croatia's growth rate of industrial production. Other abbreviations used in the study are: LIQ – liquidity[3], LIQ_1 – one quarter lag of variable liquidity and LIQ_2 – two quarters lag of variable liquidity[4]. We estimated the following regression models:

$$RATE_t = \beta_0 + \beta_1 LIQ_t + e_t \qquad (1)$$

$$RATE_t = \beta_0 + \beta_1 LIQ\_1_t + e_t \qquad (2)$$

$$RATE_t = \beta_0 + \beta_1 LIQ\_2_t + e_t \qquad (3)$$

The estimation results and diagnostic statistics for the regression model (1) with the rate of change of industrial production and variable liquidity are presented in Table 1.

[2]In accordance with the Joint Harmonised EU Methodology of Business and Consumer Survey (European Economy, 2007)
[3]Seasonally adjusted balances of variable liquidity.
[4] The period of two quarter lags is in accordance with the empirical results, i.e. that the confidence indicator (it means each variable) correctly predicts changes in referent series with the lags up to six months (Gayer, 2004).

Table 1: Estimates of the regression model for RATE and diagnostic statistics (independent variable LIQ)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-12.68577	2.615583	-4.850073	0.0000
LIQ	0.298707	0.057011	5.239456	0.0000

R-squared	0.513581	Mean dependent var	0.523481
Adjusted R-squared	0.494873	S.D. dependent var	5.186475
S.E. of regression	3.686147	Akaike info criterion	5.515790
Sum squared resid	353.2796	Schwarz criterion	5.610947
Log likelihood	-75.22105	Hannan-Quinn criter.	5.544880
F-statistic	27.45190	Durbin-Watson stat	1.617090
Prob(F-statistic)	0.000018		

The results of regression analysis and regression diagnostics for the model (2) with one quarter lag of variable liquidity are presented in Table 2.The results of the similar regression model (3) with two quarters lag of variable liquidity are presented in Table 3.

Table 2: Estimates of the regression model for RATE and diagnostic statistics (independent variable LIQ_1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-13.28362	2.455357	-5.410057	0.0000
LIQ_1	0.310347	0.053176	5.836179	0.0000

R-squared	0.567107	Mean dependent var	0.523481
Adjusted R-squared	0.550457	S.D. dependent var	5.186475
S.E. of regression	3.477427	Akaike info criterion	5.399211
Sum squared resid	314.4049	Schwarz criterion	5.494369
Log likelihood	-73.58896	Hannan-Quinn criter.	5.428302
F-statistic	34.06099	Durbin-Watson stat	1.879469
Prob(F-statistic)	0.000004		

Table 3: Estimates of the regression model for RATE and diagnostic statistics (independent variable LIQ_2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-12.74629	2.493811	-5.111169	0.0000
LIQ_2	0.295729	0.053489	5.528808	0.0000

R-squared	0.540374	Mean dependent var	0.523481
Adjusted R-squared	0.522696	S.D. dependent var	5.186475
S.E. of regression	3.583190	Akaike info criterion	5.459133
Sum squared resid	333.8206	Schwarz criterion	5.554291
Log likelihood	-74.42787	Hannan-Quinn criter.	5.488224
F-statistic	30.56772	Durbin-Watson stat	1.741272
Prob(F-statistic)	0.000008		

All lags of the variable liquidity up to two quarters proved to be significant (at the usual level of significance) indicating that the effect of the variable liquidity on industry growth in Croatia is significant. The results are in accordance with the primarily task of BS indicators which is to forecast only the direction of changes, not the values of changes. The signs of regression coefficients are positive which means that Croatian managers' liquidity assessments in manufacturing industry have positive impact on changes in Croatia's industrial production. Whereas, in accordance with obtained results of the regression model for one quarter lead (model with the best results in regression diagnostics), it can be concluded that changes in variable liquidity have significant positive impact on changes in Croatia's industrial growth rate one quarter ahead. It means that variable liquidity can be used as a predictor of industrial production (Figure 1).

Furthermore, with the aim to investigate if the recession period in Croatia influences Croatia’s economy, dummy variable was included in the regression models. The dummy variable take value one in the period when the industrial rate of change falls i.e. starting with the first quarter when the rate of change of industrial production began to decrease continuously (in the first quarter of 2007). In all regression models, the dummy variable did not prove to be statistically significant (at the usual significance level) in the model. The results of the analyses can be interpreted that the recession period is not important in predicting changes in industrial production on the basis of the changes of business survey liquidity measures for all lags of the variable liquidity and instantaneously.

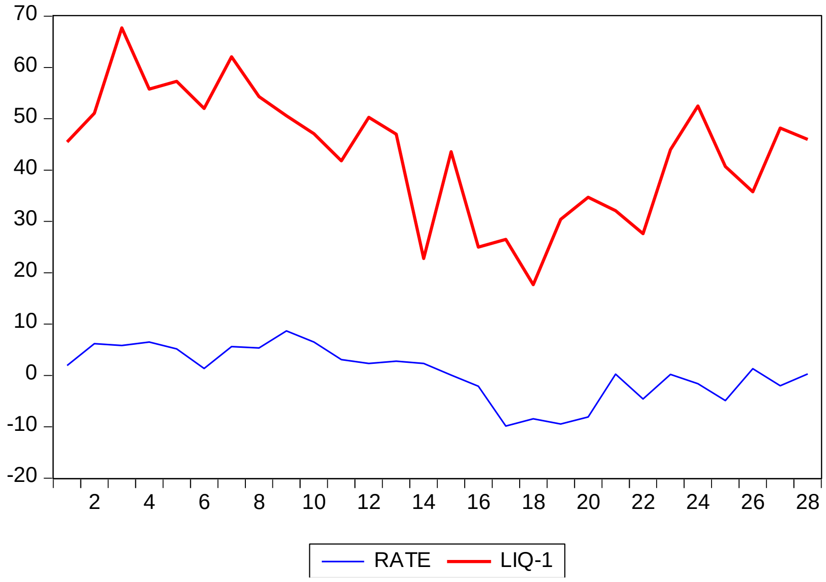

Figure 1: Rate of change of industrial production and business survey liquidity measure lagged one quarter ahead

Figure 2 shows that variable liquidity and ICI have the similar pattern. It means that in the period under observation, variable liquidity lagged one quarter, turned out to be a proxy of the ICI.

Figure 2: Industrial confidence indicator and business survey liquidity measure lagged one quarter ahead

In the analysis of forecasting accuracy of direction of change (Šošić and Čižmešija, 2003) the confusion matrix and confusion rate can be used. The confusion matrix is a specific 2x2 contingency table which allows visualization of the predicted and real changes of variable. Each column of the confusion matrix represents the instances in a predicted change, while each row represents the instances in an actual (real) change. The confusion rate (*CR*) is defined as follows:

$$CR = \frac{1}{n} \; n_{ud} + n_{du} \tag{4}$$

where n is a number of forecasts, n_{ud} and n_{du} are off-diagonal elements of the confusion matrix. CR is a number in interval [0,1]. In this paper, it is of interest to analyze the direction of change in industrial production on the basis of the change in liquidity measure. In all the cases (instantaneously, one quarter lag and two quarters lag) CR have the same value 0,5926,[5] so in selecting representative regression model, the best model is the second one (for one quarter lag of liquidity). This model has the best regression diagnostics. So, it can be conclude that on the basis of changes in variable liquidity we can predict changes in industrial production with one quarter lead. These results are in accordance

[5]In the analysis of forecasting accuracy the direction of change test was also used. It is based on confusion-rate (CR). The direction of change test is equivalent to the standard χ^2 test of independence in the standard 2x2 contingency table. Since n is small, the results were not interpretable.

with the fact that business survey liquidity measure has forecast properties and can be a proxy for ICI as a convenient composite leading indicator.

4. CONCLUSION

Arrears and consequent liquidity problem have been one of the major problems in the Croatian economy. Illiquidity was one of the particularities of the transition countries like Croatia. Over time, the illiquidity was reduced to insignificance level, but now in the recession, liquidity problem was pronounced again.

In order to improve the importance of the business survey liquidity measure and its forecasting properties, when predicting changes in the Croatian industrial production, especially in recession, we applied some econometric models. Based on the regression analysis we concluded that the changes in the liquidity variable can predict the direction of changes in industrial production with one quarter lead. Our results also show that liquidity can be a proxy of the ICI in the observed period.

REFERENCES

Bahovec, V., Čižmešija, M., Kurnoga Živadinović, N., (2008), "The forecasts of some macroeconomic variables for Croatia using the information provided by business surveys", *Proceedings of the 11th International Conference on Operational Research KOI 2006,* Boljunčić, V. (editor), Pula, Croatia, September 27-29, 2006, pp.77 – 86.

Bahovec, V., Čižmešija, M., Kurnoga Živadinović, N., (2007), "Testing for Granger Causality between Economic Sentiment Indicator and Gross Domestic Product for the Croatian Economy", *Proceedings of the 9th International Symposium on Operational Research SOR '07,* Zadnik Stirn, N., Drobne, S. (editors), Nova Gorica, Slovenia, September 26-28, 2007, pp. 403-408

Bahovec, V., Čižmešija, M.(2003), "Seasonal adjustment methods of components for Industrial Confidence Indicator – ICI, in Croatia with interface DEMETRA", *Proccedings of the 9th International Conference on Operational Research KOI 2002*, Šorić, K., Hunjak, T., Scitovski, R. (editors) Trogir, October 2-4, 2002, pp. 185-194

Čižmešija, M., Erjavec, N. and Bahovec, V. (2010), "EU Business and Consumer Survey Indicators and Croatian Economy", *Zagreb International Review of Economics & Business*, Vol. XIII, No.2, pp. 15-25.

Čižmešija, M. (2008), *Konjunkturni testovi Europske unije i Hrvatske*, Privredni vjesnik, Zagreb

Čižmešija, M. (2001), *Statističko-metodološka podloga konjunkturnih testova*, Ekonomski fakultet, Zagreb

Čižmešija, M., Kurnoga Živadinović, N. (2002), "Faktorska analiza rezultata konjunkturnih testova Hrvatske", *Ekonomski pregled*, 7-8/2002, pp. 684-705.

Gayer, C. (2004), "Forecast Evaluation of European Commission Survey Indicators", *Proceedings of the 27th CIRET Conference*, Warsaw

Nikić, G., Šošić, I., Čižmešija, M. (2002), "Business and investment surveys in Croatia – a case study of an economy in transition", *Proccedings (CD), 12 p. http://www.ciret.org/conferences/taipei_2002/c26_papers, 26th CIRET Conference,* Taipei, October 6-19, 2002

Šošić, I. and M. Čižmešija, M. (2003), "A note about forecasting accuracy of business survey in Croatia", *Bulletin of the International Statistical Institute, 54th Session, Contributed Papers*, Volume LX, Book 2 (CD): 465 – 466.

European Economy, European Commission, Directorate-General for Economic and financial affairs (2007), *The joint harmonised EU programme of business and consumer surveys, User guide,*

Žager, L. and Gulin, D. (2006), *Računovodstvo*, Hrvatska zajednica računovođa i financijskih djelatnika, Zagreb

http://www.hgk.hr, Hrvatska gospodarska kretanja – 1, 2012 [Accessed 08/05/12], Croatian Chamber of Economy