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Kalman Filter or VAR Models to Predict Unemployment Rate in Romania?

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Abstract

This paper brings to light an economic problem that frequently appears in practice: For the same variable, more alternative forecasts are proposed, yet the decision-making process requires the use of a single prediction. Therefore, a forecast assessment is necessary to select the best prediction. The aim of this research is to propose some strategies for improving the unemployment rate forecast in Romania by conducting a comparative accuracy analysis of unemployment rate forecasts based on two quantitative methods: Kalman filter and vector-auto-regressive (VAR) models. The first method considers the evolution of unemployment components, while the VAR model takes into account the interdependencies between the unemployment rate and the inflation rate. According to the Granger causality test, the inflation rate in the first difference is a cause of the unemployment rate in the first difference, these data sets being stationary. For the unemployment rate forecasts for 2010–2012 in Romania, the VAR models (in all variants of VAR simulations) determined more accurate predictions than Kalman filter based on two state space models for all accuracy measures. According to mean absolute scaled error, the dynamic-stochastic simulations used in predicting unemployment based on the VAR model are the most accurate. Another strategy for improving the initial forecasts based on the Kalman filter used the adjusted unemployment data transformed by the application of the Hodrick-Prescott filter. However, the use of VAR models rather than different variants of the Kalman filter methods remains the best strategy in improving the quality of the unemployment rate forecast in Romania. The explanation of these results is related to the fact that the interaction of unemployment with inflation provides useful information for predictions of the evolution of unemployment related to its components (i.e., natural unemployment and cyclical component).

Keywords: forecasts, accuracy, Kalman filter, Hodrick-Prescott filter, VAR models, unemployment rate

1 Introduction

The macroeconomic forecasting process witnessed rapid development because economic policies should be based on anticipations regarding the evolution of the economic indicators of a country or region. This impressive development of forecasting methods brought about a practical problem: Different forecasts are provided for the same indicator, but various forecasting methods are used. In general, international organizations prefer to use quantitative methods to

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construct their predictions. The development of econometrics made it an essential tool in building predictions, even if many experts have contested the utility of econometric models, especially in the context of the recent economic crisis. However, these models should not be neglected. The correct solution is to continue the use of more alternative models while incorporating an accuracy assessment for the economic prognoses in order to select the best prediction. This demarche could be considered a good strategy for improving forecast accuracy, an important goal of contemporary economists mainly because the cause of the recent global crisis was the high uncertainty of macroeconomic forecasts.

The literature provides many quantitative tools for predicting macroeconomic indicators like the unemployment rate. For this indicator, the Kalman filter could also be used in making predictions. This method is usually applied in determining the natural unemployment rate, the value for which we have a reasonable level or a stability of inflation rate and wages. The Phillips curve used to describe the relationship between inflation and unemployment rate is not checked in Romania, but vector-autoregressive (VAR) models are an efficient method for providing evidence of the interdependences between the two variables.

The objective of this research is to conduct a comparative analysis of unemployment rate forecasts based on two econometric methods: Kalman filter and VAR models. The best method is actually a strategy of improving the predictions' accuracy by choosing the most suitable quantitative forecasting method. Moreover, we add another perspective to improve the predictions' accuracy. We also propose improving a certain method by making a suitable transformation of that method. In this case, the Kalman filter to make predictions is applied to the transformed data series based on another filter (i.e., the Hodrick-Prescott filter). Thus, a double adjustment is made to the data. The proposed state space model used in the literature for predicting the unemployment rate is applied to the Romania data. If this model is not valid, another one is chosen to fit the data.

The organization of this research is as follows: After a brief review of the literature presenting the quantitative methods used in predicting the unemployment rate, we explain the methodology used. Predictions are made for the unemployment rate in Romania from 2010 to 2012 using the Kalman filter and VAR models, and the steps for building these forecasts are presented in detail. The accuracy evaluation is based on common accuracy measures that lead us to determine the superiority of a certain method.

2 Literature

The accuracy of unemployment rate forecasts should be known by governmental decision makers, placement agency workforce, researchers interested in the labor market, and even employees and unemployed people. It is a subject of interest for the overall public opinion. Many studies have treated the problem of the accurate evaluation of macroeconomic forecasts, but only a few of them are related to unemployment predictions.

Camba-Mendez (2012) built conditional forecasts using VAR models and Kalman filter techniques. Kishor and Koenig (2012) made predictions for macroeconomic variables like unemployment rate using VAR models and taking into account that data are subject to revisions. Sermpinis**,** Stasinakis, and Karathanasopoulos (2013) made predictions for the unemployment rate in the United States using neural networks and compared the utility of support vector regression (SVR) and the Kalman filter in combining these forecasts. The accuracy was greater for the case of SVR approach. Smooth transition vector error-correction models were used by Milas and Rothman (2008) to predict the unemployment rate in numerous countries; for the United States, the pooled predictions based on the median value of point forecasts generated by the linear and STVECM forecasts outperformed the naïve predictions. Proietti (2003) compared the accuracy of several predictions based on linear unobserved components models for the monthly unemployment rate in the United States, concluding that the shocks are not persistent during the business cycle.

Van Dijk, Teräsvirta, and Franses (2000) used a logistic smooth transition autoregressive model to predict the Organization for Economic Cooperation and Development (OECD) countries, with their forecasts outperforming the naïve predictions. Franses, Paap, and Vroomen (2004) assessed the accuracy of unemployment rate forecasts of three G7 countries using an autoregressive time-series model with time-varying parameters; this variation depended on a linear indicator variable.

Kurita (2010) showed that ARFIMA model forecasts for Japan's unemployment rate outperformed the AR(1) model predictions. Allan (2013) improved the accuracy of OECD unemployment forecasts for G7 countries by applying the combination technique. The researcher used two types of methods to assess the accuracy: quantitative techniques and qualitative accuracy methods.

A detailed study regarding unemployment forecasts and predictions performance carried out by Barnichon and

Nekarda (2012) resulted in a model for the unemployment rate whose predictions outperformed the results offered by classical time-series or by the Survey and Professional Forecasters and Federal Reserve Board. Franses, McAleer, and Legerstee (2012) evaluated the performance of unemployment forecasts made by staff of the Federal Reserve Board and the Federal Open Market Committee (FOMC); the Diebold-Mariano test indicated insignificant differences in terms of forecast accuracy.

Heilemann and Stekler (2013) offered several reasons for the lack of accuracy of G7 predictions in the last 50 years. They identified one continuous critique brought to macro-econometric models and forecasting techniques, but also concluded that the accuracy expectations are not realistic. Other aspects of the forecasts' failure related to forecasts' bias, data quality, the forecasting procedure, type of predicted indicators, and the relationship between forecast accuracy and forecast horizon.

The accuracy of forecasts based on VAR models can be measured using the trace of the mean-squared forecasts error matrix or generalized forecasts error second moment (Clements & Hendry, 2003). Robinson (1998) demonstrated better accuracy for predictions of some macroeconomic variables based on VAR models compared to other models, like transfer functions. Finally, Lack (2006) found that combined forecasts based on VAR models are a good strategy for improving predictions' accuracy.

3 Methodology

The Kalman filter is an econometric method for predicting the endogenous variables and for adjusting the estimated parameters in forecast equations. There are two systems of equations: a system of prediction equations and a system of update equations.

The stages for applying the Kalman filter are as follows:
1. Estimating endogenous variables values using available prior information.
2. Adjusting estimated parameters using adjustment equations and computing prediction errors.

A state space model includes two equations:

Measurement equation (relationship between observed and unobserved variables): $y_t = H_t\beta_t + Az_t + e_t$

Transition equation (dynamic of state (unobserved)): $\beta_t = \mu + F\beta_{t-1} + v_t$

y_t – data series
z_t – observed explanatory variables
H_t – variable coefficients of unobserved series
β_t, A, and F – constant coefficients
e_t and v_t – shocks

Assumptions
$e_t \sim iid.\ N(0, R)$
$v_t \sim iid.\ N(0, Q)$
$E(e_t, v_t) = 0$

The objectives are:

1. The estimation of state space model parameters
$y_t = H_t\beta_t + Az_t + e_t$
$\beta_t = \mu + F\beta_{t-1} + v_t$
$e_t \sim iid.\ N(0, R)$
$v_t \sim iid.\ N(0, Q)$

2. Restoration of the unobserved state
$y_t = H_t\beta_t + Az_t + e_t$
$\beta_t = \mu + F\beta_{t-1} + v_t$
$e_t \sim iid.\ N(0, R)$
$v_t \sim iid.\ N(0, Q)$
$\beta_{t/t-1}$ – the estimation of β_t latent state according to the information until t-1
$\beta_{t/t}$ – the estimation of β_t state according to the information until t
$P_{t/t-1}$ – the β_t covariance according to the information until t-1
$P_{t/t}C$ – the β_t covariance according to the information until t
$y_{t/t-1}P$ – the prediction of y using the information until t-1
$\eta_{t/t-1} = y_t - y_{t/t-1}$ – error prediction
$f_{t/t-1}$ – the variance of prediction error

The Kalman filter offers an optimal estimation for β_t, conditioned by the information related to the H_t state space parameters: A, μ, F, R, and Q. We suppose that μ, F, R, and Q are known.

The recursive Kalman filters involve three stages:

1. We start with the supposed values at the initial moment 0: $\beta_{0/0}$ and $P_{0/0}$.

2. The prediction: the optimal prediction $y_{1/0}$ at moment 1, using $\beta_{1/0}$.

3. The update: the calculation of the prediction error, using the observed value for *y* at moment *1*

$$\eta_{1/0} = y_1 - y_{1/0}$$

The information included in the prediction error has data that can be recovered for redefining our assumption regarding the value that β could have

$$\beta_{1/1} = \beta_{1/0} + K_t \eta_{1/0}$$

K_t– the Kalman gain (the importance accorded to the new information).

The predicted values:

$$\beta_{t/t-1} = \mu + F\beta_{t-1/t-1}$$

$$P_{t/t-1} = FP_{t-1/t-1}F' + Q$$

The prognosis for *y* and the error prediction are:

$$\eta_{t/t-1} = y_t - y_{t/t-1} = y_t - x_t\beta_{t/t-1}$$

$$f_{t/t-1} = x_t P_{t/t-1} x'_t + R$$

The update:

$$\beta_{t/t} = \beta_{t/t-1} + K_t\eta_{t/t-1}$$

$$P_{t/t} = P_{t/t-1} - K_t x_t P_{t/t-1}$$

Kalman gain: $K_t = P_{t/t-1}x'_t (f_{t/t-1})^{-1}$.

The actual observed unemployment rate is the sum of two components: the natural unemployment rate quantifying the persistent shocks from the supply side (we assume it follows a random path) and the cyclical unemployment that refers to the shocks from the demand side, which are limited as persistence (this component exhibits serial correlation). Some authors consider the cyclical unemployment to influence the natural unemployment rate.

$$u_t = u_t^{nat} + \alpha_t$$

$$u_t^{nat} = u_{t-1}^{nat} + \varepsilon_t$$

$\alpha_t = \rho\alpha_{t-1} + \omega_t$
$\varepsilon_t \sim N(0;\sigma_\varepsilon^2)$
$\omega_t \sim N(0;\sigma_\omega^2)$
$E(\varepsilon_t, \omega_t) = 0$

A state space model for the natural unemployment can have the following form:

$u_t = Z\beta_t$, $t = 1, 2, \ldots, T$ (measurement equation)

$$Z=[1\ 1],\ \beta_t = \begin{bmatrix} u_t^{nat} \\ \alpha_t \end{bmatrix}$$

$\beta_t = T\beta_{t-1} + R\vartheta_t$ (transition equation)

$$\mathrm{T} = \begin{bmatrix} 1 & 0 \\ 0 & \rho \end{bmatrix},\ \vartheta_t = \begin{bmatrix} \varepsilon_t \\ \omega_t \end{bmatrix}$$

$\varepsilon_t \sim N(0;\sigma_\varepsilon^2)$
$\omega_t \sim N(0;\sigma_\omega^2)$
$E(\varepsilon_t, \omega_t) = 0$

Under these conditions the Kalman filter generates optimal predictions and updates of the state variables. The Kalman filter determines the estimator of the minimum square error of the state variables vector. The literature has defined two approaches for the estimation of a variable using this filter. The first one assumes that the initial value of the non-stationary state variable can be fixed and unknown. On the other hand, the second approach considers that the initial value is random. The diffuse prior is specified. If we analyze the first observations, the approach is better even if it can generate numerical instability. If *m* is the number of state variables, we utilize the approach with Koopman, Shepard, and Doornik's (1999)diffuse prior and *m* predictions are provided. The unknown parameters that will be estimated are ε_t, ω_t and ρ. However, some authors give these parameters some reasonable values from the start. For ρ, we have to establish the value from the start, and the log-likelihood function is computed. The variance of the shocks coming from the demand side (σ_ω^2) is always greater than the variance of supply shocks (σ_ε^2).

The Hodrick-Prescott (*HP*) filter is often used in macroeconomics to extract the trend of the data series and separate the cyclical component of the time series. The resulting smoothed data are more sensitive to long-term changes.

The initial data series is composed of trend and cyclical components:

$inf_t = tr_t + c_t$.

Hodrick and Prescott (1997) suggested the following solution to the minimization problem:

$$\min_{\{tr_t\}t=1,T} \sum_{t=1}^{T}(inf_t - tr_t)^2 + \gamma \sum_{t=2}^{T-1}(\nabla^2 tr_{t+1})^2$$

γ – penalty parameter

The solution to the above equation can be written as:

$$inf_t = (\gamma F + I_T) \cdot tr_T$$

inf_t – vector of the initial data series of the inflation rate

$$F = \begin{bmatrix} 1 & -2 & 1 & 0 & \dots & & & & & & \\ -2 & 5 & -4 & 1 & 0 & \dots & \cdots & & & & 0 \\ 1 & -4 & 6 & -4 & 1 & 0 & & & & & \\ & & \vdots & & & & \ddots & & \vdots & & \\ & & & & & & \cdots & & & & \dots \\ & & & & & & & 0 & 1 & -4 & 6 & -4 & 1 & 0 \\ & & & & & & & 0 & 0 & 1 & -4 & 6 & -4 & 1 \\ 0 & & 0 & & & & \dots & 0 & 0 & 1 & -4 & 5 & -2 & \\ & & & & & & & & & & & & & \end{bmatrix}$$

The trend is calculated as: $tr_T = [(\gamma \cdot F + I_T)]^{-1} \cdot inf_T$.

Razzak (1997) proved that the Hodrick-Prescott filter acts as true filter at the end of the sample and as a smoother over the entire sample. The output gap from the true filter generates better out-of-sample predictions of inflation.

4 Assessment of Forecasts based on Kalman Filter and VAR Models

The data series used in this study is represented by the average inflation rate (denoted by *i*) and the unemployment rate (denoted by *u*) registered in Romania between 1985 and 2012. The average inflation rate is computed as a geometric mean of the monthly indices of the chained base indexes of consumer prices minus the comparison base equal to 100. The unemployment rate is an indicator used to measure the unemployment intensity, which is computed as a ratio of the number of registered unemployed people and the active population. To model the unemployment rate, we used the data set for the 1985–2009 period, with the one-step-ahead predictions being made for 2010–2012. The data series were provided by a national data source—namely, the National Institute of Statistics. The *VAR* methodology is based on stationary data sets. The augmented Dickey-Fuller test application (see Appendix 2) provided evidence of the presence of one unit root in each data series. A differentiation of order for one of both data sets led us to stationary data. The new variables are denoted by *di* and *du*, respectively.

Initially we tried to estimate a state space model that explained the theoretical background with a diffuse prior value, but it was not valid (see Appendix 3). The estimations were made in EViews.

@signal u = sv1 + sv2
@state sv1 = sv1(-1) + [var = exp(c(2))]
@state sv2 = sv2(-1)+[var=exp(c(1))]

The two following models proved to be valid:

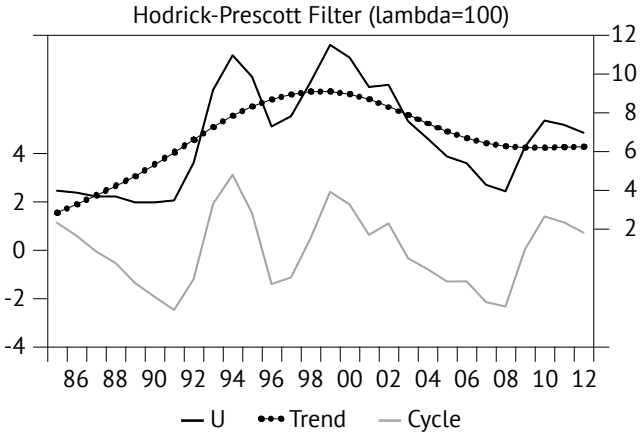
@signal u = sv1
*@state sv1 = c(2)*sv1(-1) + [var = exp(c(1))]*

and

@signal u = sv1
@state sv1 = sv1(-1) + [var = exp(c(1))]

Another strategy was based on the adjusted data using the Hodrick-Prescott filter. These new data were used to construct a new state space model using the Kalman technique in the estimation. New predictions were made for 2010–2012. Figure 1 depicts the two components of the data series: the trend and the cycle component.

Figure 1: Decomposition of unemployment rate data series using Hodrick-Prescott filter



The graph demonstrated an ascending trend until 1998, followed by a slow decrease until the end of the analyzed period, where the trend value was almost 6%.

The Granger causality test was applied for the stationary data series in order to establish if one variable causedanother one. In Granger acceptance, a variable *X* is a cause for *Y* if better predictions result when the information provided by *X* is taken into account.

Table 1 VAR Granger Causality Tests

Hypothesis	*Prob.*
di does not Granger-cause *du*	0.0042
du does not Granger-cause *di*	0.0731

Note: *di*- differential of inflation rate, *du*- differential of unemployment rate

The results of the Granger causality test show that *di* is the cause of *du*, but *du* is not the cause of *di*. Almost all the lag length criteria, except for *logL*, at the 5% level indicate that a *VAR(2)* model is the best model. All the tests required to check the validity of the estimated *VAR(2)* model are displayed in Appendix 1. The form of the *VAR* model is as follows:

$$di = -0.152048863149*di(-1) + 0.0573008404372*di(-2) - 0.888383240695*du(-1) - 0.0437580905699*du(-2) + 0.0754250947229$$

$$du = 0.166173513351*di(-1) + 0.282590212379*di(-2) + 0.407747364887*du(-1) - 0.182697623737*du(-2) + 0.136370162588$$

VAR residual portmanteau tests were used to test the errors' autocorrelation for both identified models. The assumptions of the test were formulated as:

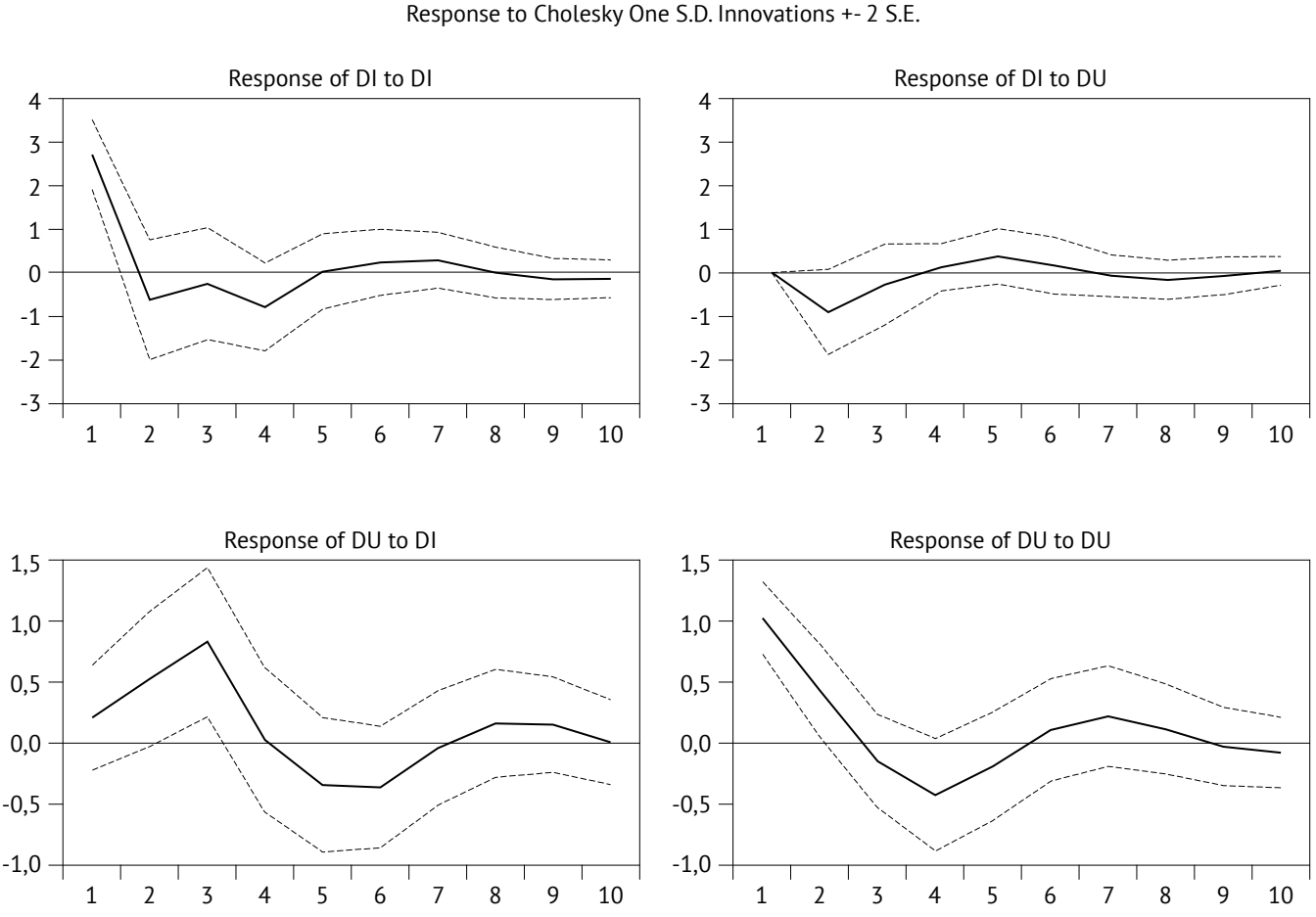
H0: The errors are not auto-correlated.

H1: The errors are auto-correlated.

For the lag 1 up to 12, the probabilities (*Prob.)* of the tests are greater than 0.05, which implies that there is not enough evidence to reject the null hypothesis (*H0*). Thus, we do not have sufficient reason to say that the errors are auto-correlated. After the application of the residual portmanteau test, we concluded that there were no autocorrelations between errors for the *VAR(2)* model.

The homoscedasticity is checked using a VAR residual LM test for the *VAR(2)* model. If the value of the *LM* statistic is greater than the critical value, the errors series is heteroskedastic. The *LM* test showed a constant variance in the errors because the values were greater than 0.05 for the probability. The residual heteroskedasticity test was applied in two variations: with cross-terms and without cross-terms.

Figure 2: Responses of each variable to their own shocks or other variable shocks



The normality tests were applied under the Cholesky (Lutkepohl) orthogonalization. If the Jarque-Bera statistic is lower than the critical value, there was not enough evidence to reject the normal distribution of the errors. The residual normality test provided probabilities greater than 0.05, implying that the errors series had a normal distribution when Cholesky (Lutkepohl) orthogonalization was applied. The impulse-response analysis and the decomposition of error variance were applied.

As Figure 2 demonstrates, there the unemployment rate had a stronger response to shocks in inflation than to its own shocks. According to Appendix 1, starting from the third lag the unemployment rate, variance of more than 40% is explained by the shocks in the inflation rate.

The Kalman filter and the *VAR* updated models were used to make unemployment rate forecasts for 2010–2012. The accuracy of the forecasts was checked to establish a better forecasting method. For the *VAR* predictions, four types of scenarios were considered:

- *S1*: Dynamic-Deterministic Simulation
- *S2*: Dynamic-Stochastic Simulation
- *S3*: Static-Deterministic Simulation
- *S4*: Static-Stochastic Simulation

We maintained a constant forecast for 2010–2012, when the Kalman filter was applied in the second version. For the other predictions based on the Kalman technique, a decrease in time occurred in the unemployment rate from one year to another. For the different variants of the *VAR* models' one-step-ahead predictions, the values registered in 2011 were greater than those in 2010 and 2012. The Kalman filter generated predictions less than 7%, while the VAR models forecasts showed a higher degree of variance, being located in the interval [6.6%; 8.65%].

The prediction error was computed as the difference between the effective value and the forecasted one of variable *X*, denoted by e_x. For the number of forecasts on the horizon, it used the notation *n*. The most frequently used statistical measures for assessing forecasts' accuracy, according to Bratu (2012), are root mean squared error (*RMSE*),

$RMSE=\sqrt{\frac{1}{n}\sum_{j=1}^{n} e_X^2}$, mean error (*ME*), $ME=\frac{1}{n}\sum_{j=1}^{n} e_X$ and mean absolute error (*MAE*), $MAE=\frac{1}{n}\sum_{j=1}^{n}\left| e_X \right|$.

RMSE is influenced by outliers. These absolute measures depend on the unit of measurement, although this disadvantage is eliminated unless the indicators are expressed as a percentage.

Theil's U statistic, used in making comparisons between predictions, can be used in two variants, which were also presented by the Australian Treasury. The following notations are used:

a – actual/registered value of the analysed variable
p – value for the predicted variable
t – time
e – error (difference between actual value and the forecasted one)
n– number of periods

U_1 takes a value between 0 and 1. A value closer to zero indicates better accuracy for that prediction. If there are alternative forecasts for the same variable, the one with the lowest value of U_1 is the most accurate.

$$U_1=\frac{\sqrt{\sum_{t=1}^{n}[a_t-p_t]^2}}{\sqrt{\sum_{t=1}^{n} a_t^2}+\sqrt{\sum_{t=1}^{n} p_t^2}}$$

Instead of U_1, the mean absolute scaled error can be computed ($MASE = mean \mid es_t \mid$), the result being the same:

$$es_t=\frac{e_t}{\frac{1}{n-1}\sum_{i=2}^{n}\left|X_i-X_{i-1}\right|}$$

Table 2 Predictions of Unemployment Rate (%) based on VAR(2) Models and KalmanFilter

	Forecasting method							
Year	Kalman filter 1	Kalman filter 2	Kalman filter based on adjusted data using Hodrick-Prescott filter 1	Kalman filter based on adjusted data using Hodrick-Prescott filter 2	*VAR(2)* models (*S1*)	*VAR(2)* models (*S2*)	*VAR(2)* models (*S3*)	*VAR(2)* models (*S4*)
2010	6.1243061140	6.275	6.293586886	6.2306	7.39341	7.382116478	7.39341	7.338550845
2011	5.9772311361	6.275	6.357197078	6.2306	7.4468778	7.447944295	7.8966003	8.625306581
2012	5.8336881581	6.275	6.421450187	6.2306	6.5904475	6.648923963	7.2046512	8.474405877

Source: Author's computations.

Table 3 Accuracy Measures of the Proposed Forecasts

	Forecasting method							
Accuracy measure	Kalman filter 1	Kalman filter 2	Kalman filter based on adjusted data using Hodrick-Prescott filter 1	Kalman filter based on adjusted data using Hodrick-Prescott filter 2	*VAR(2)* models (*S1*)	*VAR(2)* models (*S2*)	*VAR(2)* models (*S3*)	*VAR(2)* models (*S4*)
ME	1.3633	1.0667	0.9843	1.1111	0.1981	0.1820	**-0.1566**	-0.8044
MAE	1.363258197	1.066666667	0.984255283	0.9843	0.2293401	**0.213967951**	0.310947167	1.111066667
RMSE	1.3707	1.0975	1.0320	1.1407	**0.2730**	0.2480	0.3377	1.1191
MASE	0.1029	0.0806	***0.0753***	0.0840	0.0188	**0.0171**	0.0227	0.0721
U_2	0.6546	0.8031	0.8468	0.7734	0.3497	0.6357	0.8041	0.8607

Source: Author's calculations.

To make comparisons with the naive forecasts, Theil's U_2 coefficient is used.

$$U_2 = \sqrt{\frac{\sum_{i=1}^{n-1}\left[\frac{p_{t+1}-a_{t+1}}{a_t}\right]^2}{\sum_{i=1}^{n-1}\left[\frac{a_{t+1}-a_t}{a_t}\right]^2}}$$

If U_2=1, there are no differences in terms of accuracy between the two forecasts compared. If U_2<1, the forecast compared has a higher degree of accuracy than the naive one. If U_2>1, the forecast compared has a lower degree of accuracy than the naive one.

According to all accuracy indicators, the forecasts based on *VAR(2)* models are more accurate than the Kalman filter predictions. The positive values for mean errors of the Kalam technique forecasts suggest the tendency to underestimate the forecasts for all these methods. In the case of *VAR* predictions, only the dynamic simulations generated underestimated expectations. It is interesting that a considerable improvement was obtained for the Kalman filter prediction of the first space state model by adjusting the initial data using the Hodrick-Prescott filter. The second scenario of *VAR* predictions (dynamic-stochastic simulations) was the best according to the *MASE* indicator used in making comparisons.

5 Conclusions

Many quantitative methods are used to make predictions. In this study, we selected two econometric techniques that are rather commonly used in the literature: the Kalman filter method and *VAR* models. These methods were used to make short-term unemployment rate forecasts for Romania for 2010–2012. According to all accuracy measures, the Kalman technique predictions were underestimated and less accurate than the different scenarios of the VAR model forecasts. It seems that the causality between the first difference data series of inflation and unemployment rate helped improve the forecasting process more. The Kalman filter predictions based only on natural unemployment and cyclical component were not strong enough to generate more accurate forecasts. The superiority of *VAR* models in forecasting was valid only for this particular case of the Romanian economy, where we demonstrated that inflation is a cause of the unemployment rate's evolution.

Another interesting strategy this article proposed to improve Kalman filter predictions is the application of the technique on adjusted data series based on another filter: the Hodrick-Prescott filter. Applying two filters to the same data set improved the predictions' accuracy in the case of the first proposed state space model.

Another important conclusion is that the classical state space model used in the literature to determine the natural unemployment rate did not provide the expected results for the Romanian economy. Therefore, other, more simplistic state space models were proposed for Romania's unemployment rate.

All in all, this research provides pertinent results regarding the prediction of unemployment rate in Romania, but the study could be improved by comparing other predictive quantitative techniques, like *Bayesian VAR* or *VARMA* models.

References

1. Allan, G. (2013). Evaluating the usefulness of forecasts of relative growth.*Sire Discussion Paper,2013-10*, 1-26.
2. Barnichon, R., Nekarda, C. J., Hatzius, J., Stehn, S. J., &Petrongolo, B. (2012). The Ins and Outs of Forecasting Unemployment: Using Labor Force Flows to Forecast the Labor Market [with Comments and Discussion]. *Brookings Papers on Economic Activity*, 83-131. http://dx.doi.org/10.1353/eca.2012.0018
3. Bratu, M.(2012).The reduction of uncertainty in making decisions by evaluating the macroeconomic forecasts performance in Romania.*Economic Research–Scientific Journal, 25*(2), 239–262.
4. Camba-Mendez, G. (2012). Conditional forecasts on SVAR models using theKalman filter.*Economics Letters*, *115*(3), 376–378. http://dx.doi.org/10.1016/j.econlet.2011.12.087
5. Clements, M. P., & Hendry, D. F. (2003). On the limitations of comparing mean squared forecast errors (with discussion). *Journal of Forecasting, 12*, 617–639. http://dx.doi.org/10.1002/for.3980120802
6. Franses, P. H., McAleer, M., &Legerstee, R. (2012).Evaluating macroeconomic forecasts: a concise review of some recent developments.Kier Discussion Paper Series, 821, 1-29.
7. Franses, P. H., Paap, R., &Vroomen, B. (2004).Forecasting unemployment using an autoregression with censored latent effects parameters.*International Journal of Forecasting, 20*(2), 255–271. http://dx.doi.org/10.1016/j.ijforecast.2003.09.004
8. Heilemann, U., &Stekler, H. O. (2013). Has The Accuracy of Macroeconomic Forecasts for Germany Improved?.*German Economic Review*, *14*(2), 235-253. http://dx.doi.org/10.1111/j.1468-0475.2012.00569.x
9. Hodrick, R., & Prescott, E. C. (1997). Postwar U.S. business cycles: An empirical investigation. *Journal of Money, Credit and Banking,* 1–16. http://dx.doi.org/10.2307/2953682
10. Kishor, N. K., & Koenig E. F. (2012).VAR estimation and forecasting when data are subject to revision.*Journal of Business & Economic Statistics, 30*(2), 181–190.
11. Koopman, S.J., Shephard, N.&Doornik, J.A. (1999). Statistical algorithms for models in state space using SsfPack 2.2.*Econometrics Journal*, 2(1), 107-160. http://dx.doi.org/10.1111/1368-423X.00023
12. Kurita, T. (2010).A forecasting model for Japan's unemployment rate.*Eurasian Journal of Business and Economics, 3*(5), 127–134.
13. Lack, C. (2006).Forecasting Swiss inflation using VAR models.*Swiss National Bank Economic Studies, 2*.
14. Milas, C.,&Rothman, F. (2008). Out-of-sample forecasting of unemployment rates with pooled STVECM forecasts.*International Journal of Forecasting, 24*(1), 101–121. http://dx.doi.org/10.1016/j.ijforecast.2007.12.003
15. Proietti, T. (2003). Forecasting the US unemployment rate.*Computational Statistics & Data Analysis, 42*(3), 451–476. http://dx.doi.org/10.1016/S0167-9473(02)00230-X
16. Razzak, W. (1997). The Hodrick-Prescott technique: A smoother versus a filter: An application to New Zealand GDP.Economics Letters, *57*(2), 163–168. http://dx.doi.org/10.1016/S0165-1765(97)00178-X
17. Robinson, W. (1998). Forecasting inflation using VAR Analysis.*Bank of Jamaica*.Retrieved from http://www.boj.org.jm/uploads/pdf/papers_pamphlets/papers_pamphlets_forecasting_inflation_using_var_analysis.pdf
18. Sermpinis, G., Stasinakis, C., &Karathanasopoulos, A. (2013).Kalmanfilter and SVR combinations in forecasting US unemployment. *Artificial Intelligence Applications and InnovationsIFIP Advances in Information and Communication Technology, 412*, 506–515.
19. vanDijk, D., Teräsvirta, T., &Franses, P.H. (2000). Smooth transition autoregressive models—Asurvey of recent developments. Working Paper Series in Economics andFinance, No. 380, Stockholm School of Economics.

Appendix 1

Tests for Checking the Assumptions Related to the VAR Model

Lag-length criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-97.51033	NA	19.63724	8.653072	8.751811	8.677905
1	-89.69603	13.59009	14.13464	8.321394	8.617609	8.395891
2	-82.84189	10.72821*	11.15128*	8.073208*	8.566901*	8.197370*

Residual Portmanteau test for checking errors' autocorrelation

Lags	*Q*-Stat	Prob.	Adj Q-Stat	Prob.	df
1	0.175105	NA*	0.183064	NA*	NA*
2	1.326585	NA*	1.444209	NA*	NA*
3	2.837075	0.5855	3.181272	0.5280	4
4	3.579113	0.8930	4.079529	0.8499	8
5	5.432702	0.9419	6.448004	0.8918	12
6	8.810793	0.9210	11.01836	0.8084	16
7	9.136089	0.9813	11.48598	0.9326	20
8	11.53810	0.9846	15.16906	0.9157	24
9	16.88601	0.9508	23.95490	0.6839	28
10	18.92214	0.9675	27.55730	0.6911	32
11	19.42491	0.9890	28.52093	0.8081	36
12	21.16431	0.9937	32.15787	0.8067	40

* The test is valid only for lags larger than the VAR lag order.
df is degrees of freedom for (approximate) chi-square distribution

Residual LM test for checking errors' homoscedasticity
VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order *h*

Lags	LM-Stat	Prob
1	0.460020	0.9773
2	2.681114	0.6125
3	2.075462	0.7219
4	0.950521	0.9172
5	1.816200	0.7695
6	3.531397	0.4731
7	0.341387	0.9870
8	3.978712	0.4089
9	6.746046	0.1499
10	2.243840	0.6910
11	0.547576	0.9687
12	3.694621	0.4489

Probs from chi-square with 4 df.

VAR Residual Heteroskedasticity Tests
VAR Residual Heteroskedasticity Tests: No cross-terms (only levels and squares)
Joint test:

Chi-sq	df	Prob.
25.24139	24	0.3927

Individual components:

Dependent	R-squared	F(8,14)	Prob.	Chi-sq(8)
res1*res1	0.322277	0.832175	0.5894	7.412368
res2*res2	0.233480	0.533044	0.8131	5.370029
res2*res1	0.625253	2.919816	0.0383	14.38082

VAR Residual Heteroskedasticity Tests: Includes cross-terms

Joint test:

Chi-sq	df	Prob.
52.21834	42	0.1342

Individual components:

Dependent	R-squared	F(14,8)	Prob.	Chi-sq(14)	Prob.
res1*res1	0.916236	6.250420	0.0068	21.07342	0.0998
res2*res2	0.523429	0.627613	0.7870	12.03886	0.6032
res2*res1	0.929029	7.480110	0.0038	21.36766	0.0926

Jarque-Bera Test for Checking Normal Distribution

Component	Skewness	Chi-sq	df	Prob.
1	0.400022	0.613399	1	0.4335
2	0.184908	0.131066	1	0.7173
Joint		0.744465	2	0.6892

Component	Kurtosis	Chi-sq	df	Prob.
1	3.034727	0.001156	1	0.9729
2	3.009473	8.60E-05	1	0.9926
Joint		0.001242	2	0.9994

Component	Jarque-Bera	df	Prob.
1	0.614555	2	0.7354
2	0.131152	2	0.9365
Joint	0.745707	4	0.9456

Impulse–Response Analysis

Response of DI:

Period	DI	DU
1	2.685611	0.000000
2	-0.601577	-0.907380
3	-0.239417	-0.276710
4	-0.765368	0.120726
5	0.035891	0.370063
6	0.245921	0.156501
7	0.292615	-0.074911
8	0.013271	-0.166930
9	-0.134527	-0.076009
10	-0.128219	0.038676

Response of DU:

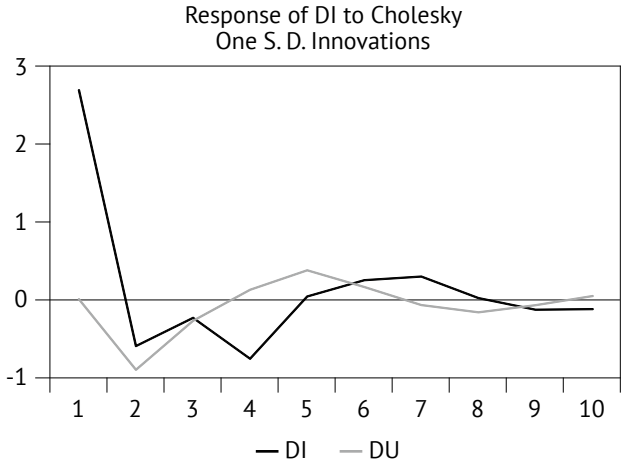
Period	DI	DU
1	0.217511	1.021384
2	0.534967	0.416467
3	0.837354	-0.167574
4	0.033907	-0.446814
5	-0.333998	-0.209706
6	-0.352703	0.091735
7	-0.031785	0.206300
8	0.169597	0.099136
9	0.159855	-0.046176
10	0.015591	-0.096744

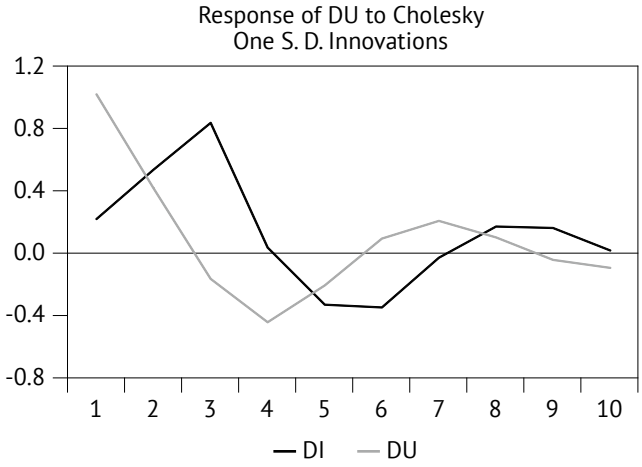
Variance Decomposition of DU:

Period	S.E.	DI	DU
1	1.044287	4.338332	95.66167
		(8.29004)	(8.29004)
2	1.245058	21.51381	78.48619
		(15.6848)	(15.6848)
3	1.509772	**45.39161**	54.60839
		(17.4357)	(17.4357)
4	1.574867	**41.76315**	58.23685
		(16.8917)	(16.8917)
5	1.623495	**43.53115**	56.46885
		(17.3532)	(17.3532)
6	1.663896	45.93614	54.06386
		(17.3496)	(17.3496)
7	1.676938	45.26035	54.73965
		(17.4312)	(17.4312)
8	1.688405	45.65663	54.34337
		(17.6840)	(17.6840)
9	1.696584	46.10526	53.89474
		(17.6590)	(17.6590)
10	1.699412	45.96038	54.03962
		(17.7893)	(17.7893)

Variance Decomposition of DI:

Period	S.E.	DI	DU
1	2.685611	100.0000	0.000000
		(0.00000)	(0.00000)
2	2.897885	90.19570	9.804295
		(10.1231)	(10.1231)
3	2.920895	89.45210	10.54790
		(9.83838)	(9.83838)
4	3.021919	89.98595	10.01405
		(9.22464)	(9.22464)
5	3.044705	88.65800	11.34200
		(10.4016)	(10.4016)
6	3.058626	88.49921	11.50079
		(10.8627)	(10.8627)
7	3.073505	88.55088	11.44912
		(10.8456)	(10.8456)
8	3.078063	88.29066	11.70934
		(11.3968)	(11.3968)
9	3.081939	88.25927	11.74073
		(11.6589)	(11.6589)
10	3.084847	88.26568	11.73432
		(11.8730)	(11.8730)





Appendix 2

ADF Test for Inflation and Unemployment Rate

Null Hypothesis: D(I) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic—based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.372594	0.0002
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided *p*-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(I,2)

Method: Least Squares

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
D(I(-1))	-1.091922	0.203239	-5.372594	0.0000
C	-0.024845	0.519951	-0.047783	0.9623
R-squared	0.546011	Mean dependent var		-0.003846
Adjusted R-squared	0.527095	S.D. dependent var		3.855228
S.E. of regression	2.651166	Akaike info criterion		4.861680
Sum squared resid	168.6883	Schwarz criterion		4.958456
Log likelihood	-61.20183	Hannan-Quinn criter.		4.889548
F-statistic	28.86477	Durbin-Watson stat		2.014213
Prob(F-statistic)	0.000016			

Null Hypothesis: D(I) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic—based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.346732	0.0010
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided *p*-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(I,2)

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
D(I(-1))	-1.109342	0.207480	-5.346732	0.0000
C	0.640661	1.152837	0.555725	0.5838
@TREND(1985)	-0.045920	0.070771	-0.648849	0.5229
R-squared	0.554172	Mean dependent var		-0.003846
Adjusted R-squared	0.515405	S.D. dependent var		3.855228
S.E. of regression	2.683736	Akaike info criterion		4.920464
Sum squared resid	165.6561	Schwarz criterion		5.065629
Log likelihood	-60.96603	Hannan-Quinn criter.		4.962266
F-statistic	14.29471	Durbin-Watson stat		2.019481
Prob(F-statistic)	0.000092			

Null Hypothesis: D(I) has a unit root

Exogenous: None

Lag Length: 0 (Automatic—based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.482909	0.0000
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided *p*-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(I,2)

Method: Least Squares

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
D(I(-1))	-1.091849	0.199137	-5.482909	0.0000
R-squared	0.545968	Mean dependent var		-0.003846
Adjusted R-squared	0.545968	S.D. dependent var		3.855228
S.E. of regression	2.597725	Akaike info criterion		4.784852
Sum squared resid	168.7044	Schwarz criterion		4.833240
Log likelihood	-61.20307	Hannan-Quinn criter.		4.798786
Durbin-Watson stat	2.014156			

Null Hypothesis: D(U) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic—based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.350208	0.0023
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided *p*-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(U,2)

Method: Least Squares

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
D(U(-1))	-0.853569	0.196213	-4.350208	0.0003
D(U(-1),2)	0.506854	0.184224	2.751288	0.0117
C	0.114034	0.241543	0.472105	0.6415
R-squared	0.465821	Mean dependent var		-0.008000
Adjusted R-squared	0.417259	S.D. dependent var		1.571431
S.E. of regression	1.199591	Akaike info criterion		3.314005
Sum squared resid	31.65840	Schwarz criterion		3.460270
Log likelihood	-38.42506	Hannan-Quinn criter.		3.354573
F-statistic	9.592329	Durbin-Watson stat		2.031800
Prob(F-statistic)	0.001011			

Null Hypothesis: D(U) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic—based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.375020	0.0100
Test critical values:	1% level	-4.374307	
	5% level	-3.603202	
	10% level	-3.238054	

*MacKinnon (1996) one-sided *p*-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(U,2)

Method: Least Squares

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
D(U(-1))	-0.873002	0.199542	-4.375020	0.0003
D(U(-1),2)	0.513185	0.186062	2.758141	0.0118
C	0.512914	0.566368	0.905621	0.3754
@TREND(1985)	-0.026409	0.033848	-0.780212	0.4440
R-squared	0.480869	Mean dependent var		-0.008000

Null Hypothesis: D(U) has a unit root

Exogenous: None

Lag Length: 1 (Automatic—based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.399596	0.0001
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided *p*-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(U,2)

Method: Least Squares

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
D(U(-1))	-0.842845	0.191573	-4.399596	0.0002
D(U(-1),2)	0.501249	0.180709	2.773790	0.0108
R-squared	0.460409	Mean dependent var		-0.008000
Adjusted R-squared	0.436948	S.D. dependent var		1.571431
S.E. of regression	1.179151	Akaike info criterion		3.244085
Sum squared resid	31.97914	Schwarz criterion		3.341595
Log likelihood	-38.55106	Hannan-Quinn criter.		3.271130
Durbin-Watson stat	2.021484			

Appendix 3

Estimation of State Space Models

Sspace: SS01

Method: Maximum likelihood (Marquardt)

	Coefficient	Std. Error	*z*-Statistic	Prob.
C(1)	-0.000273	3.200618	-8.52E-05	0.9999
C(2)	-0.056874	3.425824	-0.016602	0.9868
	Final State	Root MSE	*z*-Statistic	Prob.
SV1	3.457560	707.1167	0.004890	0.9961
SV2	3.542440	707.1168	0.005010	0.9960
Log likelihood	-55.56132	Akaike info criterion		4.111523
Parameters	2	Schwarz criterion		4.206680
Diffuse priors	2	Hannan-Quinn criter.		4.140614

Sspace: SS01

Method: Maximum likelihood (Marquardt)

Sample: 1985–2012

Included observations: 28

Convergence achieved after 25 iterations

	Coefficient	Std. Error	*z*-Statistic	Prob.
C(1)	0.656488	0.259550	2.529331	0.0114
C(2)	0.975983	0.036640	26.63683	0.0000
	Final State	Root MSE	*z*-Statistic	Prob.
SV1	6.831881	1.388528	4.920234	0.0000
Log likelihood	-50.44527	Akaike info criterion		3.746090
Parameters	2	Schwarz criterion		3.841248
Diffuse priors	0	Hannan-Quinn criter.		3.775181

Sspace: SS01

Method: Maximum likelihood (Marquardt)

	Coefficient	Std. Error	*z*-Statistic	Prob.
C(1)	0.634768	0.241763	2.625574	0.0087
	Final State	Root MSE	*z*-Statistic	Prob.
SV1	7.000000	1.373530	5.096359	0.0000
Log likelihood	**-55.54141**	Akaike info criterion		4.038672
Parameters	1	Schwarz criterion		4.086251
Diffuse priors	1	Hannan-Quinn criter.		4.053217

@signal u1 = sv1

@state sv1 = c(1)*sv1(-1) + [var = exp(c(2))]

Sspace: SS02

Method: Maximum likelihood (Marquardt)

Sample: 1985–2012

Included observations: 28

Convergence achieved after 13 iterations

	Coefficient	Std. Error	*z*-Statistic	Prob.
C(1)	1.010108	0.011748	85.97780	0.0000
C(2)	-1.869310	0.521787	-3.582511	0.0003
	Final State	Root MSE	*z*-Statistic	Prob.
SV1	6.335985	0.392721	16.13354	0.0000
Log likelihood	-20.90208	Akaike info criterion		1.635863
Parameters	2	Schwarz criterion		1.731020
Diffuse priors	1	Hannan-Quinn criter.		1.664953

@signal u1 = sv1

@state sv1 = sv1(-1) + [var = exp(c(2))]

Sspace: SS02

Method: Maximum likelihood (Marquardt)

Sample: 1985–2012

Included observations: 28

Convergence achieved after 9 iterations

	Coefficient	Std. Error	*z*-Statistic	Prob.
C(2)	-1.837286	0.441786	-4.158767	0.0000
	Final State	Root MSE	*z*-Statistic	Prob.
SV1	6.272583	0.399060	15.71839	0.0000
Log likelihood	*-21.33485*	Akaike info criterion		1.595346
Parameters	1	Schwarz criterion		1.642925
Diffuse priors	1	Hannan-Quinn criter.		1.609892

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Kalmanov filter ali VAR-modeli za napovedovanje stopnje brezposelnosti v Romuniji?

Izvleček

V prispevku predstavljamo v praksi pogost ekonomski problem. Ko imamo za isto spremenljivko več napovedi, pri odločanju pa potrebujemo samo eno, je za izbiro najboljše treba te napovedi oceniti. Namen prispevka je predlagati nekaj strategij za izboljšanje napovedi stopnje brezposelnosti v Romuniji s primerjalno analizo točnosti na podlagi dveh kvantitativnih metod, Kalmanovega filtra in vektorskih avtoregresijskih modelov (VAR-modelov). Pri prvi metodi je upoštevan razvoj komponent brezposelnosti, pri VAR-modelih pa medsebojne odvisnosti med stopnjo brezposelnosti in inflacijsko stopnjo. Po Grangerjevem testu vzročnosti je inflacijska stopnja v prvi diferenci vzrok za stopnjo brezposelnosti v prvi diferenci pri stacionarnih podatkih. Za napovedi stopnje brezposelnosti v obdobju 2010–2012 v Romuniji dobimo z VAR-modeli (v vseh različicah VAR-simulacij) bolj točne napovedi kot s Kalmanovim filtrom na osnovi dveh modelov prostora stanj za vse mere točnosti. Upoštevajoč povprečno absolutno tehtano napako, so dinamične stohastične simulacije, uporabljene za napovedovanje brezposelnosti, ki temeljijo na VAR-modelu, najbolj točne. Pri drugi strategiji za izboljšanje začetnih napovedi, ki temelji na Kalmanovem filtru, so uporabljeni popravljeni podatki o brezposelnosti, transformirani s Hodrick-Prescottovim filtrom. Uporaba VAR modelov namesto različic Kalmanovega filtra je najboljša strategija za izboljšanje kakovosti napovedi stopnje brezposelnosti v Romuniji. Medsebojna povezanost med brezposelnostjo in inflacijo namreč ponuja uporabne informacije za napovedi, ki so zanesljivejše kot napovedi na osnovi razvoj brezposelnosti glede na gibanje njenih komponente (naravna brezposelnost in ciklična komponenta).

Ključne besede: napovedi, točnost, Kalmanov filter, Hodrick-Prescottov filter, VAR-modeli, stopnja brezposelnosti

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Examining the Export-led Growth Hypothesis: The case of Croatia

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Abstract

This paper examines the relationship between gross domestic product and exports of goods and services in Croatia between 1996 and 2012. The research results confirmed unidirectional Granger causality from the exports of goods and services to gross domestic product. Following the Engle-Granger approach to cointegration, long-term equilibrium as well as short-term correlation between the observed variables was identified. Exports of goods and services and gross domestic product (GDP) in Croatia move together. If the two observed variables move away from equilibrium, they will return to their long-term equilibrium state at a velocity of 24.46% in the subsequent period. In accordance with the results, we found evidence supporting the export-led growth hypothesis in Croatia. As the outcomes indicated, to recover the economy, Croatia should put more emphasis on the development of exporting sectors.

Keywords: gross domestic product, export, Croatia, Granger causality

1 Introduction

There are extensive discussions regarding relationships between exports and economic growth (Giles & Williams, 2000), and there are four possible outcomes of investigating that relationship (Chen, 2007). First is the export-led growth hypothesis, which means that export growth causes economic growth. Export growth is typically considered one of the main determinants of an economy's growth in production and employment. Empirically, it refers to unidirectional causality from exports to gross domestic product (GDP). The second possible outcome could refer to the growth-driven export hypothesis, which postulates that a rise in GDP generally leads to a corresponding increase in exports, thereby empirically indicating unidirectional causality from GDP to exports. The third possible outcome is a bidirectional relationship between exports and economic growth. Finally, the fourth possible outcome is a neutral relationship between exports and economic growth.

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Most arguments in favor of an outward-oriented strategy emphasize trade openness by claiming that countries that increase their participation in international trade achieve long-term economic growth faster than countries that are less open to global trade (see, for example, World Bank, 1993). These arguments are often supported by the East Asian miracle, where the nexus between export and economic growth was evidenced during the last few decades of the 20th century.

A growing development gap can be identified between countries following the export-oriented path and those based on domestic market orientation, economic protectionism, and import-led (but sooner or later unsustainable) growth. However, for countries that would like to join the group of successful exporters with a certain time lag, the change from domestic demand-generated growth to export-oriented growth is by far not easy and even less self-evident (Inotai, 2013). Croatia belongs to the latter group of countries and relies on exports as one of its development pillars. Therefore, the main goal of this paper is to test the export-led growth hypothesis in Croatia by establishing the relationship between the exports of goods and services and GDP.

The paper consists of five parts. After the introductory part, the second part reviews the literature. The third part explains the methodology and data, and the fourth part provides the empirical analysis. The discussion and conclusion are included in the final part of the paper.

2 Literature Review

Many studies have tried to establish the causal link between export expansion and economic growth (Khalafalla & Webb, 2001). However, empirical research on the causality issue between export and economic growth has yielded contradictory results. Contradictions like these might be partly due to the different methods, variable selections, time frames, and frequencies (Kónya, 2006). The causal link between export promotion and economic development is neither straightforward nor universal (Sung-Shen, Biswas, & Tribedy, 1990).

Results of the study conducted by Doyle (1998) on the example of Ireland from 1963 to 1993 suggest that exports and GDP are cointegrated. She found evidence of short-run and long-run causality from exports to output. Meanwhile, Chen (2007) assessed the validity of the export-led growth and growth-driven export hypotheses in Taiwan by testing Granger causality using the vector error correction model and the bounds testing methodology. The results indicated that a long-run level equilibrium relationship exists among exports, output, terms of trade, and labor productivity of the model. In addition, a bidirectional causal relationship exists between exports and output in Taiwan. These results attest to the advantage of the export-led growth strategy for further growth in Taiwan (Chen, 2007).

Greenway, Morgan, and Wright (1999) showed that a strong positive relationship exists between real export growth and real output growth on a sample of 69 countries for the 1975–1993 period. They also showed that the composition of those exports is important in determining the strength of growth. Paul and Chowdhury (1995) found evidence of Granger causality running from exports to GDP growth in Australia for the 1949–1991 period, implying that the expansion of exports promotes economic growth in Australia.

McCarville and Nnadozie (1995) concluded that the Granger causality test confirmed the relationship between export growth and GDP growth in the Mexican case, as stated by development theory. In addition, Liu, Burridge, and Sinclair (2002) found bidirectional causality among economic growth, foreign direct investment (FDI), and exports in China based on monthly data between 1981 and 1997. According to the authors, these three variables appeared to be mutually reinforcing under the open-door policy.

Narayan, Narayan, Prasad, and Prasad (2007) examined the export-led growth hypothesis on a sample from Fiji (1960–2001) and Papua New Guinea (1961–1999). Their findings suggested that, for Fiji, there is evidence of export-led growth in the long run and, for Papua New Guinea, there is evidence of export-led growth in the short run.

Ekanayake (1999) used cointegration and error-correction models to analyze the causal relationship between export growth and economic growth in eight Asian developing countries for the 1960–1997 period. The results showed bidirectional causality between export growth and economic growth in seven of the eight countries in the sample. Ekanayake's (1999) evidence showed short-run Granger causality running from economic growth to export growth in all observed cases except one (i.e., Sri Lanka). In addition, despite the strong evidence for long-run Granger causality running from export growth to economic growth in all cases, evidence of short-run causality running from export growth to economic growth occurred in only two cases: Indonesia and Sri Lanka.

Biswal and Dhawan (1998) found that, in Taiwan between 1960 and 1990, the evidence indicates bidirectional causality, meaning exports and growth mutually reinforce each other. Their research further demonstrated that the causality testing results are very sensitive to model selection and to omitting variables. However, tests conducted

by Afxentiou and Serletis (2000) on a sample covering 50 developing countries between 1970 and 1993 showed that export growth was not an engine of growth, not even in the cases of the Asian tigers. Their research did not support the hypothesis that export growth led to gross national product (GNP) growth in a Granger sense. Within the entire sample, only Indonesia and Oman appeared to exhibit reliable causality from export growth to GNP growth, and it is likely that their dependence on oil exports produced the obtained outcome. Causality tests from import growth to GNP growth also found that only Pakistan exhibited causality from import growth to GNP growth (Afxentiou & Serletis, 2000).

Asafu-Adjaye and Chakraborty's (1999) research on the sample of four less developed countries (i.e., India, Nigeria, Fiji, and Papua New Guinea) raised doubts about policy recommendations for the less developed countries based on the export-led growth hypothesis. Furthermore, Sharma and Dhakal (1994) investigated the *prima facie* causal relationship between the exports and output growth in 30 developing countries between 1960 and 1988. Of the 30 countries, a feedback *prima facie* causal relationship between export growth and output growth was found in only five countries, whereas export growth *prima facie* caused output growth in six other countries. Output growth *prima facie* caused export growth in another eight countries, and no causal relationship was observed between output growth and export growth in the remaining 11 countries. The authors also did not find any systematic pattern in the results of low-income, middle-income, and upper middle-income countries.

Kónya (2004a, 2004b) investigated the possibility of export-led growth and growth-driven export by testing Granger causality in 25 Organization for Economic Cooperation and Development (OECD) countries between 1960 and 1997. His results indicated that no causality exists between exports and growth in Luxembourg or the Netherlands; exports cause growth in Iceland; growth causes exports in Canada, Japan, and Korea; and bidirectional causality exists between exports and growth in Sweden and the United Kingdom. With less certainty, the results indicated that no causality exists between exports and growth in Denmark, France, Greece, Hungary, and Norway; exports cause growth in Australia, Austria, and Ireland; and growth causes exports in Finland, Portugal, and the United States. In Belgium, Italy, Mexico, New Zealand, Spain, and Switzerland, the results were too controversial to make a simple choice. Furthermore, some of the revealed causal relationships implied a negative delayed impact from exports to growth or vice versa.

Afxentiou and Serletis (1991) further found that no systematic relationship exists between exports and GNP in industrial countries for the 1950–1985 period. According to their research results, export growth is not the magic key to GNP growth, and many of the secrets continue to be hidden, refusing to reveal themselves in a straightforward quantifiable manner.

Ramos (2001) investigated the Granger causality among exports, imports, and economic growth in Portugal from 1865 to 1998. The empirical results did not confirm a unidirectional causality among the variables considered. In addition, Awokuse (2007) examined the impact of export and import expansion on growth in Bulgaria, the Czech Republic, and Poland. In the case of Bulgaria, the export-led growth hypothesis and growth-led exports hypothesis were confirmed. Empirical support existed for both the export-led growth hypothesis and import-led growth hypothesis in the Czech Republic. In Poland, only the import-led growth hypothesis was supported. These results indicate that simply focusing on the role of exports as the engine of growth might be misleading.

Tang (2006) found no long- or short-run causality between export expansion and economic growth in China between 1970 and 2001 in Granger's sense. However, he found that economic growth causes import expansion in the short run. Shan and Tian (1998) also tested the export-led growth hypothesis for Shanghai, using monthly time series data from 1990 to 1996. The research found unidirectional Granger causality running from GDP to exports, implying that exceptional economic performance in Shanghai during the 1990s was not propelled by export expansion, but by a set of domestic factors and foreign investment.

Hsiao (1987) investigated the existence and directions of causality between exports and GDP for Hong Kong, Taiwan, South Korea, and Singapore using Sims' unidirectional exogeneity test and Granger's causality test. Using the same set of data, applied tests were shown to have different causal implications, but the one common finding from the two tests was a lack of support for the hypothesis of unidirectional causality from exports to GDP. These results imply that the rapid economic growth of countries in the sample was not only achieved with the export promotion policy, but also derived from the domestic growth of industries and import substitution. The export-led growth hypothesis was rejected in the case of Australia as well (Shan & Sun, 1998).

Ahmad and Kwan (1991) found no causal link from exports to economic growth, or vice versa, on a sample of 47 African countries. Some subsets of countries provided weak support for causation running from economic growth to exports. The authors suggested the possibility of another independent factor that jointly influences both the growth of income and exports. However, the inclusion of omitted variables in the estimation of exports–income causality must remain arbitrary until a fully structural model that specifies the channels

by which exports affect income and vice versa is developed (Ahmad & Kwan, 1991).

As for Croatia, empirical research regarding the relationship between exports and economic growth is very scarce. Dritsaki and Stiakakis (2014) studied the relationship among FDI, exports, and economic growth in Croatia using annual time series data for 1994 to 2012. Several econometric models were applied, including the bounds testing (ARDL) approach and the ECM–ARDL model. The results confirmed a bidirectional long-run and short-run causal relationship between exports and growth.

Živković, Živković, and Grdinić (2014) analyzed the relationship among GDP, the imports-coverage ratio, FDI, and gross fixed capital formation in selected Central Eastern European countries using an error-correction model. The empirical results confirmed a positive long-run influence of the imports-coverage ratio, FDI, and gross fixed capital formation on GDP growth for all of the countries except Croatia. In the case of Croatia, significant negative feedback occurred between FDI and GDP growth in the long run, but positive feedback occurred in the short run.

At the micro level, Valdec and Zrnc (2014) used propensity score matching to test for causal effects of starting to export on firm performance in Croatian manufacturing firm-level data. The results confirmed that exporters have characteristics superior to those of non-exporters. In the main sample specification, pervasive evidence existed of self-selection into export markets, meaning that firms were successful years before they became exporters.

3 Methodology, Data, and Hypothesis

Economic time series are often non-stationary time series. At the same time, one of the assumptions for regression model estimation is time series stationarity. For that reason, we employed the Phillips-Perron Unit Root Test to check the stationarity characteristics of the observed time series. If the variables are of the same order of integration, as is the case here, it can be assumed that they are cointegrated. For the purpose of testing the relationship among the variables, the error correction model or the Engle-Granger approach to cointegration (Engle & Granger, 1987) was assumed. According to this approach, a linear regression model was defined on a non-stationary time series, and then the stationarity of residuals of the defined regression model was tested. If two time series were cointegrated, then there must be Granger-causality in at least one direction. In order to empirically check causality between exports and GDP in Croatia, the Granger causality test must be applied. In this case, the test usage was a consequence of data properties, as is discussed later in the text. We found our variables of interest integrated of the same order and decided to model a non-stationary time series. Considering the research objective and available data span, we found these methods to be the most appropriate.

The Granger (1969) causality test is one of the earliest and most frequently used methods developed to quantify causal effects in a time series. It is based on a generally acknowledged fact that the cause precedes the effect, which it consequently creates. It can be said that X Granger-causes Y if the past values of X can contribute to anticipating the future values of Y, which is better than using the past values of Y alone. The Granger causality test can be carried out for stationary or cointegrated time series.

The Granger causality test assumes the evaluation of the following model:

$$Y_t = \mu_t + \sum_{i=1}^{p} \alpha_i \cdot Y_{t-i} + \sum_{j=1}^{q} \beta_i \cdot X_{t-i} + \varepsilon_t$$

where μ_t is the deterministic component and ε_t is white noise. The null hypothesis can be tested using an F-test. If the *p*-value is lower than the defined level of significance, the null hypothesis is not accepted and the conclusion is that the first observed time series Granger-causes the second time series.

In order to explore Granger-causality, two variables were observed: GDP level in Croatia from 1996 to 2012 at constant prices and exports of goods and services for the same period at constant prices as well. Furthermore, we tested the relationship among other GDP components for the same time period. The variable description and data sources are provided in Table 1.

Table 1 Variable Description and Data Sources from 1996 to 2012

Variable	Description	Unit	Source
GDP	GDP in Croatia	000 HRK	Croatian Bureau of Statistics
EGS	Croatia's exports of goods and services	000 HRK	Croatian Bureau of Statistics
C	Personal consumption in Croatia	000 HRK	Croatian Bureau of Statistics
G	Government consumption in Croatia	000 HRK	Croatian Bureau of Statistics
I	Investment in Croatia	000 HRK	Croatian Bureau of Statistics

4 Empirical Analysis

Figure 1 shows the movement of GDP, exports of goods, exports of services, and exports of both goods and services for 1996 to 2012 in Croatia.

As shown in Table 2, we found GDP to be integrated at an order of two, while the exports of goods and services was integrated at the 1% empirical level of significance; thus, we assumed a long-term relationship between the observed variables.

Table 2 Phillips-Perron Unit Root Test

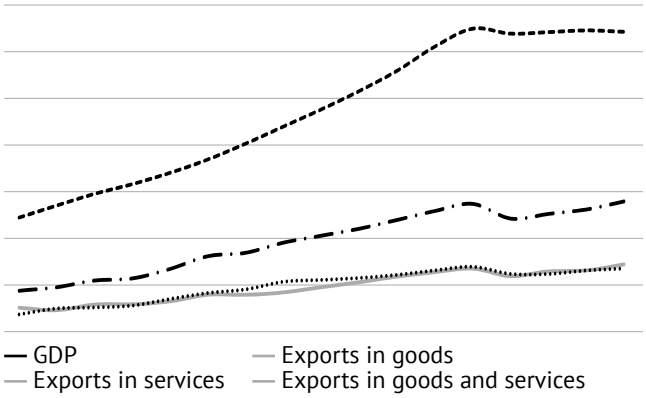
Variable		*p*-value
GDP	in levels around zero	0.99
	in levels around constant	0.61
	in levels with trend around constant	0.96
	first difference around zero	0.25
	first difference around constant	0.61
	first difference with trend around constant	0.80
	second difference around zero	0.00
EGS	in levels around zero	0.99
	in levels around constant	0.70
	in levels with trend around constant	0.84
	first difference around zero	0.03
	first difference around constant	0.02
	first difference with trend around constant	0.05
	second difference around zero	0.00
C	in levels around zero	0.99
	in levels around constant	0.46
	in levels with trend around constant	0.98
	first difference around zero	0.08
	first difference around constant	0.19
	first difference with trend around constant	0.39
	second difference around zero	0.00
I	in levels around zero	0.73
	in levels around constant	0.48
	in levels with trend around constant	0.96
	first difference around zero	0.01
G	in levels around zero	0.99
	in levels around constant	0.80
	in levels with trend around constant	0.75
	first difference around zero	0.17
	first difference around constant	0.18
	first difference with trend around constant	0.45
	second difference around zero	0.00

Source: Authors' calculations.

Table 2 also indicates that the investment variable is integrated at an order of one and the other variables are integrated at an order of two. In order to determine causality between the variables of the same integration order, we employed Granger causality tests. The results are presented in Table 3.

The results in Table 3 indicate causality from exports of goods and services to the GDP level in Croatia. Furthermore, the exports of goods and services Granger-cause

Figure 1. GDP level, exports of goods, exports of services, and exports of goods and services in Croatia, 1996 – 2012 (millions of HRK)



Source: Croatian Bureau of Statistics. Retrieved from www.dzs.hr (August, 30, 2014).

Table 3 Pairwise Granger Causality Tests

Pairwise Granger Causality Tests
Sample: 1996 - 2012
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
G does not Granger-cause C	16	1.21339	0.2906
C does not Granger-cause G		14.2909	0.0023
GDP does not Granger-cause C	16	0.00752	0.9322
C does not Granger-cause GDP		1.45383	0.2494
EGS does not Granger-cause C	16	7.16449	0.0190
C does not Granger-cause EGS		0.02769	0.8704
GDP does not Granger-cause G	16	20.6470	0.0006
G does not Granger-cause GDP		8.59429	0.0117
EGS does not Granger-cause G	16	12.4689	0.0037
G does not Granger-cause EGS		0.01042	0.9202
EGS does not Granger-cause GDP	16	10.6073	0.0062
GDP does not Granger-cause EGS		0.03242	0.8599

Source: Authors' calculations.

Table 4 Long-term Relationship between GDP and Exports of Goods and Services in Croatia

Dependent Variable: GDP
Method: Least Squares
Sample: 1996 – 2012
Included observations: 17
GDP = C(1) + C(2)*EGS

	Coefficient	Std. Error	*t*-Statistic	Prob.
C(1)	22449.58	9698.265	2.314804	0.0352
C(2)	2.216773	0.094976	23.34046	0.0000
R-squared	0.973204	Mean dependent var		237169.0
Adjusted R-squared	0.971417	S.D. dependent var		74876.43
S.E. of regression	12658.95	Akaike info criterion		21.84025
Sum squared resid	2.40E+09	Schwarz criterion		21.93827
Log likelihood	-183.6421	Hannan-Quinn criter.		21.84999
F-statistic	544.7770	Durbin-Watson stat		0.853790
Prob(F-statistic)	0.000000			

Source: Authors' calculations.

Table 5 Phillips-Perron Unit Root Test of the Residuals (US) in the Long-term Equilibrium Model

Null Hypothesis: US has a unit root
Exogenous: None
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. *t*-Stat	Prob.
Phillips-Perron test statistic		-2.025241	0.0442
Test critical values:	1% level	-2.717511	
	5% level	-1.964418	
	10% level	-1.605603	

Source: Authors' calculations.

Table 6 Short-term Relationship between GDP and Exports of Goods and Services in Croatia

Dependent Variable: D2GDP
Method: Least Squares
Sample (adjusted): 1998 – 2012
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
D2EGS	0.745318	0.136327	5.467143	0.0001
US(-1)	-0.244612	0.101890	-2.400742	0.0320
R-squared	0.692751	Mean dependent var		-967.4870
Adjusted R-squared	0.669116	S.D. dependent var		7273.988
S.E. of regression	4184.179	Akaike info criterion		19.63957
Sum squared resid	2.28E+08	Schwarz criterion		19.73398
Log likelihood	-145.2968	Hannan-Quinn criter.		19.63857
Durbin-Watson stat	2.157031			

Source: Authors' calculations.

personal consumption (C) as well as government consumption (G) while government consumption Granger-causes GDP. At the same time, GDP Granger-causes government consumption, and personal consumption Granger-causes government consumption (G).

We found no cointegration between the GDP level and government expenditure level (p-value = 0.12). Therefore, we defined the GDP level as the dependent variable and exports of goods and services as the independent variable in the assumed linear regression model. The estimated results are shown in Table 4.

As shown in Table 4, we found a strong relationship between GDP level and the level of exports of goods and services in Croatia. Changes in the GDP level in 97.32% of the cases move together with changes in the level of exports of goods and services in Croatia.

After we estimated the long-term equilibrium between the observed variables, we tested stationarity characteristics of residuals from the estimated long-term relationship model (US). As Table 5 demonstrates, at the 5% level of significance, we found stationary residuals in the long-term equilibrium model.

In order to model the short-term relationship between the observed variables, we applied a stationary time series. As variables are integrated at an order of two, we used the variables in the second difference and residuals in the long-term equilibrium model levels. The results are shown in Table 6.

The estimated results in Table 6 indicate that the GDP level and exports of goods and services move together. The coefficient with the variable US(-1) is significant and in accordance with theoretical assumptions (negative). If the two observed variables move away from equilibrium, they will return to equilibrium at a velocity of 24.46%. In other words, if the two observed variables move away from the state of their long-term equilibrium over time, in the next period they will speedily return to the state of their long-term equilibrium. In addition, there is a strong relationship between GDP development and exports of goods and services in the long term. Moreover, as the Granger causality test results indicate, the influence from exports to GDP might occur through personal consumption or government consumption. In order to check the assumptions of the illustrated model, White's test for homoscedasticity of variance, the Jarque-Bera test for normality of residuals, and the test for the autocorrelation of the residuals were run (see Appendix). Following these, it was established that the assumptions of the model were met at the 95% confidence level.

5 Discussion and Conclusion

Regarding the relationship between exports and economic growth, as has been noted, some analysts believe that the causality direction is from export to economic growth, which is expressed as the export-led growth hypothesis (Balassa, 1978; Bhagwati, 1978; Edwards, 1998). In addition, various studies support growth-led export in a way that the causality direction is from economic growth to export growth. Regarding the growth-led exports hypothesis, an increase in exports is supported through the benefits of efficiency caused by the increase in the national workforce's skill levels and technology advancement (Bhagwati, 1978; Krugman, 1984). These two approaches do not overlap. Studies dealing with developed countries usually show that trade openness can have a positive impact on economic growth, especially in the long run, through the import of high-tech products, spillover effects resulting from FDI (Grossman & Helpman, 1990), and various reforms and programs that aim to create better conditions for participation in international markets (Ram, 1987). There is also the possibility that no relationship exists or just a simple contemporaneous relationship exists between these two variables.

The research results presented in this paper suggest unidirectional causality from exports of goods and services to GDP level in Croatia. Furthermore, we found several influence channels from exports of goods and services to GDP. Exports of goods and services Granger-cause personal consumption (C), personal consumption (C) Granger-causes government consumption (G), and government consumption (G) Granger-causes GDP. Exports of goods and services Granger-cause government consumption (G), which Granger-causes GDP, and GDP Granger-causes government consumption (G). The empirical evaluation herein leads to the conclusion that, in Croatia, the growth of exports of goods and services Granger-causes GDP growth. Moreover, exports of goods and services and GDP in Croatia move together. If the two observed variables move away from equilibrium, they will return to equilibrium at a velocity of 24.46 % in the next period.

The results of this research suggest that an export-led growth model can be acceptable for achieving economic growth and development in Croatia. In accordance with the results, we found that Croatia should put more emphasis on exports development and improvement of its trade relations. However, this research does have limitations, as reflected in its coverage and scope. It would be interesting to examine in detail which measures or policies Croatia should apply. Furthermore, a study that would establish separate relationships between exports of goods and GDP as well as between exports of services and GDP would perhaps give different results.

References

1. Afxentiou, P. C., & Serletis, A. (1991). Exports and GNP Causality in the Industrial Countries: 1950–1985. *Kyklos*, *44*(2), 167–179. http://dx.doi.org/10.1111/j.1467-6435.1991.tb02095.x
2. Afxentiou, P. C., & Serletis, A. (2000). Output growth and variability of export and import growth: international evidence from Granger causality tests. *Developing Economies*, *38*(2), 141–163. http://dx.doi.org/10.1111/j.1746-1049.2000.tb00874.x
3. Ahmad, J., & Kwan, A. C. C. (1991). Causality between exports and economic growth. Empirical evidence from Africa. *Economics Letters, 37*, 243–248. http://dx.doi.org/10.1016/0165-1765(91)90218-A
4. Asafu-Adjaye, J., & Chakraborty, D. (1999). Export-led growth and import compression: further time series evidence from LDCs. *Australian Economic Papers, June*, 164–175. http://dx.doi.org/10.1111/1467-8454.00049
5. Awokuse, T. O. (2007). Causality between exports, imports, and economic growth: Evidence from transition economies. *Economics Letters, 94*, 389–395. http://dx.doi.org/10.1016/j.econlet.2006.08.025
6. Balassa, B. (1978). Exports and economic growth: Further evidence. *Journal of Development Economics, 5*, 181–189. http://dx.doi.org/10.1016/0304-3878(78)90006-8
7. Bhagwati, J. N. (1978). *Anatomy and consequences of exchange control regimes*. New York: Ballinger Publishing.
8. Biswal, B., & Dhawan, U. (1998). Export-led growth hypothesis: cointegration and causality analysis for Taiwan. *Applied Economics Letters, 5*, 699–701. http://dx.doi.org/10.1080/135048598354159
9. Chen, S-W. (2007). Exactly what is the link between export and growth in Taiwan? New evidence from the Granger causality test. *Economics Bulletin, 6*(7), 1–10.
10. Croatian Bureau of Statistics. (2014). *CBS Databases*. Retrieved from http://www.dzs.hr/default_e.htm
11. Doyle, E. (1998). Export-output causality: The Irish case 1953–93. *Atlantic Economic Journal*, *26*(2), 147–161. http://dx.doi.org/10.1007/BF02299357
12. Dritsaki, C., & Stiakakis, E. (2014). Foreign direct investments, exports, and economic growth in Croatia: A time series analysis. *Procedia Economics and Finance*, *14*(14), 181–190. http://dx.doi.org/10.1016/S2212-5671(14)00701-1
13. Edwards, S. (1998). Openness, productivity and growth: What do we really know? *Economic Journal*, *108*(447), 383–398. http://dx.doi.org/10.1111/1468-0297.00293

14. Ekanayake, E. M. (1999). Exports and economic growth in Asian developing countries: Cointegration and error-correction models. *Journal of Economic Development, 24*(2), 43–56.
15. Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica*, *55*(2), 251–276. http://dx.doi.org/10.2307/1913236
16. Giles, J. A., & Williams, C. L. (2000). *Export-led growth: A survey of the empirical literature and some noncausality results part 1*. Econometrics Working Paper EWP0001. http://dx.doi.org/10.1080/09638190050086177
17. Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica, 37*(3), 424–438. http://dx.doi.org/10.2307/1912791
18. Greenway, D., Morgan, W., & Wright, P. (1999). Exports, export composition and growth. *The Journal of International Trade and Economic Development, 8*(1), 41–51. http://dx.doi.org/10.1080/09638199900000004
19. Grossman, G. M., & Helpman, E. (1990). Comparative advantage and long-run growth. *American Economic Review*, 80, 796–815.
20. Hsiao, M. W. (1987). Tests of causality and exogeneity between exports and economic growth: The case of Asian NICs. *Journal of Economic Development*, *12*(2), 143–159.
21. Inotai, A. (2013). *Sustainable growth based on export-oriented economic strategy*. Sofia: Friedrich Ebert Stiftung.
22. Khalafalla, K. Y., & Webb, A. J. (2001). Export-led growth and structural change: evidence from Malaysia. *Applied Economics, 33*, 1703–1715. http://dx.doi.org/10.1080/00036840010015066
23. Kónya, L. (2004a). Export-led growth, growth-driven export, both or none? Granger causality analysis on OECD countries. *Applied Econometrics and International Development*, *4*(1), 73–94.
24. Kónya, L. (2004b). Unit-root, cointegration and Granger causality test results for export and growth in OECD countries. *International Journal of Applied Econometrics and Quantitative Studies, 1*(2), 67–94.
25. Kónya, L. (2006). Exports and growth: Granger causality analysis on OECD countries with a panel data approach. *Economic Modelling*, *23*, 978–992. http://dx.doi.org/10.1016/j.econmod.2006.04.008
26. Krugman, P. R. (1984). *Import protection as export promotion*. Oxford: Oxford University Press.
27. Liu, X., Burridge, P., & Sinclair, P. J. N. (2002). Relationships between economic growth, foreign direct investment and trade: evidence from China. *Applied Economics, 34*, 1433–1440. http://dx.doi.org/10.1080/00036840110100835
28. McCarville, M., & Nnadozie, E. (2001). Causality tests of export-led growth: The case of Mexico. *Atlantic Economic Journal, 23*(2), 140–145. http://dx.doi.org/10.1007/BF02300439
29. Narayan, P. K., Narayan, S., Prasad, B. C., & Prasad, A. (2007). Export-led growth hypothesis: evidence from Papua New Guinea and Fiji. *Journal of Economic Studies, 34*(4), 341–351. http://dx.doi.org/10.1108/01443580710826380
30. Paul, S., & Chowdhury, K. (1995). Export-led growth hypothesis: some empirical testing. *Applied Economics Letters, 2*, 177–179. http://dx.doi.org/10.1080/135048595357384
31. Ram, R. (1987). Exports and economic growth in developing countries: evidence from time series and cross–section data. *Economic Development and Cultural Change, 36*, 51–72. http://dx.doi.org/10.1086/451636
32. Ramos, F. F. R. (2001). Exports, imports, and economic growth in Portugal: evidence from causality and cointegration analysis. *Economic Modelling, 8*, 613–623. http://dx.doi.org/10.1016/S0264-9993(00)00055-9
33. Shan, J., & Sun, F. (1998). Export-led growth hypothesis for Australia: an empirical re-investigation. *Applied Economics Letters, 5*, 423–428. http://dx.doi.org/10.1080/135048598354555
34. Shan, J., & Tian, G. G. (1998). Causality between exports and economic growth: the empirical evidence from Shanghai. *Australian Economic Papers, June*, 195–202. http://dx.doi.org/10.1111/1467-8454.00015
35. Sharma, S. C., & Dhakal, D. (1994). Causal analyses between exports and economic growth in developing cou0ntries. *Applied Economics, 26*, 1145–1157. http://dx.doi.org/10.1080/00036849400000112
36. Sung-Shen, N., Biswas, B., & Tribedy, G. (1990). Causality between exports and economic growth: An empirical study. *Journal of Economic Development, 15*(1), 47–61.
37. Tang, T. C. (2006). New evidence on export expansion, economic growth and causality in China. *Applied Economic Letters, 13*, 801–803. http://dx.doi.org/10.1080/13504850500425303
38. Valdec, M., & Zrnc, J. (2014). The direction of causality between exports and firm performance: microeconomic evidence from Croatia using the matching approach. *Financial Theory and Practice*, *1*.
39. World Bank. (1993). *The East Asian miracle: Economic growth and public policy*. New York: Oxford University Press.
40. Živković, S., Živković, I., & Grdinić, M. (2014). A VECM approach to detangling growth, exports, imports and FDI knot in selected CEE countries. *Croatian Operational Research Review, 5*, 161–175. http://dx.doi.org/10.17535/crorr.2014.0005

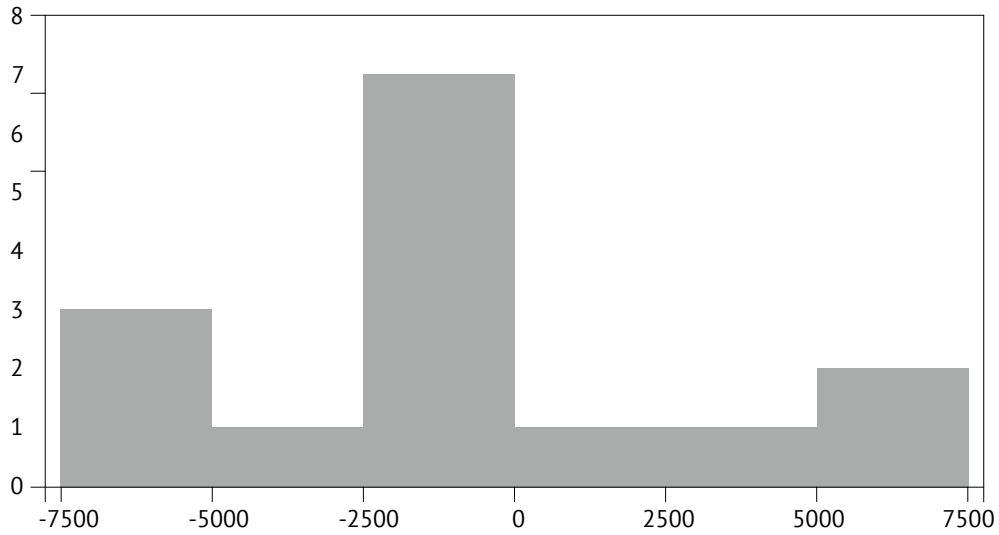
Appendix

Table 7 White Heteroskedasticity Test

F-statistic	2.873553	Prob. F(3,11)	0.0847
Obs*R-squared	6.590496	Prob. Chi-Square(3)	0.0862
Scaled explained SS	3.181509	Prob. Chi-Square(3)	0.3645

Source: Authors' calculations.

Figure 2. Jarque-Bera normality test



Source: Authors' calculations.

Table 8 Correlogram

Sample: 1998–2012
Included observations: 15

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. *| . |	. *| . |	1	-0.187	-0.187	0.6340	0.426
. **| . |	. **| . |	2	-0.270	-0.316	2.0627	0.357
. |* . |	. | . |	3	0.088	-0.043	2.2271	0.527
. | . |	. *| . |	4	-0.015	-0.102	2.2323	0.693
. |* . |	. |* . |	5	0.178	0.195	3.0366	0.694
. | . |	. | . |	6	-0.039	0.027	3.0795	0.799
. **| . |	. *| . |	7	-0.214	-0.120	4.5350	0.717
. *| . |	. **| . |	8	-0.101	-0.250	4.9095	0.767
. |* . |	. | . |	9	0.202	0.040	6.6479	0.674
. *| . |	. **| . |	10	-0.181	-0.296	8.3190	0.598
. | . |	. | . |	11	-0.032	-0.046	8.3855	0.678
. |* . |		12	0.119	0.020	9.5946	0.651

Source: Authors' calculations.

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Testiranje hipoteze o izvozno podprti rasti: primer Hrvaške

Izvleček

V članku preverjamo povezanost bruto domačega proizvoda in izvoza blaga in storitev na Hrvaškem v obdobju med letoma 1996 in 2012. Izsledki raziskave potrjujejo enosmerno Grangerjevo vzročnost od izvoza blaga in storitev do bruto domačega proizvoda. Skladno z Engle-Grangerjevim pristopom h kointegraciji smo ugotovili dolgoročno ravnovesje in kratkoročno korelacijo med opazovanimi spremenljivkami. Izvoz blaga in storitev in bruto domači proizvod se na Hrvaškem gibljejo skupaj. Če se gibanje opazovanih spremenljivk odmakne od ravnovesja, se v naslednjem obdobju vrnejo v dolgoročno stanje ravnovesja s hitrostjo 24,46 %. Skladno z izsledki smo potrdili hipotezo o izvozno podprti rasti na Hrvaškem. Rezultati nakazujejo, da bi morala Hrvaška za okrevanje gospodarstva večji poudarek dati razvoju izvoznih sektorjev.

Ključne besede: bruto domači proizvod, izvoz, Hrvaška, Grangerjeva vzročnost

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Safeguarding Creditors in the Course of Simplified Reduction of Subscribed Capital

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Abstract

The central characteristics of simplified subscribed capital reduction are its very narrow purpose, and a weakened regime of safeguarding of creditors. The main and, frankly, only purpose of the institution is recovery. It is namely most difficult to expect from a distressed company undergoing simplified subscribed capital reduction, which is first and foremost intended for recovery, to safeguard its creditors in the same extent as in the case of ordinary reduction of subscribed capital. The article provides an analysis of the intent and purpose of simplified subscribed capital reduction and the regulations governing the safeguarding of creditors. Using a descriptive method, subject matter analysis, and comparative legal analysis of the issue, the article elaborates on why regulations governing the safeguarding of creditors are too weak with regard to the effects brought forth by this type of subscribed capital reduction and proposes appropriate supplementation and amendments to applicable legislation.

Keywords: simplified subscribed capital reduction, safeguarding of creditors, capital inadequacy, payment ban, tied assets

1 Introduction

The central characteristics of simplified subscribed capital reduction are the direct opposite of characteristics of an ordinary subscribed capital reduction: a narrow aim and purpose, and a weakened regime for safeguarding of creditors (compared to safeguards applied in ordinary subscribed capital reduction).[1] The main and only purpose of this specific type of capital reduction is the recovery of a distressed company. The law breaks down the institution into three specific purposes: covering of carried-forward loss, covering of fiscal year net loss, and reallocation of assets from subscribed capital to capital reserves (first paragraph of Article 379 of ZGD-1[2]). It is namely difficult to expect from a company in financial distress, which is undergoing simplified subscribed capital reduction with the sole purpose of recovery, to uphold the same creditors safeguarding regime as with ordinary subscribed capital reduction. Maintaining a broad extent of safeguards for the creditors would hinder the recovery of the company, while on the other hand—at least in most cases—resulting in a disproportionate infringement of the position of creditors, who are already at risk due to the losses realized by the company,

[1] For details with regard to ordinary subscribed capital reduction, see Drnovšek (2012 and 2013).

[2] Companies Act, Official Journal of the Republic of Slovenia, No. 42/2006 with subsequent amendments and revisions.

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not only (or, more accurately not as late as) the subscribed capital reduction. The reduction is namely executed in order to adjust the amount of subscribed capital to the (already) reduced financial position of the company, or to reallocate subscribed capital to another category of tied-up capital, and does not result in (additional) reduction of assets (on grounds of reducing the subscribed capital).[3] With regard to simplified subscribed capital reduction, the recovery effect is achieved by transferring predetermined amounts from the categories of subscribed capital, capital reserves and reserves from profit into balance sheet items referred to in the first sentence of the first paragraph of Article 379 of ZGD-1.[4] As there is no fresh (external) capital injection, legal theory also refers to the institution as "book recovery".[5]

The simplification of the subscribed capital reduction, as opposed to the ordinary reduction, is seen from the first paragraph of Article 379, and from the reference stipulated by the third paragraph of Article 379 of ZGD-1. The former restricts the aim and purpose of the institution and thus takes away some of the authority of the general meeting which the latter holds in case of ordinary subscribed capital reduction. On the other hand, the released amount of the subscribed capital is easier to utilize, since it does not fall under the time-consuming regime of safeguarding of creditors, stipulated by Article 375 of ZGD-1 (the third paragraph of Article 379 of ZGD-1 namely fails to reference the aforementioned provision). [6] Since the safeguarding regime does not apply, as is the case with ordinary subscribed capital reduction, the execution of the measure may largely be accelerated.

Weakened safeguarding of creditors does not mean that the legal regulation is disregarding the interests of creditors, since their interests are safeguarded in a different manner—a manner more suitable for the institution of simplified subscribed capital reduction. However, the safeguarding regime only goes half way, as the protection, such as currently constructed, is too weak. The forgoing thesis will be elaborated on and proven by means of descriptive method and subject matter analysis of the regulation of safeguarding of creditors in the course of simplified subscribed capital reduction. The findings will be additionally fortified by means of comparative analysis of the regulation in the German legal environment.

2 Recovery and Covering Losses

Pursuant to the second paragraph of Article 379 of ZGD-1, simplified subscribed capital reduction is admissible only if, after prior utilization of net profit and carried-forward profit and after the release of appropriate reserves from profit and capital reserves, the company has at its disposal statutory reserve-fund, the amount of which does not exceed the maximum amount prescribed by the law (10%, as per the third paragraph of Article 64 and first indent of the second paragraph of Article 379 of ZGD-1) or corporate charter, which is to be determined on grounds of the new (reduced) amount of subscribed capital.[7] Such a threshold is stipulated also by the first point of the tenth paragraph of Article 64 of ZGD-1, which governs the utilization of statutory[8] and capital reserves at the point of preparation and adoption of the annual report in cases when statutory reserve-fund does not exceed the threshold stipulated by the law or corporate charter. In the aforementioned instance, statutory and capital reserves may be utilized to cover the net or carried-forward loss only if the losses cannot be covered by carried-forward or net profit, or by corresponding (equal) reserve and profit categories. It is thus possible that both situations arise simultaneously, i.e. the situation referred to in the first point of the tenth paragraph of Article 64 of ZGD-1, and the one referred to in the second paragraph of Article 379 of ZGD-1. In such an instance, no situation has priority over the other, since the law leaves the decision whether to utilize the last available reserve (as per the first point of the tenth Paragraph of Article 64 of ZGD-1) or reduce the subscribed capital (as per Article 379 of ZGD-1) to the company.[9]

By allowing for simplified subscribed capital reduction even when the company (still) has at its disposal statutory reserve-fund, the amount of which (determined on grounds of reduced subscribed capital) does not exceed the threshold stipulated by law or corporate charter, the regulation

[3] Cf. Oechsler in Münchener Kommentar (Goette et al., 2011, § 229, line number (hereinafter: l. no.) 1, 4); Lutter in Kölner Kommentar (Zöllner et al., 1995, Vorb. § 229, l. no. 1)..

[4] Accord with reference to German law Oechsler in Münchener Kommentar (Goette et al., 2011, § 229, l. no. 6).

[5] Oechsler in Münchener Kommentar (Goette et al., 2011, § 229, l. no. 6); Wirth (1996, p. 867). Cf. Schmidt (1982, p. 520); Kocbek in Korporacijsko pravo (Ivanjko et al., 2009, p. 729).

[6] Cf. Kocbek in Korporacijsko pravo (Ivanjko et al., 2009, p. 729). In German law, cf. Oechsler in Münchener Kommentar (Goette et al., 2011, § 229, l. no. 4); Wirth (1996, p. 867).

[7] For assumptions and requirements of simplified subscribed capital reduction in continental legal systems in general, see Bratina, Jovanovič, Podgorelec, Primec (2011, p. 674).

[8] Statutory reserves are the reserves referred to in the first indent of the second paragraph of Article 64 of ZGD-1 (Liabilities and Equity A. III. 1.).

[9] By reference to the third paragraph of § 150 and § 229 of the German AktG ("Aktiengesetz"), accord Oechsler in Münchener Kommentar (Goette et al., 2011, § 229, l. no. 33). Cf. Wirth (1996, p. 869 (left line)).

clearly suggests that capital inadequacy[10] is not a mandatory requirement for the execution of simplified subscribed capital reduction. In case the company realized a loss equal (at most) to such amount of statutory reserve-fund, and the company has no other available reserves which could be utilized to cover the loss, capital inadequacy is not given, whereas it is still admissible to reduce the subscribed capital in order to cover the loss. In all likelihood, the company will decide to cover the loss by means of simplified subscribed capital reduction (only) after capital inadequacy occurs.

2.1 Defining loss and time

Article 379 of ZGD-1 uses the following terms: "carried-forward loss", "fiscal year net loss", "fiscal year net profit", and "carried-forward profit". The wording of the law may lead a casual reader to erroneously assume that simplified subscribed capital reduction may only be used to cover the loss of the (full) fiscal year or used only to remedy the balance disclosed in the annual balance sheet (balance sheet as at the last day of the fiscal year; cf. fourth indent of the fourth paragraph of Article 53 of ZGD-1). However, such a superficial interpretation of the law does not pass even the most basic grammatical test. The reasons why the aforementioned assumptions are false are the following:

a) The awkward wording of Article 370 of ZGD-1 is nothing but a (useless) nod to the wording of the law with regard to general regulations governing balance sheet law (Part I, Chapter 8; cf. only Article 64 and Article 66 of ZGD-1), and does not denote a content-related restriction of the applicability of simplified subscribed capital reduction. The term "fiscal year net loss" should not be understood verbatim, and the term "carried-forward loss" should not be understood as only the carried-forward loss disclosed in the annual balance sheet.[11] Even special provisions of ZGD-1 governing subscribed capital reduction cannot sufficiently support the assumption that simplified subscribed capital reduction can only be applied as per the annual balance sheet cut-off date, since ordinary subscribed capital reduction allows for the covering of losses and reallocation of assets to capital reserves as well. It is thus completely illogical that such a restriction is foreign to the freedom arising from the intent and purpose of ordinary subscribed capital reduction, while on the other hand limiting the very type of subscribed capital reduction, which, by definition of the law, is primarily intended for recovery, only to the balance at year-end and thus forcing the company (in need of recovery) to maintain its distressed position, deepen its loss and wait for some "magical moment". In simple terms: the aim of Article 60 of the ZGD-F amendment (enacted in 2001)[12] was not to change the content-related applicability of subscribed capital reduction. The aim of the changed provision, which, unfortunately, resulted in a grand failure, was to harmonize the terminology (the omission of the wording "compensate for lower value of assets" is not relevant to this analysis).[13]

b) According to ZGD-1, the concentration of effects of simplified subscribed capital reduction to the last day of the past fiscal year (fiscal year which ended prior to the decision on subscribed capital reduction) is impossible. Simplified subscribed capital reduction becomes effective with the registration of the decision on reduction into the court registry (third paragraph of Article 379 in relation with Article 374 of ZGD-1), whereas the reduction cannot have retroactive effects, i.e. cannot apply to the cut-off date of the balance sheet of the past fiscal year, and thus cannot change the (possibly previously adopted) annual report.[14] In other words, if the decision on executing a simplified subscribed capital reduction in order to cover the loss is not taken by the general meeting, which is to be held on the cut-off date of the annual balance sheet (see below), simplified subscribed capital reduction cannot be used to cover the fiscal year net loss, since the net loss will turn into carried-forwards loss on the very next day.

[10] The term capital inadequacy denotes a situation when the subscribed capital had already been eaten into. We refer to capital inadequacy when the sum total of the net loss and carried-forward loss, reduced by potential carried-forward profit or net profit, exceeds the sum total of capital reserves and reserves from profit. As a result, the amount of own capital is below the amount of subscribed capital. Cf. Wirth (1996, p. 869 (left line)); Podgorelec (2006, p. 1673); Kobal, Prikriti prenosi premoženja in prikrita izplačila dobička (2007, p. 136).

[11] Cf. Kocbek (2013, p. 359-360), who represents the opinion that simplified subscribed capital reduction, executed with the aim to cover the loss, may also be executed on grounds of an interim balance sheet which discloses the net loss as at the balance sheet cut-off date.

[12] Act amending the Companies Act (Official Journal of RS, No. 45/2001).

[13] Prior to the ZGD-F amendment, the first sentence of the first paragraph of Article 354 of ZGD-1 read: "Reduction of subscribed capital aiming to compensate for lower asset value, cover losses or reallocate assets to reserves, may be executed in a simplified manner." After the enactment of the ZGD-F amendment (Article 60), the provision read: "Reduction of subscribed capital reduction aiming to cover carried-forward loss or fiscal year net loss or reallocate assets to capital reserves may be executed in a simplified manner". Currently, the first sentence of the first paragraph of Article 379 of ZGD-1 reads as follows (practically unchanged): "Reduction of subscribed capital aiming to cover carried-forward loss or fiscal year net loss or reallocate assets to capital reserves may be executed also in a simplified manner."

[14] For retrospective effects of simplified subscribed capital reduction in German law see § 234 of the German AktG.

c) A concentration of effects arising from simplified subscribed capital reduction executed on the last day of the past fiscal year may lead to the very same consequences (effects) which the second paragraph of Article 379 of ZGD-1 intends to prevent. If, during the period since the end of the past fiscal year until the decision on simplified subscribed capital reduction, the company realized profit which may be utilized to cover the loss, either partially or fully, simplified subscribed capital reduction is not permissible for that amount of the loss (perhaps even the full loss) which the company is able to cover with the realized profit.[15]

2.2 Determining loss and quality of loss

The loss to be covered with simplified subscribed capital reduction shall exist at the time of the general meeting decision.[16] The reason why the loss was realized and the amount of the loss are irrelevant,[17] however, the quality of the loss needs to justify the intended permanent change of subscribed capital.[18] Relevant quality of the loss is not given, if, e.g., the company discloses a loss which may be quickly remedied by future gains.[19] Simplified subscribed capital reduction is thus not based solely on absolute facts, but rather, to a certain extent, also on projections of the management, which need to be drawn up with sufficient diligence.[20]

The loss does not need to be determined in the formal annual report, and the annual report—even a previously audited and finally adopted report—cannot serve as grounds for simplified subscribed capital reduction as long as there is a chance that the company realized profit in the meantime.[21] Statutory provisions governing simplified subscribed capital reduction do not provide any instructions on how to determine the loss, or instructions on the disclosure of the loss in financial statements. As a result, simplified subscribed capital reduction does not need to be based on a formal, previously drawn up balance sheet disclosing the loss which needs to be covered.[22] A diligent assessment and projection of the management are fully sufficient.[23] In practice, the management would still draw up an interim balance sheet in order to quantify the loss and determine the categories stipulated by the second paragraph of Article 379 of ZGD-1. However, the balance sheet does not need to be audited (despite the company potentially being obligated to audit its annual report), or adopted in any formal manner[24] (e.g., by the supervisory board). The obligation to draw up an interim balance sheet, which would need to be presented to the general meeting when deciding on simplified subscribed capital reduction, is not prescribed even by Article 19 of the Decree on the registration of companies and other legal entities in the register of companies.[25] The management may draw up the balance sheet referred to in the second point of Article 19 of the Decision even after the general meeting decision (and will be obligated to do so, since the management will need to present relevant items as at the date of decision of the general meeting).

3 Aim and Purpose of Reduction of Subscribed Capital

If the position of creditors is endangered (already) by a negative development of the company's financial position, (subsequent) recovery is only to their benefit. The peremptory nature of the aim of simplified subscribed capital reduction and its strict limitation to recovery purposes is thus instituted with the main objective of safeguarding the creditors. Instead of directly safeguarding the claims of creditors of the company (as is the case with ordinary subscribed capital reduction pursuant to Article 375 of ZGD-1), the institution of simplified subscribed capital reduction is aimed (solely) at the improvement of the financial position of the debtor (company).[26] The very concept of simplified subscribed capital reduction is thus based on the irrefutable assumption that the measure is beneficial,

[15] Cf. Kocbek (2013, p. 360-361).

[16] Accord Wirth (1996, p. 868 (top right line)); Hüffer (2010, § 229, l. no. 7); Kocbek (2013, p. 360).

[17] Accord Krieger in Münchener Handbuch—Aktiengesellschaft (Hoffmann-Becking et al., 2007, § 61, l. no. 6); Hüffer (2010, § 229, l. no. 7-8).

[18] Krieger in Münchener Handbuch—Aktiengesellschaft (Hoffmann-Becking et al., 2007, § 61, l. no. 6); Hüffer (2010, § 229, l. no. 8), who expressly emphasizes the permanency of the loss.

[19] Similar Oechsler in Münchener Kommentar (Goette et al., 2011, § 229, l. no. 22); Krieger in Münchener Handbuch—Aktiengesellschaft (Hoffmann-Becking et al., 2007, § 61, l. no. 6). Cf. Wirth (1996, p. 868 (right line)).

[20] This conclusion is obvious already from the wording of the law, since there is always a certain time period between the decision on capital reduction and its effect (i.e. registration in the court registry).

[21] In German law cf. Wirth (1996, p.. 868 (bottom right and top right lines)); Lutter in Kölner Kommentar (Zöllner et al., 1995, § 229, l. no. 11).

[22] Accord Krieger in Münchener Handbuch—Aktiengesellschaft (Hoffmann-Becking et al., 2007, § 61, l. no. 6). Cf. Lutter in Kölner Kommentar (Zöllner et al., 1995, § 229, l. no. 11 (end)).

[23] Cf. Krieger in Münchener Handbuch—Aktiengesellschaft (Hoffmann-Becking et al., 2007, § 61, l. no. 6); Lutter in Kölner Kommentar (Zöllner et al., 1995, § 229, l. no. 13).

[24] Similarly, Krieger in Münchener Handbuch—Aktiengesellschaft (Hoffmann-Becking et al., 2007, § 61, l. no. 7).

[25] Decree on the registration of companies and other legal entities in the register of companies (Official Journal of RS, No. 43/2007 with subsequent amendments and revisions).

[26] Cf. Oechsler in Münchener Kommentar (Goette et al., 2011, § 229, l. no. 14).

or at least, neutral, to creditors.[27] Assets released by the reduction shall therefore be utilized only for recovery purposes (cf. first and second paragraph of Article 379 of ZGD-1), whereas no payments to shareholders are permitted. Even dividend payments from future profits (and other disposal of distributable profit) are restricted (Article 380 of ZGD-1).

4 Payment Ban, Fulfilment of Intent, and Tied Assets

With regard to simplified subscribed capital reduction, the main replacement for Article 375 of ZGD-1 is provided by the ban on utilization of released assets for payments to shareholders (released assets shall not be used for payments to shareholders or used as a waiver of the shareholders' obligation to pay contributions).[28] Released assets (first and second paragraph of Article 379 of ZGD-1) shall be utilized only for the fulfilment of the primary intent and purpose of simplified subscribed capital reduction (first paragraph of Article 379 of ZGD-1). However, the law fails to provide any specific provisions on the latter (as, e.g., § 230 of the German AktG) in the part referring to the simplified reduction of subscribed capital (Articles 379 and 380 of ZGD-1). The aforementioned rule is the result of a very narrow and restrictive intent and purpose of simplified subscribed capital reduction (first paragraph of Article 379 of ZGD-1), and (general) rules on preservation of capital (first paragraph of Article 227 and eighth paragraph of Article 230 of ZGD-1) which still apply to simplified subscribed capital reduction. In other words, while in case of ordinary subscribed capital reduction the repayment of contributions is admissible and even common practice, payments in case of simplified subscribed capital reduction are never admissible. The amount of tied-up capital is not changed due to simplified subscribed capital reduction.[29] With regard to released assets and safeguarding of creditors, it is therefore sufficient to denote that the assets concerned shall only be utilized to fulfil a narrow and restrictive (admissible) intent and purpose. Moreover, the law, at least partially, remedies the disadvantages for creditors which arise from the abrogation of contingent subscribed capital (Article 380 of ZGD-1).[30] As a means of remedying the haircuts to the basic guaranteed asset base, the regulation calls for the accelerated channeling of profit to tied-up reserves. By allowing the utilization of released assets only for the fulfilment of intents and purposes stipulated by the first paragraph of Article 379 of ZGD-1, the law prevents the general meeting from releasing an excessive amount of subscribed capital in order to create available assets for payments to shareholders.[31]

4.1 Force and extent of tying nature of assets

The narrow purpose and the ban on channeling assets to shareholders applies to all released assets: statutory reserves and other reserves from profit (first indent of the second paragraph of Article 379 of ZGD-1), capital reserves (first indent of the second paragraph of Article 379 of ZGD-1), net profit and carried-forward profit (second indent of the second paragraph of Article 379 of ZGD-1), and the released amount of subscribed capital (first paragraph of Article 379 of ZGD-1). The authority of the management to utilize released assets is limited as well, since the management is obligated to adhere to relevant statutory provisions and to the resolution of the general meeting (with regard to the latter, cf. Article 267 and the second paragraph of Article 285 in relation with Article 267 of ZGD-1). Both shareholders (pursuant to Article 233 of ZGD-1) and members of management or supervisory bodies (pursuant to Article 263 of ZGD-1) are liable for violating the payment ban. In case of a waiver of the obligation to provide contributions, the debt waiver agreement is null and void pursuant to the first paragraph of Article 86 of the Code of Obligations.[32]

4.2 Payment ban after the reduction of subscribed capital

The ban stipulated by the first sentence of Article 380 of ZGD-1 enters into force when the simplified subscribed capital reduction becomes effective, i.e. when the resolution on capital reduction is registered in the court registry (third paragraph of Article 379 in relation with Article 374

[27] Oechsler in Münchener Kommentar (Goette et al., 2011, § 229, l. no. 4), including a presentation of possible occurrence of competition of creditors.

[28] Cf. Lutter in Kölner Kommentar (Zöllner et al., 1995, § 230, l. no. 21).

[29] Accord Plavšak in ZGD-1 (Kocbek et al., 2014, p. 440).

[30] In future periods, the loss covered with the released amount of subscribed capital could otherwise be covered from profit (eleventh paragraph of Article 64 and first paragraph of Article 230 of ZGD-1). Cf. Lutter in Kölner Kommentar (Zöllner et al., 1995, § 230, l. no. 3).

[31] Cf. Lutter in Kölner Kommentar (Zöllner et al., 1995, § 230, l. no. 3).

[32] Code of Obligations (OZ), Official Journal of RS, No. 83/2001 with subsequent amendments and revisions.

of ZGD-1). As of that moment, dividend payments are not admissible, and the company is not allowed to utilize distributable profit for other purposes stipulated by the corporate charter until the amount of statutory reserve-fund reaches the threshold stipulated by law or corporate charter. The share of subscribed capital to be reached by statutory reserve-fund is measured on grounds of the reduced subscribed capital. Until statutory reserve-fund has been filled, the provision of the fourth paragraph of Article 64, which stipulates a 5% restriction of the amount of net profit which may be reallocated to statutory reserves, does not apply (as per the second sentence of Article 380 of ZGD-1). The second sentence of Article 380 of ZGD-1 does not prescribe the obligation to set aside and reallocate statutory reserves, as the latter is still governed by the third and fourth paragraph of Article 64 of ZGD-1. The second sentence of Article 380 of ZGD-1 merely breaks through the 5% threshold stipulated by the fourth paragraph of Article 64 of ZGD-1. The fourth paragraph of Article 64, modified by the second sentence of Article 380 of ZGD-1, thus denotes the following: If necessary, the company shall reallocate to statutory reserves all net profit, reduced by the amount potentially required to cover the carried-forward loss, until statutory reserve-fund reaches the share of (the reduced) subscribed capital stipulated by law or corporate charter. The primary (and, to a certain extent, only) intent and purpose of Article 380 of ZGD-1 is the safeguarding of creditors, including future creditors.[33] The institution allows for a quicker renouncement of the payment ban and is thus only of indirect benefit to the shareholders.

The law calls for an accelerated filling of statutory reserves and protection of capital against (potential future) losses, as well as for the strengthening of capital after the simplified subscribed capital reduction becomes effective. The payment ban instituted by categories of tied-up capital is reduced through the reduction of subscribed capital and the covering of losses with assets made available by the capital reduction. If subscribed capital would not be subject to reduction, future profits would need to be utilized to cover the loss, i.e. to fill tied-up assets.[34] It is for this very purpose that the law locks up future profits in the company, so that they need to be reallocated (in an accelerated manner) to the tied-up capital category (statutory reserves). By doing so, the law not only ties up the assets prior to the reduction of subscribed capital (second paragraph of Article 379 of ZGD-1) and assets made available by capital reduction (first paragraph of Article 379 of ZGD-1), but also the profits realized after the reduction of subscribed capital (Article 380 of ZGD-1). Dividend payments are not admissible and distributable profit shall not be utilized for other purposes stipulated by the corporate charter. Not only is the company allowed to reallocate a greater volume of net profit to statutory reserves, it is obligated to do so. Until statutory reserve-fund has been filled, distributable profit does not exist, since the entire net profit is channeled to statutory reserves.

4.3 In all cases and instances

The situations referred to in the first indent of the second paragraph of Article 379 and the first sentence of Article 380 of ZGD-1 are related to the same qualifying element: filled statutory reserve-fund, the amount of which is measured on grounds of the new (reduced) amount of subscribed capital. The maximum amount of statutory reserves which may remain in order for simplified subscribed capital reduction to be admissible is equal to the minimum amount which allows a company to freely utilize distributable profit after the capital reduction becomes effective. Regardless of the intent and purpose (first paragraph of Article 379 of ZGD-1) for which simplified subscribed capital reduction was executed, it may occur that the company will have full statutory reserve-fund available for disposal immediately after subscribed capital reduction becomes effective. It may also occur that the company will previously utilize even those tied-up reserves which it might had saved, meaning that statutory reserve-fund will not be full after the capital reduction. The application (effect) of Article 380 of ZGD-1 is thus not dependent on the purpose (first paragraph of Article 379 of ZGD-1) of simplified subscribed capital reduction, but rather on the level of filled capacity of statutory reserve-fund at the moment when capital reduction becomes effective.

5 Too Narrow and Too Broad at the Same Time

To be precise, the previously referred to promotion of capital strength is only part of the truth, as the law simultaneously takes away some of the company's room for manoeuvre which it could have had without endangering its creditors. If Article 380 of ZGD-1 would not have the second sentence, the reallocation of statutory reserves would be governed only by the fourth paragraph of Article 64 of ZGD-1. Moreover, if the first sentence of Article 380 of ZGD-1 would not extend beyond the ban on payment of distributable profit to shareholders, the surplus net profit, i.e. the profit in excess of 5%, would be channeled to distributable profit, which could in turn be utilized for other purposes (stipulated by law or corporate charter), including

[33] In German law, cf. Veil in Schmidt/Lutter AktG (Schmidt et al., 2008, § 233, l. no. 1-2).

[34] Cf. Lutter in Kölner Kommentar (Zöllner et al., 1995, § 233, l. no. 3).

the setting aside of statutory reserves (if so stipulated by the corporate charter), whereas the 5% threshold stipulated by the fourth paragraph of Article 64 is (most certainly) not relevant to the aforementioned situation.[35] Distributable profit still couldn't be channeled to shareholders (until statutory reserve-fund has been filled), whereas the decision on accelerated protection and strengthening of capital by means of tied-up reserves would be left to shareholders, i.e. to those who are not entitled to distributable profit until the capital has been given adequate protection and reached adequate strength (as stipulated by law or corporate charter). If distributable profit would be classified as carried-forward profit, the latter would automatically be utilized to cover potential net loss (incurred in future fiscal periods). In case the general meeting decided to utilize distributable profit to set aside other reserves from profit (first sentence of the sixth paragraph of Article 230 of ZGD-1), the latter could (again) be utilized to cover the loss. In case of potential net loss, the carried-forward profit and other reserves from profit would even be the first to suffer. The same is true for corporate charter reserves[36] if they are allowed to be utilized to cover the loss. Moreover, shareholders would be given the chance to directly influence subscribed capital even before statutory reserve-fund has been filled (and could do so to a much greater extent): distributable profit may be categorized as carried-forward profit, and the latter is an admissible source of increasing subscribed capital with company assets (fifth point of the first paragraph of Article 359 of ZGD-1).

5.1 Safeguarding of creditors that benefits shareholders

Article 380 of ZGD-1 safeguards the creditors. Until statutory reserve-fund has been filled, the provision does not allow for any derogation and shareholders must simply accept the payment ban (the same applies to other potential beneficiaries of distributable profits, if they are entitled to receive payments pursuant to the corporate charter). However, this is where it all ends. Immediately after statutory reserve-fund has been filled, the full distributable profit may again be distributed among shareholders and utilized for other purposes stipulated by the corporate charter. As a matter of fact, it is now even easier to channel distributable profit from the company, since the threshold of the payment ban, set with categories of tied-up capital, mostly subscribed capital, has been lifted (reduced). The forgoing notwithstanding, the law fails to stipulate any additional safeguards to the filling of statutory reserve-fund, and even the amount of the latter is measured on grounds of the reduced subscribed capital. For clarity purposes and to help future analysis, let us consult the following typical example, referred to in the second paragraph of Article 379 of ZGD-1.

In the example above, the company is able to execute a simplified subscribed capital reduction in order to cover the loss (- 250); however, it does not need to execute a prior release of tied-up reserves. After the subscribed capital reduction executed in order to cover the loss, the position is as shown in Table 2.

Table 1 Position Prior to the Reduction of Subscribed Capital

Assets	Liabilities + Equity	
	Subscribed capital	1,000
	Capital reserves (points 1 through 3 of the first paragraph of Article 64 of ZGD-1)	30
	Statutory reserves	45
	Net profit/loss	- 250
	Liabilities	200
1,025		1,025

Table 2 Position After the Reduction of Subscribed Capital

Assets	Liabilities + Equity	
	Subscribed capital	750
	Capital reserves (points 1 through 3 of the first paragraph of Article 64 of ZGD-1)	30
	Statutory reserves	45
	Liabilities	200
1,025		1,025

[35] Unlike the German AktG (third paragraph of § 58), ZGD-1 fails to stipulate that distributable profit may be utilized to set aside reserves from profit, but only limits the utilization of distributable profit to other reserves from profit (Liabilities and Equity A. III. 5.). According to the German AktG, distributable profit may, by law, be utilized to set aside additional statutory reserves. Per ZGD-1, the latter would be possible on grounds of appropriate corporate charter regulation. In the aforementioned instance, the general meeting would be able to decide on the reallocation of distributable profit to statutory reserves. The general meeting is also not obligated to adhere to the 5% threshold stipulated by the fourth paragraph of Article 64 of ZGD-1 when deciding on the amount of distributable profit to be reallocated. This allows for setting aside of statutory reserves prematurely and allows the company to reach the upper limit of the statutory reserve-fund threshold in an accelerated manner. The upper limit of statutory reserve-fund and the 5% allocation threshold are thus relevant only when reallocating statutory reserves from net profit with regard to the preparation and adoption of the annual report. However, the grounds for challenge stipulated by Article 399 of ZGD-1 need to be observed even in case of reallocation of statutory reserves as part of the utilization of distributable profit. For details on setting aside reserves from profit from distributable profit see Drnovšek (2010, p. 1502, 1519-1521).

[36] Corporate charter reserves are the reserves referred to in the fourth indent of the second paragraph of Article 64 of ZGD-1 (Liabilities and Equity A. III. 4.).

After the subscribed capital reduction the payment ban is still instituted by tied-up capital categories (as well as foreign capital), however, the very amount of tied-up capital has been reduced (previously 1,075; now 825). In case the company would not cover the loss by executing a simplified subscribed capital reduction, it would first need to utilize future profit to cover the loss and fill statutory reserve-fund. The company would thus need to realize profit in excess of 275 (250 to cover the loss and an additional 25 to fill statutory reserve-fund). However, after covering the loss against subscribed capital, the company does not need to realize any additional profit, but is free to channel the entire new profit to shareholders (among others). Although the loss-affected assets of the company have not been changed (strengthened) with the reduction of subscribed capital, and the position of creditors has subsequently not been altered, it is still possible to channel all future profit away from the company. At this point, one needs to recall the fact that the main replacement for Article 375 of ZGD-1 with regard to simplified subscribed capital reduction is represented by the inadmissibility of channeling released assets to shareholders. However, as shown in the previous example, the situation is not far from what the law prohibits. The relevant amount of subscribed capital may not have been paid to the shareholders, however, the very reduction of subscribed capital allowed the company to cover the loss and simultaneously lower the payment ban, instituted by elements of tied-up capital, and thus achieve easier (quicker) channeling of distributable profit.

6 Consequences of Violations

An annual report violating Article 380 of ZGD-1 is null and void (first indent of the first paragraph of Article 401 of ZGD-1), as is a general meeting resolution on the utilization of distributable profit (third indent of Article 390 of ZGD-1). Both shareholders (pursuant to Article 233 of ZGD-1) and members of management and supervisory bodies (Article 263 of ZGD-1) are liable for violations of the payment ban.

7 Conclusion

The forgoing analysis leads us to the following valid conclusion: the concept of safeguarding of creditors as referred to in Article 380 of ZGD-1 allows for a (completely legal) circumvention of rules governing the terms for admissibility of simplified subscribed capital reduction (Article 379 of ZGD-1). The amounts referred to in Article 379 of ZGD-1 are, in fact, utilized solely for recovery, however, this very command is undermined by the (next available) option to channel (excessive) profits away from the company after the reduction of subscribed capital.[37] This gap is quite simple to bridge: the existing concept of safeguarding of creditors should be supplemented by introducing a time-limited ban on the payment of the majority of distributable profits, which would apply despite the fact that the statutory reserve-fund has been filled. Such a ban would give a company sufficient room for manoeuvre in strengthening its financial position in the future. A quantity-based parallel could be drawn by reference to Article 399 of ZGD-1 which stipulates that a 4% dividend is considered sufficient margin for the safeguarding of shareholders' interests.[38] Article 380 of ZGD-1 thus needs to be amended so that a certain period of time (e.g., two fiscal years after the general meeting resolution) needs to pass before the majority of distributable profits (e.g., dividend in excess of 4 %) can be paid, even though the statutory reserve-fund had been filled. An exception to the rule may be justified only by the safeguarding of creditors, modelled after the safeguarding regime applied in ordinary subscribed capital reduction.[39]

[37] German law (§ 233 of the German AktG) therefore justifiably limits the amount of distributable profit payments for a full two years after the adoption of the resolution on simplified subscribed capital reduction even if statutory and capital reserves have been sufficiently filled. Legal theory emphasizes that this very restriction replaces the concept of safeguarding of creditors, which is applied to ordinary subscribed capital reduction. For details, see Oechsler in Münchener Kommentar (Goette et al., 2011, § 233, l. no. 2-3). Cf. Lutter in Kölner Kommentar (Zöllner et al., 1995, § 233, l. no. 3).

[38] First paragraph of Article 399 of ZGD-1: *"A general meeting's resolution on the appropriation of distributable profits may be challenged … if the general meeting decides not to distribute the profits to the shareholders in the amount corresponding to at least 4% of the share capital, provided that, according to the due diligence principle, this is unnecessary given the circumstances in which the company operates."*

[39] In comparative law, such a solution is referred to in the second paragraph of § 233 of the German AktG: *"[…] Die Zahlung eines Gewinnanteils von mehr als vier vom Hundert ist erst für ein Geschäftsjahr zulässig, das später als zwei Jahre nach der Beschlußfassung über die Kapitalherabsetzung beginnt. Dies gilt nicht, wenn die Gläubiger, deren Forderungen vor der Bekanntmachung der Eintragung des Beschlusses begründet worden waren, befriedigt oder sichergestellt sind, soweit sie sich binnen sechs Monaten nach der Bekanntmachung des Jahresabschlusses, auf Grund dessen die Gewinnverteilung beschlossen ist, zu diesem Zweck gemeldet haben. […]"*.

References

1. Bratina, B., Jovanovič, D., Podgorelec, P., & Primec, A. (2011). *Pravo družb in gospodarsko pogodbeno pravo*. Maribor: De Vesta.
2. Drnovšek, G. (2010). Zakonski rezervni sklad delniške družbe. *Podjetje in delo, 8*, 1498–1536.
3. Drnovšek, G. (2013). Redno zmanjšanje osnovnega kapitala delniške družbe: namen, znesek, izplačilna zapora in oblika izločenega premoženja. *Podjetje in delo, 5*, 736–750.
4. Drnovšek, G. (2012). Upnikova pravica do zavarovanja in registrska zapora pri rednem zmanjšanju osnovnega kapitala delniške družbe. *Podjetje in delo, 8*, 1670–1696.
5. Goette, W., Habersack, M., Oechsler, J., et al. (2011). *Münchener Kommentar zum Aktiengesetz*. München: Verlag C. H. Beck/Verlag Franz Vahlen.
6. Hoffmann-Becking, M., Krieger, G., et al. (2007). *Münchener Handbuch des Gesellschaftsrechts*. München: Verlag C. H. Beck.
7. Hüffer, U. (2010). *Aktiengesetz*. München: Verlag C. H. Beck.
8. Ivanjko, Š., Kocbek, M., & Prelič, S. (2009) *Korporacijsko pravo: pravni položaj gospodarskih subjektov*. Ljubljana: GV založba.
9. Kocbek, M., Plavšak, N., et al. (2014). *Veliki komentar Zakona o gospodarskih družbah (ZGD-1)*. Ljubljana: IUS Software, GV Založba.
10. Kocbek, M. (2013). Poenostavljeno zmanjšanje osnovnega kapitala zaradi kritja izgube na podlagi vmesne bilance stanja. Podjetje in d*elo, 2*, 358–361.
11. Kobal, A. (2007). *Prikriti prenosi premoženja in prikrita izplačila dobička—davčno pravni vidik* (Ph.D. dissertation). Maribor: Pravna fakulteta Univerze v Mariboru.
12. Podgorelec, P. (2006). Ohranjanje osnovnega kapitala pri d.o.o. (2006). *Podjetje in delo, 8,* 1669–1698.
13. Schmidt, K. (1982). Die sanierende Kapitalerhöhung im Recht der Aktiengesellschaft, GmbH und Personengesellschaft. *Zeitschrift für Unternehmens- und Gesellschaftsrecht (ZGR), 3*, 519–538. http://dx.doi.org/10.1515/zgre.1982.11.3.519
14. Schmidt, K., Lutter, M., Veil, R., et al. (2008). *Aktiengesetz Kommentar*. Köln: Verlag Dr. Otto Schmidt.
15. Wirth, G. (1996). Vereinfachte Kapitalherabsetzung zur Unternehmenssanierung: Zugleich eine Anmerkung zum Urteil des LG Dresden vom 15. 8. 1995 "Sachsenmilch AG." *Der Betrieb (DB), 17*, 867–872.
16. Zöllner, W., Lutter, M., et al. (1995). *Kölner Kommentar zum Aktiengesetz*. Köln, Berlin, Bonn, München: Carl Heymanns Verlag KG.

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Gregor Drnovšek successfully defended his Ph.D. thesis in corporate law in January 2015 at the Faculty of Law in Maribor, where he was appointed to an assistant position. In addition, he has acquired more than 10 years of experience in economy, especially in banking, where he specialized in investment banking and corporate finance and served as executive secretary of a management board. He is the author of various original scientific articles and professional articles as well as co-author of monographs. In addition, he has participated in scientific conferences. His research and studies focus mainly on corporate law and takeover law.

Varstvo upnikov pri poenostavljenem zmanjšanju osnovnega kapitala

Izvleček

Osrednji značilnosti poenostavljenega zmanjšanja osnovnega kapitala sta zelo ozek namen in oslabljeno varstvo upnikov. Namen je pravzaprav le en, namreč sanacija. Od finančno prizadete družbe je težko pričakovati, da bo pri zmanjšanju osnovnega kapitala, ki je namenjeno sanaciji, sposobna varovati upnike po merilih, ki veljajo pri rednem zmanjšanju osnovnega kapitala. V prispevku avtor analizira namen poenostavljenega zmanjšanja osnovnega kapitala in zakonsko ureditev varstva upnikov. Pri tem z metodo deskripcije, vsebinsko analizo in primerjalnopravno študijo utemelji, zakaj je pravna ureditev varstva upnikov prešibka glede na učinke te oblike zmanjšanja osnovnega kapitala, in predlaga spremembo zakonske ureditve.

Ključne besede: poenostavljeno zmanjšanje osnovnega kapitala, varstvo upnikov, podbilanciranost, izplačilna prepoved, vezanost premoženja

Is Trust in Banks in Slovenia Put to the Test?

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Abstract

The question of the banking system's stability in connection to trust since the 2008 crisis has been the subject of many debates seeking to find permanent solutions to banking system problems, as the current situation affects bank customers' behavior. This article examined trust in banks during the financial crisis and offers, via demographic variables, explanations as tow whether or not customers tend to withdraw their deposits during a crisis. The results contribute to banks' decision-making regarding deposits management and understanding customers' behavior, especially during a crisis. The results show a negative relationship between trust and deposit withdrawal intention, where gender and education level play an important role.

Keywords: trust, financial institution, bank, Slovenia, logistic regression

1 Introduction

This article deals with trust. In economics, trust is the main factor allowing the fractional reserve bank system to exist and is the most important characteristic in the relationship between financial institutions, including banks, and their customers. Bank customers have a tendency to buy banking services from a bank, which they consider to be trustworthy and sound. This already fragile connection is under a lot of pressure in normal circumstances, let alone during times of crisis, when banks are often held responsible (Hurlburt, Miller & Voas, 2009; Schelkle, 2011). However, the complexity of the phenomenon itself is shown by the fact that trust has not only been examined in economics, but also by psychologists, sociologists, anthropologists, and others (for example, see Mayer, 2004; Whitney, 1994). One angle is common to all: the fragility of trust. Trust is gradually built, but can be destroyed in a moment (more for example Rempel, Holmes & Zanna, 1985; Weber, Malhotra & Murnighan, 2004). Authors also talk about trust's antipode—namely, mistrust (Tyler & Stanley, 2007)—and the perceived fairness of bank services (Szykman, Rahtz, & Plater, 2005). It is important to research and, in practice, implement trustworthy relationships because trust is a central concept on which other concepts, like loyalty and satisfaction (see Anderson & Narus, 1990) are based. These are a sustainable source of banks' competitive advantage (see Trif, 2013). Taking all these facts into consideration, it is necessary to research trust in banking systems. Therefore, our research deals with the relationship of trust, deposit safety scheme, and deposit withdrawals during times of financial crisis

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in the case of the Slovenian banking system. We connected these variables with selected socioeconomic factors.

The article continues as follows. We start with a theoretical background. AS this is an empirically oriented study, we test the conceptual model and three main hypotheses regarding (1) the impact of gender, age, and level of education of bank customers on their perceived bank deposit safety; (2) the impact of those factors on customers' perceived trust in the bank; and (3) the withdrawal of bank deposits connected to gender, age, and education. The third section of the article gives the research framework and delivers results. In the discussion and conclusion section, we assess the findings and give some suggestions for further research.

2 Literature Review

This literature review deals with trust, connecting it to other variables that we considered in our research. In the following paragraphs, we summarize the limited literature on trust as a concept in the financial markets context, with financial institutions being the foundation of that part of the economy. We then discuss trust in connection with gender, age, and education level. The financial crisis and its consequences for all levels of economy and society offer a sound reason to also define trust through the optics of its resilience during a financial crisis, when it is tested over and over again in the relationship between banks and customers. In addition, banks are burdened with the process of restructuring and are even subject to failures. Customers seem to have different attitudes toward these processes, ranging from fear to understanding.

The following section of the article is structured based on the research model depicted in Figure 1. This model incorporated concepts dealt with in the literature review; the hypotheses are presented and tested in the empirical part of the article.

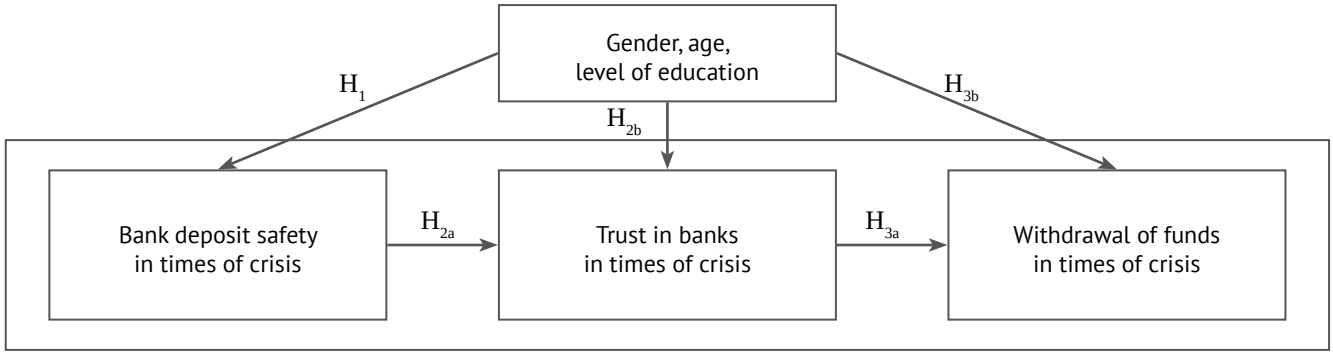
2.1 Concept of trust in financial institutions

The body of literature in this field is mainly dedicated to banks rather than other financial institutions, which is probably due to the specifics of a bank as a company and its influence on the individual (Süchting, 1998). Trust is the most important category in the process of reaching a personal financial decision. As with all other services, banking services are intangible products and defined only by contract, which remove trust and make taking risks meaningless (Calderon, Chong, & Galindo, 2009; Sapienza & Zingales, 2009).

Moorman, Deshpandé, and Zaltman (1992) defined trust as preparedness to relate to a trustworthy partner in the broadest meaning of the word, while Coulter and Coulter (2002) added that a higher level of trust leads to better cooperation. Authors in general tend to define trust as a dynamic category, resulting from a process, and talk about different dimensions of trust. Therefore, it can be defined through different viewpoints. As McKnight & Chervany (2000) pointed out, trust can be seen as a notion, as systemic trust, as belief, and an intention to trust (Sztompka, 1999), where it develops from a quality relationship (Whitney, 1994) over individual characteristics to a cultural standard. Therefore, bank customers and banks have built systemic trust, which is theoretically defined as trust between an institution and an individual. Customers tend to perceive the banking institution as a relationship to a system as a whole (Bennet & Kottasz, 2012); here, trust built between the customer and an individual banking clerk is in the foreground and an important basis for bank customer loyalty (Gulati, 1995; Parkhe, 1993; Zineldin, 1995).

Trust is accompanied by other similar concepts, like loyalty and satisfaction that are interconnected and decisive in preserving the role of an individual bank as a customer's main bank. Despite the fact that individuals' subjective impression plays a leading role in defining what loyalty or satisfaction might be, trust and reliability are of great

Figure 1: Conceptual research model



Source: Authors

importance in building and preserving customer loyalty (Bloemer, de Ruyter, & Peeters, 1998) Morgan and Hunt (1994) incorporated the concept of commitment into their model and defined it as a key element of banks' customer relations strategy. A long-term relationship has a positive relationship to trust while a bad image has a negative relationship to trust.

However, trust needs a wider context than the bank–bank clerk–bank customer communication triangle to exist. It needs an operating, stable institutional framework (Aghion, Algan, Cahuc & Shleifer, 2010); Carlin, Dorobantu, & Viswanathan, 2009) and, consequently, a stable banking system given the regulatory and legislative demands. Stevenson and Wolfers (2011) argue that the level of trust in this connection depends on the country's development stage. In an international comparison (Coupé, 2011) of transition countries in Slovenia, 55% of respondents declared having trust in their banks. In the highly developed Netherlands (90%) or Austria (70%), the percentage is of course higher (Knell & Stix, 2010; Mosch & Prast, 2010), while for example in Bulgaria that level is significantly lower (Mudd & Valev, 2009).

2.2 Trust and financial crisis

Trust, being a dynamic factor, changes over time. Stevenson and Wolfers (2011) demonstrated that changes in trust are connected with unemployment rate changes, which is quite a good predictor for future crises connected to bank deposit withdrawal (Guiso, Sapienza, & Zingales, 2008; Ramirez, 2009; Sapienza & Zingales, 2009). Deb and Chavali (2010) argued that the intention to deposit money is positively related to trust both pre- and post-crisis.

During our literature review, we did not come upon any research dealing with trust in connection to the views and demographic characteristics of bank customers in Slovenia, as addressed to in this article. Various public polls have been conducted in this regard in Slovenia, and the results were published in mass media (see Delo, 2013; Slovenske novice, 2012). Interestingly, regardless of events in Spain and Greece, 71% of Slovenians have not thought about withdrawing their deposits (Slovenske novice, 2012). Bank runs did not occur in our banking system, although the financial crisis affected the amount of savings deposited in banks as 60.9% of respondents had lower savings than before the crisis (Slovenske novice, 2012). *Vox populi* research in 2012 found contradicting results: Half of respondents worried about their savings in banks, while 27% thought that their deposits were no longer safe (Delo, 2013).

2.3 The impact of gender, age, and education on trust

Existing research on trust in the economic or business sense of the word has found that women have more troubles with trust in general (Alesina & La Ferrara, 2002). As consumers, women give more second thoughts to trust than men (Sheehan Bartel, 1999). Buchan, Croson, and Solnick (2008), in their research of behavioral differences in the investment game, discovered that men trust more than women, but women tend to be more trustworthy.

Regarding the influence of educational level on trust, the literature is relatively scarce. When it comes to dealing with trust within the economic context and in the field of financial institutions and/or banks, it is even scarcer. However, based on the research in Mexico, which examined numerous factors affecting the relationship, it has been argued that people with less education feel uncomfortable with banking issues (Djankov, Miranda, Seira, & Sharma, 2008). Although the study focuses on a less developed banking system, this example is nevertheless a good example of the complexity involved in researching the bank–customer relationship. Many possible angles have to be considered, such as present customers' needs, future needs, retaining customers, and differences in the banking system's development level. Thus, the current paper provides insights into the relationship of trust based on selected demographic variables and between various trust viewpoints and circumstances, as defined in the conceptual research model.

3 Research

3.1 Research methodology

3.1.1 Sample and data collection

A questionnaire was used to collect data from December 10, 2013, to January 27, 2014. The target population represented random users, over the age of 18, who were legally able to buy bank services in Slovenia independently. All the returned questionnaires were correctly completed. For the hypothesis testing, the data was collected based on a convenience non-random sample of 150 customers of bank services from Slovenia. In the total sample, 57% were male (n = 64) and 43% female (n = 86) respondents. A more detailed sample description is given in Table 1.

Table 1 Sample Survey Results

Control variables	fi	fi %
Education:		
Less than secondary education	13	8.7 %
Secondary education	53	35.3%
More than secondary education	84	56.0%
Gender:		
Male	64	57.3 %
Female	86	42.7%
Age:		
18–28 years (young population)	59	39.3 %
29–39 years (middle population)	34	22.7 %
More than 40 years (older population)	57	38.0 %

Source: Authors' calculations

The time of period was chosen deliberately due to the fact that some significant changes occurred in the Slovenian banking system at that time. Two main events in the banking sector took place: The ownership structure changed due to the Slovenian government's recapitalization of five banks, and the banking system's restructuring process began with the supervised liquidation of two private banks, Factor Banka and Probanka. Non-performing assets were then transferred to the Bank Assets Management Company, established in March 2013 (BAMC, 2015; BS, 2015). Such events were so powerful and present in day-to-day media that they were expected to make the public think about the banking crises even more and put their trust in banks to the test.

3.1.2 Instrument of research

The theoretical framework and conceptual research model served to develop questions to study three variables: bank deposit safety, trust in banks during a crisis, and withdrawal of savings during a crisis. Demographic characteristics were also considered. The bank deposit safety variable was measured with yes (1) or no (0) answers to a question about whether individuals considered their deposits to be safe in banks. Trust in the bank was measured with the same dichotomous answers to a question about trust in one's bank in times of crisis. Finally, the withdrawal of savings in times of crisis also used the same dichotomous answers to a question about whether individuals would in times of financial crisis withdraw their bank deposits.

Three control variables were included in the questionnaire to check if hypothesized predictor variables affected bank deposit safety, trust in banks in times of crisis, and withdrawal of savings in times of crisis beyond the impact of these variables. The control variables were age (categorical variable: young population from 18 to 28, middle-aged population from 29 to 39, and older population over 40 years of age), gender (dichotomous variable: females were assigned value 0 and males value 1), and education (categorical variable: less than secondary education, secondary education, and post-secondary education).

3.1.3 Data analysis

We formally tested three hypotheses:

- H_1: Bank customers' gender, age, and level of education affect their perceived bank deposit safety in times of crisis.
- H_2: Bank customers' perceived bank deposit safety in times of crisis, gender, age, and education have a significant effect on their perceived trust in the bank in times of crisis.
- H_3: Customers' perceived trust in the bank in times of crisis, gender, age, and level of education play a significant role in the decision to withdraw funds from their savings account in times of crisis.

We used binomial logistic regression (Hosmer & Lemeshow, 2000; Kedmenec, Tominc, & Rebernik, 2014), which estimates the probability of an event—in our case, the recognition of opportunities or not. We ran five binomial logistic regressions. While Model I includes only control variables, Models II, III, IV, and V include both the predictor variables and control variables. The parameters of the logistic response functions were estimated using the maximum likelihood method, which denotes changes in the log odds of the independent variable. In logistic regression, the observed and predicted values can be used to assess the fit of the model. The measure we use is the log-likelihood based on summing the probabilities associated with the predicted and actual outcomes (Field, 2009, p. 267):

$$\text{Log-likelihood} = \sum_{i=1}^{N}\left[Y_i \ln\left(P(Y_i)\right) + (1 - Y_i)\ln(1 - P(Y_i))\right] \quad (1)$$

To test whether the relationship between dependent and independent variables is direct or indirect, binary logistic regression was used to develop a model as follows:

$$P(Y) = \frac{1}{1 + e^{-(b_0 + b_1 X_{1i} + b_2 X_{2i} + \cdots + ib_n X_{ni})}} \quad (2)$$

where:
P(Y) is the probability of the dependent variable (Model I: bank deposit safety in times of crisis; Models II and III: trust in banks during a crisis; Models IV and V: withdrawal of savings in times of crisis)

b_0 = a constant

b_i = the estimated coefficients

X_i = the independent variables

e = the base of the natural logarithm

The goodness of fit of the model was assessed using the Model χ^2-test, the rate of correct classifications, Nagelkerke's (1991) R_N^2, Cox and Snell's (1989) R_{CS}^2, and Hosmer and Lemeshow's (2000) $R_{H\text{-}L}^2$:

$$R_N^2 = \frac{R_{CS}^2}{1 - e^{\left[\frac{2(LL(baseline))}{n}\right]}} \quad (3)$$

$$R_{CS}^2 = 1 - e^{\left[-\frac{2}{n}(LL(new)) - (LL(baseline))\right]} \quad (4)$$

$$R_{H\text{–}L}^2 = \frac{-2LL\ (model)}{-2LL\ (original)} \quad (5)$$

where LL is log-likelihood and *n* is sample size.

Hair, Anderson, Tatham, and Black (1998) argued that Cox and Snell's R_{CS}^2 is reported less frequently because it cannot reach the maximum value of 1. In order to test the significance of the regression coefficient, we used the Wald statistic, which is "usually used to ascertain whether a variable is a significant predictor of the outcome" (Field, 2009, p. 270):

$$\text{Wald} = \frac{b}{SE_b} \quad (6)$$

where *b* is the regression coefficient and SE_b the standard error.

The Wald statistic, Cox and Snell's R_{CS}^2 , and Nagelkerke's R_N^2 are statistical tools used to test the effectiveness of a model by looking at whether a model fits the data (Seo, Ranganathan, & Babad, 2008). We also measured the value of the odds ratio (Exp(β), which is an indicator of the change in odds resulting from a unit change in the predictor. "The odds of an event occurring are defined as the probability of an event occurring divided by the probability of that event not occurring" (Field, 2009, p. 271). We can calculate the odds as:

$$\text{odds} = \frac{P(event)}{P\ (no\ event)},\ P(\text{event Y}) = \frac{1}{1+e^{-(b_0+b_1X_1)}}, \quad (7)$$

$$P(\text{no event Y}) = 1 - P(\text{event Y})$$

P(Y) = the probability of Y occurring

e = base of natural logarithms

b_0 = constant

b_n = coefficient (or weight) attached to predictor

X_n = predictor variable

In order to test whether the inclusion of predictor variables led to statistically significant improvements of the model, we used the Blok χ^2-test. We computed the improvement of the model as follows:

$$\chi^2 = 2[LL(new) - LL(baseline)],\ (df = k_{new} - k_{baseline}) \quad (8)$$

where χ^2 is the chi-square distribution, df is degrees of freedom, and *k* is number of parameters. The 0.05 (two-tailed) significance level was used. To test the hypotheses, it was appropriate to use SPSS 21 software.

3.2 Results

In Model I in Table 2, bank deposit safety in times of crisis is the dependent variable and demographic factors are the control variables. It can be seen that only gender and age are significant at the 0.05 level (Model $\chi^2 = 30.267$, $p < 0.001$).

Table 2 Results of Logistic Regressions—Model I (Bank deposit safety in times of crisis (PBAD); 0–no, 1–yes)

Variables	Variable categories	Model I		
		Coeff. β S.E.	Wald	Exp(β)
Gender	0-female 1-male	1.193** (0.399)	8.943	3.296
Age	Young population	-1.377* (0.640)	4.638	0.252
	Middle population	-0.174n.s. (0.598)	0.084	0.841
	Older population	b.c.		
Education	Less than secondary	-1.438n.s. (0.772)	3.474	0.237
	Secondary degree	0.370n.s. (0.449)	0.681	1.448
	More than Secondary	b.c.		
Constant		0.652 (0.547)	1.419	1.919
Model χ^2 (df)		30.267*** (5)		
Block χ^2 (df)				
-2LL (final model)		169.903		
Nagelkerke R_N^2		0.248		
Cox & Snell R_N^2		0.183		
χ^2 Hosmer and Lemeshow's $R_{H\text{–}L}^2$		28.064***		
% of correct predictions		72.0		

Notes: *** significant at $p < 0.001$; ** significant at $p < 0.01$; * significant at $p < 0.05$; n.s. not significant; b.c. base category

Source: Authors' calculations.

The relationship between gender and bank deposit safety in times of crisis is significant (β = 1.193, $p < 0.01$), indicating that male customers are more likely to perceive bank deposit safety in times of crisis compared to female ones. We also found that the younger population is less likely than the older population to perceive bank deposit safety in times of crisis (β = -1.377, $p < 0.05$), indicating that Hypothesis 1 can only be partially accepted.

Nagelkerke's R_N^2 is a further modification of the Cox and Snell coefficient R_{CS}^2 to ensure that it can vary from 0 to 1 (Nagelkerke, 1991). For the model estimates, Cox and Snell's R_{CS}^2 and Nagelkerke's R_N^2 measures are 0.183 and 0.248, respectively, which confirm the statistical robustness of the estimated results. Hosmer and Lemeshaw's R_{H-L}^2 test ($\chi^2 = 28.064$; df = 7; $p < 0.001$) indicated that the predicted model fits well with the data.

From Table 3, it can be seen that Model III, which includes both predictor and control variables, is significant at the 0.001 level (Model $\chi^2 = 99.285$, $p < 0.001$). As Block χ^2 is also significant (Block $\chi^2 = 27.646$, $p < 0.001$), the inclusion of predictor variables into the model leads to significant improvement of the model compared to Model II. Bank deposit safety significantly predicts (Wald = 34.799, $p < 0.001$) the odds of trust in banks in times of crisis. In Model III, the relationship between bank deposit safety and trust in banks in times of crisis is significant (β = 4.551, $p < 0.001$), indicating that those customers who perceive bank deposit safety in times of crisis are more likely to have trust in banks in times of crisis.

Gender significantly predicts (Wald = 5.279, $p < 0.05$) the odds of trust in banks in times of crisis. Male customers are less likely to perceive trust in banks in times of crisis (β = -1.417, $p < 0.001$) than female customers.

Table 3 Results of Logistic Regressions—Models II and III (Trust in banks in times of crisis (TB); 0–no, 1–yes)

Variables	Variable categories	Model II			Model III		
		Coeff. β S.E.	Wald	Exp(β)	Coeff. β S.E.	Wald	Exp(β)
Bank deposit safety in the crisis time	0-no 1-yes	3.317*** (0.466)	50.662	27.574	4.551*** (0.772)	34.799	94.770
Gender	0-female 1-male				-1.417* (0.617)	5.279	0.242
Age	Young population				-0.151 n.s. (0.809)	0.035	0.860
	Middle population				1.937* (0.699)	7.687	6.937
	Older b.c. population						
Education	Less than secondary				0.632 n.s. (1.683)	0.141	1.881
	Secondary degree				2.340** (0.683)	11.739	10.379
	More than Secondary b.c.						
Constant		-1.833 (0.381)			-3.848 (0.874)		
Model χ^2 (df)		71.640*** (1)			99.285*** (6)		
Block χ^2 (df)					27.646*** (5)		
-2LL (initial model) -2LL (final model)		134.595			106.949		
R_L^2					79.5		
Nagelkerke R_N^2		0.508			0.648		
Cox & Snell R_{CS}^2					0.484		
χ^2 Hosmer and Lemeshow's R_{H-L}^2					3.346 n.s.		
% of correct predictions		83.3			83.3		

Notes: *** significant at $p < 0.001$; ** significant at $p < 0.01$; * significant at $p < 0.05$; n.s. not significant; b.c. base category; = 1 – [2LL (final model) / – 2LL (initial model)]

Source: Authors' calculations.

The relationship between age and trust in banks in times of crisis is significant (β = 1.937, $p < 0.05$), indicating that middle-aged adults are more likely to perceive trust in banks in times of crisis than the older population. This means that Hypothesis 2 was partly proven.

Educational attainment is also significant, having a positive effect (β = 2.340, $p < 0.01$) on trust in banks in times of crisis. We also found that customers with a secondary degree are more likely to perceive trust in banks in times of crisis than those with a post-secondary degree. The R_L^2 model equaled 79.5%, which means that 79.5% of the variation in the dependent variable is explained by the model. The current model's Nagelkerke's R_N^2 is 0.648, which is fairly high, suggesting a good fit for the model. The predictive power of the model is very good, with an overall accuracy of 83.3%.

Table 4 summarizes the results of the binary logistic regression for Models IV and V. One predictor variable and three control variables were included in Model V. Trust in banks in times of crisis was included in Model IV; gender, age, and education were included in Model V. As the Block χ^2 is also significant (Block χ^2 = 48.609, $p < 0.001$), the inclusion of control variables in the model leads to a significant improvement of the model compared to Model V. It accounted for 27.7% (Cox and Snell's R_{CS}^2) to 37.2% (Nagelkerke's R_N^2) of the variance in withdrawals of savings in times of crisis. The result of the Hosmer and Lemeshow test R_{H-L}^2 was significant (χ^2 = 23.0; df = 8; $p < 0.01$), indicating that the model was good and the data fit the model well. This model correctly classified 76.7% of rates. The R_L^2 model equaled 84.6%, which means that 84.6% of the variation in the dependent variable is explained by the model.

Table 4 Results of Logistic Regressions—Models IV and V (Withdrawal of savings in times of crisis (SW); 0–no, 1–yes)

Variables	Variable categories	Model IV			Model V		
		Coeff. β S.E.	Wald	Exp(β)	Coeff. β S.E.	Wald	Exp(β)
Trust in banks in crisis time	0-no 1-yes	-1.539*** (0.354)	18.840	0.215	-2.416*** (0.501)	23.254	0.089
Gender	0-female 1-male				-1.272** (0.416)	9.337	0.280
Age	Young population				0.503 n.s. (0.670)	0.564	1.654
	Middle population				1.248 n.s. (0.668)	3.494	3.482
	Older b.c. population						
Education	Less than secondary				0.279 n.s. (0.709)	0.154	1.321
	Secondary degree				1.941*** (0.539)	12.970	6.966
	More than Secondary b.c.						
Constant		0.519 (0.253)	4.218	1.680	-0.006 (0.602)	0.000	0.994
Model χ^2 (df)		20.190*** (1)			48.609*** (6)		
Block χ^2 (df)					28.419*** (5)		
-2LL (initial model) -2LL (final model)		184.516			156.097		
R_L^2					84.6		
Nagelkerke R_N^2		0.169			0.372		
Cox & Snell R_{CS}^2					0.277		
χ^2 Hosmer and Lemeshow's R_{H-L}^2					23.0**		
% of correct predictions		68.7			76.7		

Notes: *** significant at $p < 0.001$; ** significant at $p < 0.01$; * significant at $p < 0.05$; n.s. not significant; b.c. base category; = 1 – [2LL (final model) / – 2LL(initial model)]

Source: Authors' calculations.

The results of the main Model V (Table 4) show that trust in banks in times of crisis is associated with a higher likelihood of withdrawal of funds from bank accounts in times of crisis ($\beta = -2.416$, $p < 0.001$). This result explains that those customers who trust in their bank during a crisis are perceived to be less likely to withdraw their savings in times of crisis. Gender is also significant, having a negative effect ($\beta = -1.272$, $p < 0.01$) on withdrawal of savings in times of crisis. Males are less likely to perceive the need to withdraw money in times of crisis than females. The results also indicate that no significant relationship exists between age and withdrawal of funds in times of crisis. Finally, the level of education presents a positive, significant sign ($\beta = 1.941$, $p < 0.001$), indicating that those with a secondary degree perceive are more likely to withdraw money in times of crisis than those with a post-secondary degree. These results partially support Hypothesis 3.

4 Discussion and Conclusions

In this study, we used a conceptual research model to study the behavior of bank customers in times of crisis. We found a link between bank customers' gender and age and bank deposit safety in times of crisis. Our research results show that male customers are on average 3.3 times more likely to perceive bank deposit safety in times of crisis than female customers (Exp (β) = 3.296). In addition, the younger population is on average only 0.3 times less likely to perceive bank deposit safety in times of crisis than the older population (Exp (β) = 0252). From these results, it can be concluded that female customers are more cautious than males about perceived bank deposit safety in times of crisis. The younger population also perceives less bank deposit safety in times of crisis than the older population. The reasons for such results could be the lack of both experience and insight into banks' operating models in younger customers. The results showed no significant correlation between customers' level of education and bank deposit safety in times of crisis.

In the next phase, we examined the relationship between bank deposit safety in times of crisis, demographic factors, and trust in banks in times of crisis. We found that individuals who perceive bank deposit safety in times of crisis are on average only 94.7 times as likely to trust in banks in times of crisis as those who do not perceive bank deposit safety in times of crisis (Exp (β) = 94.770).

We also focused on the influence of confidence in banks during a crisis and the impact of demographic factors on the withdrawal of money from a savings account in times of crisis. Customers who trust banks in times of crisis are on average only 0.1 times less likely to withdraw their savings during a crisis than those who do not trust banks in times of crisis ((Exp (β) = 0.089). Thus, banks have to continually invest resources in maintaining their customers' trust to be able to maintain an adequate level of savings in their customers' bank accounts.

This study could be expanded to include other factors, such as the reliability of banks and trust in deposit schemes in times of crisis, as well as additional demographic factors (income, status). The study could also be extended to other comparable geographic markets. It is important to note that the bank customers were asked only about the possible decisions in times of crisis, but this might not necessarily reflect their concrete decisions and actions in times of crisis.

References

1. Aghion, P., Algan, Y., Cahuc, P., & Shleifer, A. (2010). Regulation and Distress. *The Quarterly Journal of Economics*, MIT Press, vol. *125*(3), pages 1015-1049. http://dx.doi.org/10.1162/qjec.2010.125.3.1015
2. Alesina, A., & La Ferrara, E. (2002). Who trusts others? Journal of Public Economics, 85(2), 207–234. http://dx.doi.org/10.1016/S0047-2727(01)00084-6
3. Anderson, J. C., & Narus, J. A. (1990). A model of distributor firm and manufacturer firm working partnerships. *The Journal of Marketing*, *54*(1), 42–58.
4. BAMC. (2015). *BAMC started the third asset transfer phase, transferring the assets of 92 companies*. Retrieved from http://www.dutb.eu/en/for-the-media/press-releases/61-dutb-je-zacela-tretjo-fazo-prenosa-terjatev-v-kateri-so-terjatve-do-92-tih-podjetij
5. Banka Slovenije (BS). (2014). *Financial stability review, March 2014*. Retrieved from https://www.bsi.si/en/publications.asp?MapaId=784
6. Bennett, R., & Kottasz, R. (2012). Public attitudes towards the UK banking industry following the global financial crisis. *The International Journal of Bank Marketing, 30*(2), 128–147. http://dx.doi.org/10.1108/02652321211210877
7. Bloemer J., de Ruyter, K., & Peeters, P. (1998). Investigating drivers of bank loyalty: the complex relationship between image, service quality and satisfaction. *International Journal of Bank Marketing, 16*(7), 276–286. http://dx.doi.org/10.1108/02652329810245984
8. Buchan, N. R., Croson, R. T., & Solnick, S. (2008). Trust and gender: An examination of behavior and beliefs in the Investment Game. *Journal of Economic Behavior & Organization*, *68*(3), 466–476. http://dx.doi.org/10.1016/j.jebo.2007.10.006

9. Calderon, C., Chong, A., & Galindo, A. (2002). Development and efficiency of the financial sector and links with trust: Cross-country evidence. *Economic Development and Cultural Change. 51*(1), 189–204. http://dx.doi.org/10.1086/344547
10. Carlin, B. I., Dorobantu, F., & Viswanathan, S. (2009). Public trust, the law, and financial investment. *Journal of Financial Economics, 92*(3), 321–341. http://dx.doi.org/10.1016/j.jfineco.2008.07.001
11. Coulter, K. S., & Coulter, R. A. (2002). Determinants of trust in a service provider: the moderating role of length of relationship. *Journal of Service Marketing 16*(1), 35–50. http://dx.doi.org/10.1108/08876040210419406
12. Coupé, T. (2011). *Mattresses versus banks—The effect of trust on portfolio composition*. Kyiv School of Economics and Kyiv Economics Institute Discussion Paper No. 40.
13. Cox, D. R., & Snell, E. J. (1989). *The analysis of binary data* (2nd ed.). London: Chapman & Hall.
14. Deb, M., & Chavali, K. (2010). Significance of trust and loyalty during financial crisis: A study on customer behavior of Indian banks. *South Asian Journal of Management*, *17*(1), 43–60.
15. Delo. (2013). *Anketa dela: Še zadostno zaupanje v banke*. Retrieved from http://www.delo.si/novice/politika/anketa-dela-se-zadostno-zaupanje-v-banke.html
16. Djankov, S., Miranda, P., Seira, E., & Sharma, S. (2008). *Who are the unbanked?* World Bank Policy Research Working Paper No. WPS4647.
17. Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London: Sage.
18. Guiso, L., Sapienza, P., & Zingales, L. (2008). Trusting the stock market. *Journal of Finance*, *63*(6), 2557–2600. http://dx.doi.org/10.1111/j.1540-6261.2008.01408.x
19. Gulati, R. (1995). Does familiarity breed trust? The implications of repeated ties for contractual choices in alliances. *Academy of Management Journal, 38*(1), 85–112. http://dx.doi.org/10.2307/256729
20. Hair, J., Anderson, R., Tatham, R., & Black, W. (1998). *Multivariate data analysis*. Englewood Cliffs, NJ: Prentice-Hall International.
21. Hosmer, D. W., & Lemeshow, S. (2000). *Applied logistic regression* (2nd ed.). New York: Wiley. http://dx.doi.org/10.1002/0471722146
22. Hurlburt, G. F., Miller, K. W., & Voas, J. M. (2009). An ethical analysis of automation, risk, and the financial crises of 2008. *IT Professional Magazine*, *11*(1), 14–19. http://dx.doi.org/10.1109/MITP.2009.2
23. Kedmenec, I., Tominc, P., & Rebernik, M. (2014). Gender differences in the usage of resources in the entrepreneurial opportunity identification process in Slovenia and Croatia. Economic Research-Ekonomska Istraživanja, 27(1), 366–377. http://dx.doi.org/10.1080/1331677X.2014.966973
24. Knell, M., & Stix, H. (2010). *Trust in nanks—Evidence from normal times and from times of crises*. Beiträge zur Jahrestagung des Vereins für Socialpolitik 2010: Ökonomie der Familie—Session: Trusting Banks in a Financial Crisis, No. A1-V1.
25. Mayer, J. (2004). Zaupanje kot pogoj za ustvarjalno sodelovanje. In: Rozman R. & Kovač, J. (Eds.): *Zaupanje v in med organizacijami (združbami)*. Kranj: Fakulteta za organizacijske vede, Ekonomska fakulteta, Zveza organizatorjev Slovenije.
26. McKnight, D. H., & Chervany, N. L. (2001). Trust and distrust definitions: One bite at a time. In: Falcone, R., Singh, M. & Tan, Y.-H. (Eds.): *Trust in Cyber-societies. LNAI* 2246, 27–54, Springer-Verlag Berlin Heidelberg.
27. Moorman, C., Deshpandé, R., & Zaltman, G. (1992). Relationships between providers and users of market research: the dynamics of trust within and between organizations. *Journal of Marketing Research, 29*(3), 314–329. http://dx.doi.org/10.2307/3172742
28. Morgan, R. M., & Hunt, S. D. (1994). The commitment trust theory of relationship marketing. *Journal of Marketing*, *58*(3), 20–38. http://dx.doi.org/10.2307/1252308
29. Mosch, R., & Prast, H. (2010). *Confidence and trust: empirical investigations for the Netherlands and the financial sector*. Beiträge zur Jahrestagung des Vereins für Socialpolitik 2010: Ökonomie der Familie—Session: Trusting Banks in a Financial Crisis, No. A1-V2
30. Mudd, S. B., & Valev, N. T. (2009). Once bitten, twice shy: experiences of a banking crisis and expectations of future crises. Wiliam Davidson Institute Working paper. No.969. Retrieved from http://deepblue.lib.umich.edu/bitstream/handle/2027.42/64382/wp969.pdf?sequence=1 http://dx.doi.org/10.2139/ssrn.1490072
31. Nagelkerke, N. (1991). A note on a general definition of the coefficient of determination. *Biometrika*, *78*(3), 691–692. http://dx.doi.org/10.1093/biomet/78.3.691
32. Parkhe, A. (1993). Strategic alliances structuring: a game theoretic and transaction cost examination of inter-firm cooperation. *Academy of Management Journal, 36*(4), 739–794. http://dx.doi.org/10.2307/256759
33. Ramirez, C. (2009). Bank fragility, "money under the mattress," and long-run growth: U.S. evidence from the "perfect" panic of 1893. *Journal of Banking and Finance*, *33*(12), 2185–2198. http://dx.doi.org/10.1016/j.jbankfin.2009.05.020
34. Rempel, J. K., Holmes, J. G., & Zanna, M. P. (1985). Trust in close relationships. *Journal of personality and social psychology*, *49*(1), 95. http://dx.doi.org/10.1037/0022-3514.49.1.95
35. Sapienza, P., & Zingales, L. (2009). A trust crisis. Retrieved from http://faculty.chicagobooth.edu/brian.barry/igm/atrustcrisis.pdf
36. Schelkle, W. (2011). A tale of two crises: The euro area in 2008/09 and in 2010. *European Political Science: EPS, 10*(3), 375–383. http://dx.doi.org/10.1057/eps.2011.23
37. Seo, D. B., Ranganathan, C., & Babad, Y. (2008). Two-level model of customer retention in the US mobile telecommunications service market. *Telecommunications Policy, 32*, 182–196. http://dx.doi.org/10.1016/j.telpol.2007.09.004
38. Sheehan Bartel, K. (1999). An investigation of gender differences in on-line privacy concerns and resultant behaviors. *Journal of Interactive Marketing, 13*(4), 24–38. http://dx.doi.org/10.1002/(SICI)1520-6653(199923)13:4<24::AID-DIR3>3.0.CO;2-O
39. Slovenske novice. (2012). *Vse težje je kaj privarčevati, a bankam (še) zaupamo*. Retrieved from http://www.slovenskenovice.si/novice/slovenija/vse-tezje-je-kaj-privarcevati-bankam-se-zaupamo

40. Stevenson, B., & Wolfers, J. (2011). *Trust in public institutions over the business cycle*. IZZA Discussion Paper No. 5570. http://dx.doi.org/10.2139/ssrn.1787737
41. Süchting, J. (1998). Die Theorie der Bankloyalität-(immer noch) eine Basis zum Verständnis der Absatzbeziehungen von Kreditinstituten?. In *Handbuch des Bankmarketing* (pp. 1-25). Wiesbaden: Gabler Verlag. http://dx.doi.org/10.1007/978-3-322-93179-5_1
42. Sztompka, P. (1999). *Trust: A sociological theory*. Cambridge: Cambridge University Press.
43. Szykman, L., Rahtz, D. R., & Plater, M. (2005). *Living* on the edge: financial services for the lower socio-economic strata. *Discourse, Diversity and Distinction: Macromarketing at 30 Years,* 59.
44. Trif, S. M. (2013). The influence of overall satisfaction and trust on customer loyalty. *Management & Marketing*, *8*(1), 109.
45. Tyler, K., & Stanley, E. (2007). The role of trust in financial services business relationships. *Journal of Services Marketing, 21*(5), 334–344. http://dx.doi.org/10.1108/08876040710773642
46. Weber, J. M., Malhotra, D., & Murnighan, J. K. (2004). Normal acts of irrational trust: Motivated attributions and the trust development process. *Research in organizational behavior,* 26, 75-101. http://dx.doi.org/10.1016/S0191-3085(04)26003-8
47. Whitney, J. O. (1994). *The trust factor: Liberating profits and restoring corporate vitality*. New York: McGraw–Hall, Inc.
48. Zineldin, M. (1995). Bank–company interactions and relationships: some empirical evidence. *International Journal of Bank Marketing, 13*(2), 30–43. http://dx.doi.org/10.1108/02652329510078677

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Ali je zaupanje v banke v Sloveniji na preizkušnji?

Izvleček

Vprašanje stabilnosti bančnega sistema in zaupanje v banke sta, zlasti od leta 2008 naprej, v središču iskanja trajnih rešitev za težave bančnega sistema, ki temelji na zaupanju, trenutno stanje pa vpliva na vedenje uporabnikov bančnih storitev. V prispevku proučujemo zaupanje uporabnikov v banke v času finančne krize z izbranimi demografskimi spremenljivkami in s tem povezano možnost dviga prihrankov z bančnih računov. Rezultati raziskave so za banke koristni pri učinkovitem upravljanju prihrankov uporabnikov in razumevanju vedenja uporabnikov v času finančne krize. Med drugim smo namreč ugotovili, da obstaja negativna povezava med zaupanjem uporabnikov v banke in dvigom prihrankov uporabnikov bančnih storitev v času finančne krize, rezultati pa so odvisni od spola in ravni izobrazbe.

Ključne besede: zaupanje, finančna institucija, banka, Slovenija, logistična regresija

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