CROATIAN NATIONAL BANK

Financial Conditions and Economic Activity

Mirna Dumičić and Ivo Krznar

Zagreb, April 2013

WORKING PAPERS W-37

PUBLISHER
Croatian National Bank
Publishing Department
Trg hrvatskih velikana 3, 10002 Zagreb
Phone: +385 1 45 64 555
Contact phone: +385 1 45 65 006
Fax: +385 1 45 64 687

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PRINTED BY
Kerschoffset Zagreb d.o.o.

Printed in 300 copies

ISSN 1331-8586 (print)
ISSN 1334-0131 (online)

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Abstract

The main aim of this paper is to analyse the interrelation between domestic and external financial conditions and economic activity. For this purpose, an overall Financial Conditions Index (FCI) for Croatia was constructed, together with two subcomponents – domestic and foreign – used to estimate a VAR model of interdependence between financing conditions and real economic activity in Croatia and in the eurozone. The results of the estimated model indicate that financing conditions in Croatia are primarily determined by domestic GDP and external financial conditions, while a variance decomposition estimate, with these two variables, also points to foreign GDP as an important determinant of the variability of domestic economic and financial activity indicators.

JEL:
E44, E50, E58

Keywords:
financial conditions index, GDP, Croatia, eurozone, principal component analysis, VAR model

Contents

1 Introduction

Numerous research papers have suggested that there is a strong interdependence between a country's financial conditions and economic activity. Financial conditions are determined by the interaction of various economic and financial variables that have an impact on the operating conditions of domestic sectors in a given time period. In a small and open economy such as Croatia, real and financial developments, besides being dependent on domestic factors, also heavily depend on global economic and financial conditions. The understanding of this relationship is important for economic policy makers, as it provides an insight into the scope of the measures intended to produce an effect on the domestic economy. In addition, in circumstances of renewed tightening of financing conditions and a slowdown in economic activities in most countries of the eurozone, the question arises as to the possible effect of such a development of events on the Croatian economy.

The main aim of this paper is therefore to analyse the interrelation between domestic and external financial conditions and economic activity, that is, to quantify the link between economic activity and financial conditions. For this purpose, an overall Financial Conditions Index (FCI) for Croatia was constructed, together with two subcomponents – domestic and foreign – used to estimate a VAR model of the interdependence between financing conditions and real economic activity in Croatia and in the eurozone. The results of the estimated model indicate that financing conditions in Croatia are primarily determined by domestic GDP and external financial conditions, while a variance decomposition estimate, with these two variables, also points to foreign GDP as an important determinant of the variability of domestic economic and financial activity indicators.

The paper is structured as follows. The introduction is followed by a review of the literature that provides a theoretical basis for the FCI construction, describes methods for its calculation and the manners of selecting constituent variables, analysing the interrelation between financial conditions and economic activity. The third chapter of the paper describes the construction of an overall FCI for Croatia and its subcomponents, and compares its developments with those in the eurozone FCI. The fourth chapter estimates a VAR model that includes GDP for Croatia and the eurozone, the eurozone FCI and the domestic and foreign components of the FCI for Croatia. Information on the spillover effects of external shocks on domestic variables was obtained by estimating impulse response functions and a variance decomposition, showing the extent to which these shocks affected the volatility of the domestic variables in the observed period. The last chapter presents the main conclusions of the research.

2 Literature review

Financial conditions, defined as conditions for borrowing in the domestic and foreign markets, can be viewed as a combination of various variables that in the best way describes their common trend. The FCI was

first applied slightly more than ten years ago as an extended version of a monetary conditions index.[1] A theoretical framework representing a basis for the construction of an FCI is presented in detail in Hatzius *et al* (2010). They point out that the index provides additional information on current financing conditions and show empirically that these indications might prove to be very useful in making projections of future economic activity. Similar findings are presented by Matheson (2011). In this context, Espinoza, Fornari and Lombardi (2009) give at least two possible explanations for the importance of financial market developments in forecasting economic cycles. Specifically, tightened financial and credit conditions limit the corporate sector's potential to expand its operations and reduce household personal consumption, whereas asset prices reflect the expected profitability of enterprises closely related to future economic growth.

The advantage of FCIs over indices based on macroeconomic data is that they are more up to date due to a higher frequency of financial indicators, and much larger in scope compared with, for example, monetary conditions indices, as in addition to the exchange rate and benchmark interest rate they contain a series of other indicators (Mayes and Viren, 2001), enabling the inclusion of the effects of unconventional monetary instruments. There is a series of potential initial variable sets for the construction of the FCI; most often selected are those that best reflect capital costs for enterprises, that is, those that affect the wealth of households (including real estate and share prices, interest rates, etc.), as well as various measures of liquidity, debtor risk, lending conditions, collateral value and banks' overall propensity to lend (Hatzius *et al* 2010). Therefore, most Financial Conditions Indices comprise measures of long-term and short-term interest rates, developments in share prices, risk premiums and exchange rates. This type of index also contains information on the interrelation of financial variables, which enables a conclusion to be reached on the systemic significance of individual indicators (Brave and Butters, 2011).

Notwithstanding their greater predictive power, FCIs have the same drawbacks as monetary conditions indices. Both types of indices are conditioned by the structure of the models used for their estimation (if these are theoretically-based models), assume the stability of model parameters and exogeneity of the variables employed for their estimation, and include variables that affect economic activity with varied dynamics.[2]

The methods used for the FCI construction are mostly related to the calculation and estimation of the weighted average of the variables included in the index and the relative significance of individual variables for the movement of this average. Their advantage is that they are not dependent on any model, but the general drawbacks of the FCI, as well as of the FCI in this case, relate to these methods as well. The principal component analysis method, standardly used in the literature to obtain a single indicator of general financing conditions from a large number of relevant variables, transforms data by saving as much information as possible from the initial variable set in a small number of constructed series (components). This approach assumes the existence of a standardised financial conditions indicator, that is, of a common component defined by the covariance between each indicator and other data.

Most papers dealing with financial conditions indices are based on the methodology by Stock and Watson (1989, 2002) who were the first to employ factor model analysis to forecast macroeconomic developments.[3] The use of a dynamic factor model in this context assumes the existence of a composite financial conditions indicator, with the FCI representing the common component estimated on the basis of a set of financial indicators.

Matheson (2011) used the same method in calculating the FCI for the US and the eurozone. Analysing the efficiency of FCI forecasts of real economic activity in the US and the eurozone, he showed that the forecasts of a VAR model that, in addition to the GDP gap, inflation and the real short-term interest rate, also includes the FCI, are better than those produced by a basic VAR model that excludes the FCI or includes only individual index variables, as well as better than AR forecasts. Montagnoli and Napolitano (2004), building on the approach of Goodhart and Hoffman (2000), who focus on the impact of a wider set of financial variables on monetary policy, analysed the impact of asset price imbalances capable of threatening the stability of the banking system on the policy of central banks of the US, Canada and the eurozone. In addition, having included the FCI in the Taylor rule, they demonstrated that the index produces

1 For the chronological development of the FCI see Beaton, Lalonde and Luu (2009).

2 For a discussion of the drawbacks of the FCI and a demonstration of the manner in which statistical estimation methods for the FCI solve some of these drawbacks, see Gauthier, Graham and Liu (2004).

3 Factor model forecasting and the basic approach of Stock and Watson are briefly summarized in Kunovac (2007).

a positive and statistically significant impact on interest rate policies of the observed central banks.

Once the FCI has been calculated, irrespective of the calculation method selected, it is standardised in such a way that its average equals 0 and the standard deviation equals 1. The positive values of the index imply tighter than average financial conditions, while the negative index values represent looser financing conditions. More favourable financial conditions, such as lower interest rates, can thus result in an increase in investment and consumption. In contrast, the tightening of financial conditions, reflected in a growing risk premium or a liquidity drop in the system, can limit private sector activities by producing a negative impact on the decisions of enterprises regarding employment and investments, and on household decisions on borrowing and consumption (Bloom, Floetotto and Jaimovich, 2009, Espinoza Formari and Lombardi, 2009).

The main aim in constructing an FCI is to select the best possible indicators of financing availability, such as the price of capital, financial system liquidity, lending conditions, collateral value, etc., depending on market-specific factors and data availability. Authors most often use current time variables, and in some cases lagging indicators.

Hatzius *et al* (2010) attempt to create an indicator that would rectify the weaknesses of existing indices, have more predictive power and could employ longer time series and a larger number of variables. In addition to interest rates and asset prices, their FCI also includes a large number of other quantitative indicators and survey data. In addition, they empirically tested the power of their FCI to predict future real activity and then compared the obtained results with the predictive power of individual variables, demonstrating that, on average, indices provide a better prediction of future real activity.

Brave and Butters (2011) constructed an FCI comprising risk measures, liquidity indicators (the propensity to lend and borrow at prevailing interest rates) and the degree of use of the financial lever (debt to equity ratio), by means of money market, equity and bond market indicators and indicators of banking system operation. In addition to a regular FCI, they also calculated an FCI adjusted for current and past economic activity and inflation, considering it a wider measure of financial stability as it demonstrates the interconnection between financial and economic conditions.

3 Financial Conditions Index for Croatia

The variables for the construction of the overall FCI for Croatia were selected taking into account the specific characteristics of a small and open economy and the specific domestic monetary policy transmission mechanism, which is dominated by the exchange rate channel. In addition, due to the shallowness and relatively low level of development of domestic financial markets, some indicators that are commonly used to calculate the FCI for developed countries were unavailable. They were replaced by other variables that are especially relevant for small and open economies, such as capital inflows, global interest rate trends or risk premiums on government eurobonds. The possible effects of changes in CNB monetary and macroprudential policies were indirectly taken into account by including corporate and household interest rates and the exchange rate. However, this paper does not aim to measure either the direct impact of CNB measures on the FCI and its variables or their impact on economic activity. This is why the calculation of the FCI does not include the variables that describe monetary conditions in Croatia (such as reserve requirements or foreign exchange interventions).

The FCI for Croatia is defined as the first main component estimated by the principal component analysis method, based on quarterly data for the period from early 2000 to the end of the third quarter of 2011. It is a composite index consisting of 28 variables:

$$FCI_t = x_t \alpha$$

where α is the weight vector having dimensions 28×1, and x_t is 1×28 vector of the values of variables used in estimating the FCI, related to the price of borrowing on the domestic and foreign markets, the exchange rate, share prices, real estate prices, the volume of corporate, household and government lending on the domestic and foreign debt markets, and the variables approximating debtor risk on the domestic and foreign markets

Table 1 Variables of the FCI for Croatia and their impact on the overall index movement – the correlation of individual variables with the common factor

OVERALL FCI for Croatia	
Variables	Loading parameters
GDP	0.00
EMBI Croatia	0.15
EMBI + EURIBOR	0.17
1-year EURIBOR	0.06
EUR/HRK	0.24
EUR/CHF	–0.07
Weighted exchange rate in accordance with the structure of bank assets	0.26
VIX	0.11
Total external debt	0.09
Hedonic real estate price index	–0.05
Loan supply surplus/deficit in the domestic market	–0.03
Share of non-performing loans in total placements (corporates)	0.30
Share of non-performing loans in total placements (households)	0.25
Loans to households and corporates	–0.03
Loans to government	0.05
Loans to state-owned enterprises	0.06
Interest rate on total kuna loans not indexed to foreign currency	0.18
Interest rate on total kuna loans indexed to foreign currency	0.33
Interest rate on long-term kuna corporate loans indexed to foreign currency	0.29
Interest rate on short-term kuna corporate loans not indexed to foreign currency	0.06
Interest rate on long-term kuna household loans indexed to foreign currency	0.32
Interest rate on short-term kuna household loans not indexed to foreign currency	0.31
Spread between interest rates on kuna loans indexed to foreign currency and foreign currency deposits	0.32
Spread between interest rates on total loans and total deposits	0.20
Spread between interest rates on kuna loans not indexed to foreign currency and kuna deposits	0.05
Overnight interest rate (Zagreb Money Market)	0.08
Interest rate on 3-month T-bills	0.24
CROBEX	–0.04

FCI RC – domestic component	
Variables	Loading parameters
GDP	0.04
EUR/HRK	0.26
Weighted exchange rate in accordance with the structure of bank assets	0.30
Hedonic real estate price index	–0.04
Loan supply surplus/deficit in the domestic market	0.03
Share of non-performing loans in total placements (corporates)	0.32
Share of non-performing loans in total placements (households)	0.27
Loans to households and corporates	–0.01
Loans to government	0.04
Loans to state-owned enterprises	0.08
Interest rate on total kuna loans not indexed to foreign currency	0.20
Interest rate on total kuna loans indexed to foreign currency	0.32
Interest rate on long-term kuna corporate loans indexed to foreign currency	0.28
Interest rate on short-term kuna corporate loans not indexed to foreign currency	0.05
Interest rate on long-term kuna household loans indexed to foreign currency	0.32
Interest rate on short-term kuna household loans not indexed to foreign currency	0.32
Spread between interest rates on kuna loans indexed to foreign currency and foreign currency deposits	0.34
Spread between interest rates on total loans and total deposits	0.23
Spread between interest rates on kuna loans not indexed to foreign currency and kuna deposits	0.09
Overnight interest rate (Zagreb Money Market)	0.04
Interest rate on 3-month T-bills	0.22
CROBEX	0.00

FCI RC – foreign component	
Variables	Loading parameters
GDP	–0.39
EUR/HRK	–0.13
EMBI Croatia	0.54
EMBI + EURIBOR	0.49
1-year EURIBOR	0.07
VIX	0.54
Total external debt	–0.08

Note: A higher absolute amount of the loading parameter denotes larger significance of variables in the FCI construction, with signs showing the correlation with the index. Positive FCI values assume tighter than average financial conditions and vice versa.
Sources: CNB, CBS, Bloomberg, ZMM, ZSE and authors' calculations.

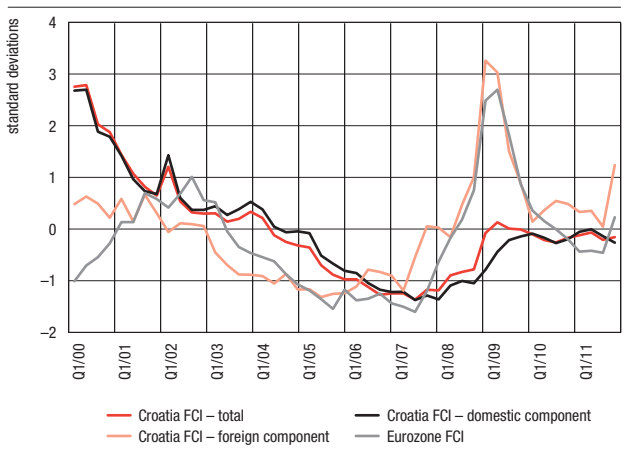
(Table 2 in the Appendix)[4]. The weights correspond to the eigenvector assigned to the largest eigen value of the second moment matrix $X_t'X_t$, where X_t $T\times28$ matrix (T-the sample size) is a matrix that contains T observations of individual variables in each column. As the *FCI* is the first principal component of data, the weights are determined according to the contribution of each variable to the explanation of the common trend of all 28 variables.

The estimated matrix of loading parameters (Table 1), which imply the correlation of individual variables with the FCI, suggests that the main determinants of the dynamics of the overall FCI for Croatia are domestic interest rates on various loan categories and the shares of non-performing placements in total bank placements, whose growth makes financing conditions worse. In addition, financial conditions also deteriorate because of the weakening of the kuna exchange rate against the euro and a currency basket based on the shares of individual currencies in bank assets, and due to interest rate increases on government foreign and short-term kuna borrowing.

Both domestic and foreign variables exert considerable effects on the dynamics of the FCI for Croatia. Their effects cannot be separated, which can be of interest for analysts, and especially for economic policy makers. In order to gain a more detailed insight into which variables have a crucial impact on overall domestic financing conditions, two FCI subcomponents were also constructed: a domestic subcomponent, which includes 22 variables determining domestic market borrowing conditions, and a foreign subcomponent, which shows the common trend of seven variables related to the foreign financial market. The GDP growth rate, measuring the risk of all sectors of the economy on both the domestic and foreign markets, and the exchange rate of the kuna versus the euro, which has a direct effect on debt repayment cost on both the domestic and foreign markets, were used in estimating both index components.

Table 1 shows that the domestic component of the FCI for Croatia is primarily determined by the exchange rate of the domestic currency vis-à-vis the euro or a currency basket defined according to the bank asset structure, interest rates on corporate and household loans and trends in non-performing loans in total loans. The foreign component of the domestic FCI is predominantly determined by the risk premium for Croatia, EURIBOR and general investor risk aversion, measured by the VIX index.

Figure 1 FCI for Croatia and the eurozone



Source: CNB, Bloomberg, CBS, ZMM, ZSE, authors' calculations and World Economic Outlook, October 2011.

Figures 1, 2 and 3 show trends in the FCI for Croatia and its main determinants in the period from the beginning of 2000 to the third quarter of 2011, and also developments in the eurozone FCI[5]. It can be noted that the dynamics of the two indices were relatively harmonised during most of the period under review.

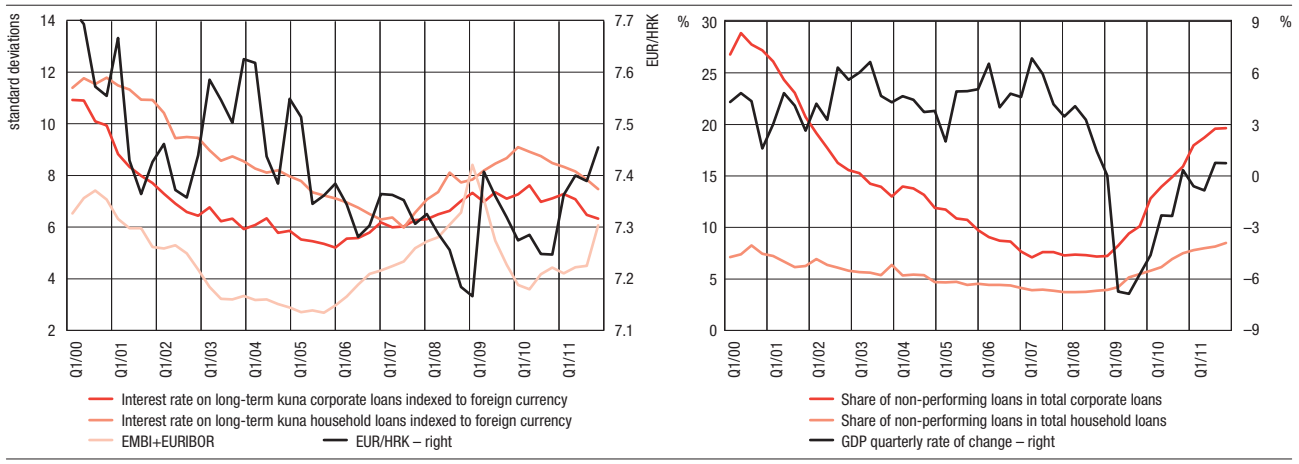
Croatia experienced a several-year period of loosening of financial conditions, which lasted until mid-2007. Most of the period was marked by high global liquidity levels, relatively low global benchmark interest rates, very low investor risk aversion and, in turn, very low risk premiums for most emerging market countries. The dynamics of overall financing conditions in Croatia diverged from that in the eurozone until early 2003; viewed by components, it can be noted that the overall FCI was primarily influenced by domestic variables, whose changes resulted in a gradual easing of financing conditions. This was followed by an increasingly strong capital inflow, with the result that the impact of foreign financing conditions and the foreign component of the domestic FCI on overall FCI trends gradually increased.

Boosted by the strong growth of investments and personal consumption, the domestic economy grew at relatively high rates, and bank lending interest rates continuously decreased due to the increasingly low price of foreign capital and strengthened competition between banks. Notwithstanding monetary policy measures aimed at alleviating external imbalances and curbing

4 Each variable is "standardised" in such a way that its arithmetic mean equals zero and standard deviation equals one.

5 Each index is "standardised" in the manner that its arithmetic mean equals zero and standard deviation equals one.

Figure 2 Trends in the selected components of the FCI for Croatia



Sources: CNB, Bloomberg, J.P. Morgan and CBS.

bank lending, the above-average easing of financial conditions during part of the observed period was to a large extent related to the deterioration of the country's external position, manifested in the growth of the balance of payment deficit and external debt, and in a sharp increase in total debt of domestic sectors.

Although domestic interest rates on corporate loans had started to increase in 2006, domestic financial conditions began to tighten significantly in mid-2007, when problems emerged with subprime mortgage loans on the US market, with financial conditions in the eurozone starting to tighten in the same period. This is also the period when interest rates on household loans, after having decreased continuously, started to rise. The country risk premium increased from its all-time low, although the initial increase was not significant. Following the collapse of Lehman Brothers in September 2008, the country's financial conditions deteriorated sharply as a result of a slump in domestic economic activity, a surge in the country risk premium and the resulting increase in the price of foreign borrowing, mounting depreciation pressures on the domestic currency versus the euro and the beginning of the increase in the non-performing loan ratio.

In the following period, significantly tightened financial conditions stabilised at a high level relative to the whole observed period. The continued growth in corporate and household interest rates and in the non-performing loan ratio offset the positive effect of decreases in the exchange rate and borrowing price on the FCI in 2009. In 2010 and 2011, the FCI stability was determined by the contrasting effects of a drop in interest rates and weaker economic downturn on the one hand, and a continued growth in non-performing loans and renewed increases in the exchange rate and the price of foreign borrowing on the other. In contrast with domestic financing conditions, financing conditions in the eurozone, as well as the foreign component of the domestic FCI, having reached a peak in early 2009, loosened gradually until the beginning of 2011. However, due to uncertainty about the resolution of the government debt market crisis in the countries in the eurozone periphery, the eurozone FCI increased sharply early in the second half of 2011.

4 Economic activity and financial conditions

An FCI is in the literature standardly calculated so as to be independent of economic conditions. This is because the FCI, as an indicator of future economic activity, must not reflect endogenous feedback effects of the dynamics of past economic activity in the current period. The regression of financial variables on economic activity indicators and the calculation of factors on the residuals of the mentioned regression model

provide for the construction of an exogenous index of financial shocks that reflects pure financial shocks and is suitable for predicting future economic activity.

However, as this analysis does not aim to predict real trends, but to examine the interdependence of domestic and foreign financial conditions and domestic economic activity, the FCI presented in this paper (both the overall index and its components) includes economic activity indicators as variables that reflect client risk. Specifically, the previous papers attempting to explain domestic economic activity (Krznar and Kunovac, 2010) have failed to identify domestic variables that might explain trends in the real rate of change in domestic GDP. This paper, therefore, in addition to estimating the effects of economic activity on financial conditions, also aims to estimate the feedback effects of financial conditions on economic activity. This is why the effects of economic activity are not excluded from financial conditions, which is the usual procedure in the literature dealing with the prediction of GDP growth rates based on FCI trends in the past.

The estimated VAR model includes five variables: GDP for Croatia and the eurozone, the FCI for the eurozone and the domestic and foreign components of the FCI for Croatia. Prior to the estimation of the model, block-exogeneity restrictions were introduced, in order to prevent domestic variables from influencing foreign variables; a similar model with identification details was shown in Krznar and Kunovac (2010). The exogenous block of the model includes real GDP and the FCI for the eurozone, while domestic GDP and the domestic and foreign components of the FCI for Croatia are the components of the domestic block. As all the variables are non-stationary at levels, the VAR model is estimated in first differences.

The number of five lags in the VAR model was selected based on the Akaike information criteria. In order to make a formal check that this manner of selection of the lag number does not contradict one of the VAR model assumptions we used the Portmanteau test of autocorrelation of errors for the estimated VAR model to test the hypothesis that additional lags are not "hidden" in errors, which would lead to an autocorrelation of errors. The results of the test show that there is no autocorrelation between errors, which leads to the conclusion that this choice of lag number is not incorrect.

Given that impulse response functions and variance decompositions are calculated correctly only in the case of a stable VAR model, the stability of the assessed model should be tested. For this purpose, the modulus of the root of the VAR model was calculated that is larger than one, which suggests that this VAR model in differences is stable.[6]

As we are interested in the short-term spillover effects of external shocks on domestic variables, long-term connections between variables are not in the foreground. Moreover, given the relatively short sample, it is not desirable to analyse the long-term connections between variables. The vector error-correction model (VECM), which estimates not only the short-term connection parameters, but also the cointegration parameters, requires a large number of observations. The reduced-form VAR model parameters were estimated by FGLS. For more details about the model estimate and structural analysis of the VAR process with block-exogenous restrictions, see Lütkepohl (2005).

The model was estimated using seasonally adjusted quarterly data for the period from the second quarter of 2000 to the third quarter of 2011. Eurozone GDP data come from Eurostat, and data on domestic GDP in the domestic block come from the Croatian Bureau of Statistics, CBS. The eurozone FCI was obtained from the IMF's World Economic Outlook. FCIs for Croatia based on domestic and foreign factors were estimated in the same manner as the overall FCI, which is described in more detail in the previous chapter.

The paper continues with an analysis of the impulse responses of domestic variables to domestic and external shocks (in the amount of one standard deviation for all variables) and the proportion of the variance of domestic variables accounted for by these shocks. Apart from measuring the size of the cumulative impact of unit shocks on the observed variables, the analysis of impulse response functions also enables an estimation of the duration of shock absorption and of the significance of a particular shock's influence on domestic variables.

Based on the estimated VAR model parameters, we calculated cumulative impulse response functions of domestic variables (GDP, FCI's domestic and foreign components) to shocks (impulses) of all variables with one standard deviation (Figures 3, 4, and 5).

The directions of domestic variable impulse responses to external and domestic shocks are in line with the expected signs of the relationships between individual variables. The impulse response functions of domestic GDP (Figure 3) show significant spillover effects from shifts in economic activity and financial conditions in the

6 The calculations of the modulus of the root, non-autocorrelation test and lag number tests are available on request.

eurozone on domestic economic activity. GDP growth and the loosening of financial conditions in the eurozone are reflected in a positive, significant reaction of domestic GDP, which is in line with the conclusions in Krznar and Kunovac (2010). In addition, a tightening of every component of the domestic FCI has an impact on the reduction in domestic production.

The tightening of financial conditions in the eurozone results in the tightening of domestic financial conditions based on the foreign component connected with foreign financial markets. This is in line with expectations, as some of the components of the eurozone FCI are included in the calculation of the foreign component of the FCI for Croatia. In contrast, a positive shock to domestic GDP reduces the domestic FCI consisting of foreign variables and results in eased financing conditions in the short term. In contrast, a positive shock to the domestic component of the FCI for Croatia increases the foreign component of the FCI for Croatia. This suggests that trends in the variables related to the foreign debt market do not depend only on financial conditions in the eurozone, but also on the dynamics of domestic economic and financial activities.

The impulse response functions of the domestic FCI suggest that domestic GDP and the foreign component of the domestic FCI are the main determinants of the dynamics of financial conditions in Croatia. Responses to eurozone GDP and FCI shocks are non-significant. However, this result does not indicate that foreign variables do not influence domestic financial conditions, because economic activity and financing conditions in the eurozone are also the main determinants of domestic economic activity and the foreign component of domestic financial conditions.

While an analysis of impulse response functions provides information on the size of external shock spillover effects on domestic variables, a variance decomposition (Figure 6) shows the extent to which these shocks are responsible for the volatility of domestic variables observed in the last eleven years. Variance decomposition estimates suggest that external shocks are the key variability determinants of domestic indicators. In this connection, a shock to the eurozone economic activity predominantly accounts for domestic GDP volatility (39%). A shock to the eurozone FCI (21%) and a shock to the foreign component of the FCI for Croatia (23%) explain approximately the same proportion of the variation of domestic GDP as a shock on the side of GDP.

As expected, the volatility of the foreign component of the FCI for Croatia can be mainly explained by shocks to the FCI for the eurozone (44%) and eurozone GDP (24%). The volatility of the domestic component of the FCI for Croatia is under the dominant influence of foreign variables (shocks to eurozone GDP and eurozone FCI jointly account for more than a half of variations in the domestic FCI). To a somewhat smaller extent, the volatility of the domestic FCI component could be accounted for by shocks to domestic GDP (11%) and shocks to the foreign component of the domestic FCI (14%). In other words, this means that the variables that have a predominant effect on financing conditions in Croatia are primarily determined by trends in foreign indicators, and depend less on trends in domestic variables influenced by economic policy makers. This result suggests that domestic economic policy makers have relatively little room for manoeuvre, which has to be taken into account when designing measures to ease financing conditions in Croatia.

5 Conclusion

The main aims of this paper were to estimate an indicator that would reflect financing conditions in Croatia, to define its main determinants and to examine its effects on economic activity based on the estimated VAR model that links real activity and financial conditions in Croatia and in the eurozone.

For this purpose, an FCI for Croatia was constructed, calculated as a weighted average of numerous variables related to the domestic and foreign debt markets and economic activity variables approximating debtor risk. In addition to the overall index, a domestic FCI component, which reflects domestic factors influencing overall financing conditions, and a foreign FCI component, based on foreign factors shaping domestic financial conditions, were also calculated.

The estimated overall FCI suggests that the main determinants of the dynamics of financing conditions in Croatia are domestic variables whose growth has a

deleterious effect on financing conditions, such as interest rates on corporate, household and government borrowing and bank portfolio quality. In addition, financial conditions also deteriorate because of the weakening of the kuna exchange rate against the euro and a currency basket based on the shares of individual currencies in bank assets, and because of corporate, household and government risk premiums on the foreign and domestic debt markets, as constituent parts of borrowing costs.

The estimated impulse response functions of the VAR model point to a significant spillover effect from shifts in domestic economic activity and financial conditions in the eurozone on financial conditions in Croatia. From the perspective of domestic economic policy makers this may indicate that there is a relatively limited scope for measures aimed at loosening financial conditions in the country, as their main determinants to a large extent depend on trends in external developments.

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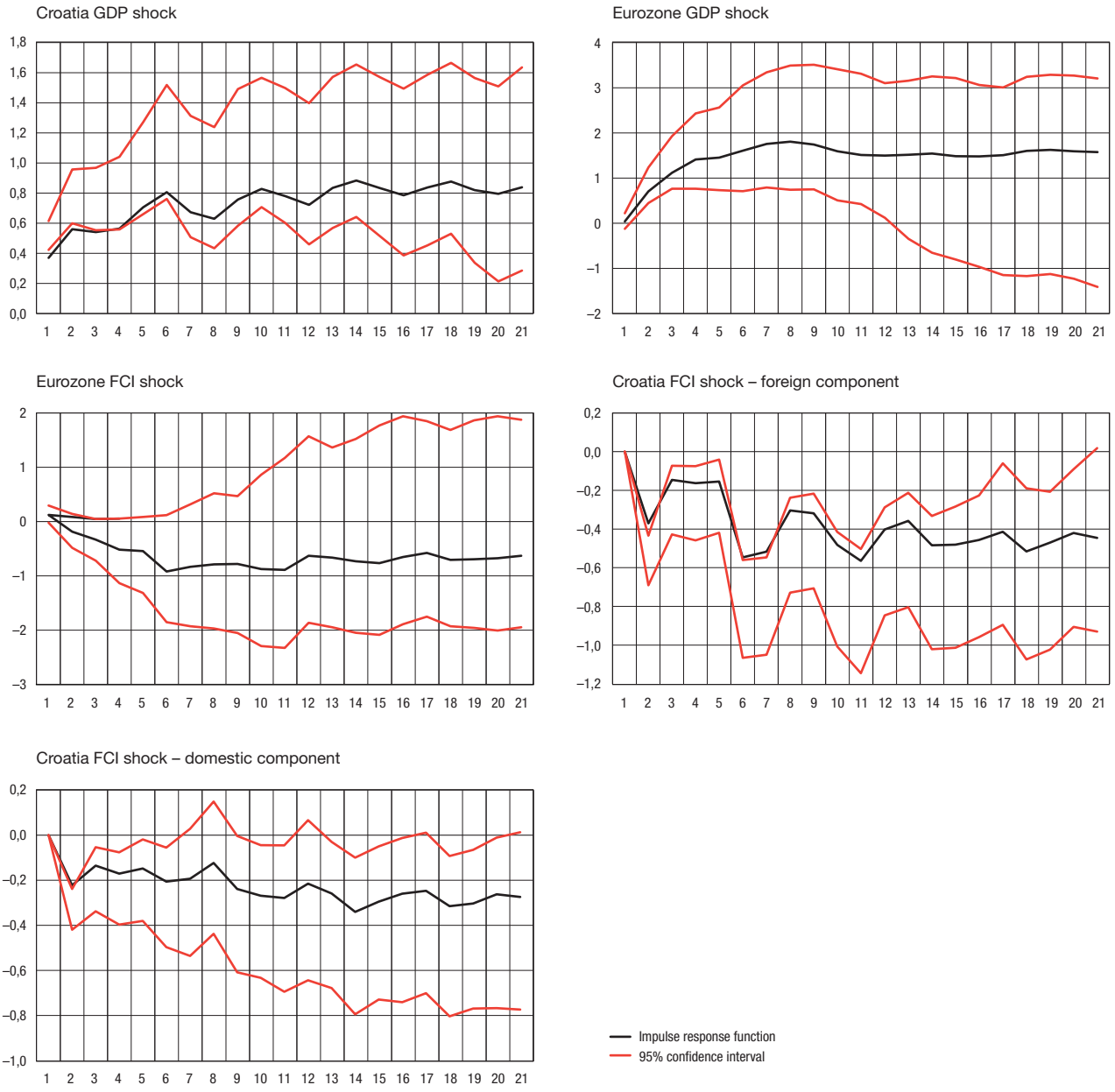
Appendix

Table 2 Data description

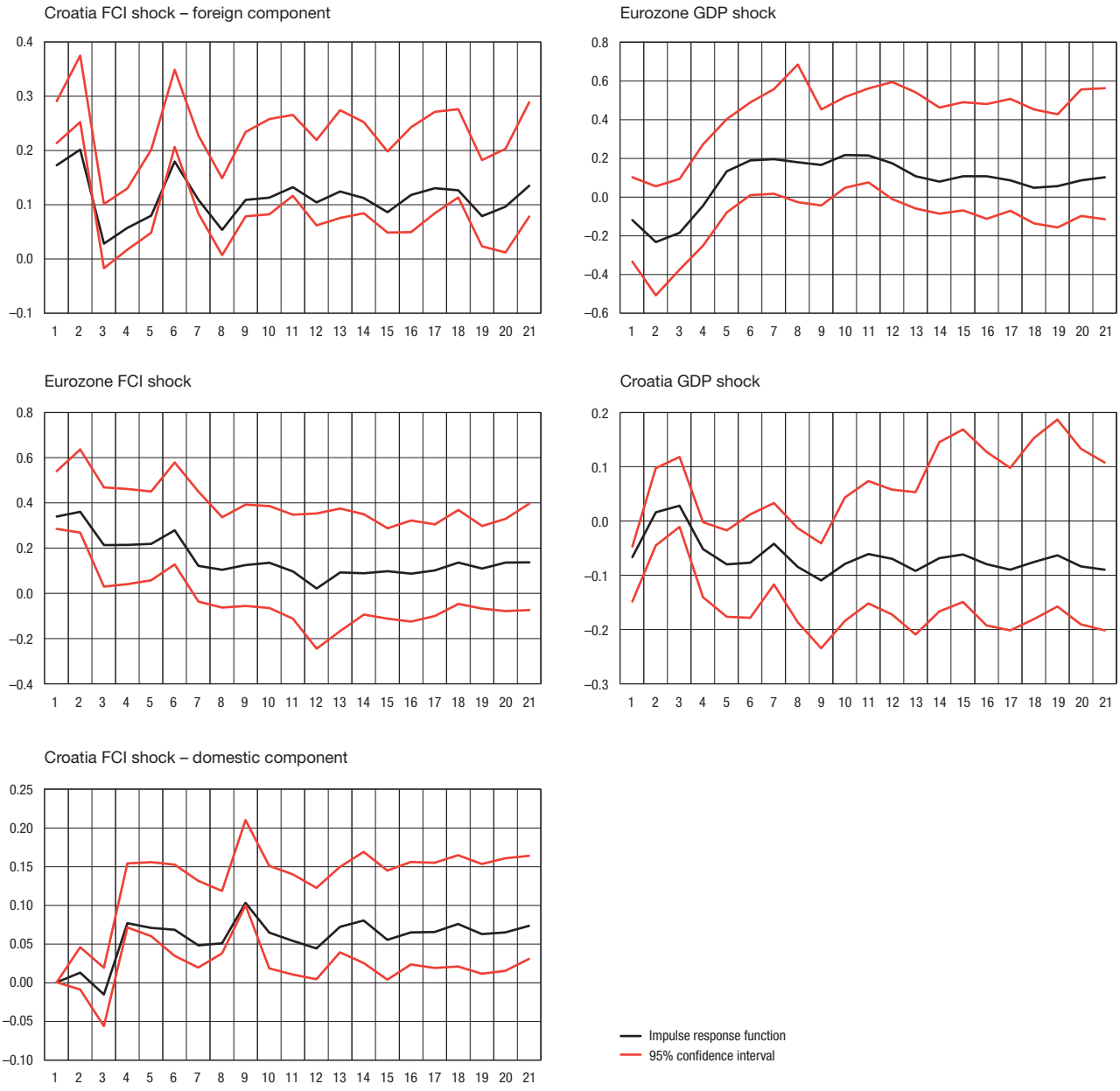
Variables	Description and source
GDP	Quarterly rate of change, seasonally adjusted, CBS, CNB
EMBI Croatia	J.P. Morgan; Bloomberg
EMBI + EURIBOR	J.P. Morgan; Bloomberg
1-year EURIBOR	Bloomberg
EUR/HRK	CNB
EUR/CHF	Bloomberg
Weighted exchange rate in accordance with the structure of bank assets	CNB; authors' calculations
VIX	Measure of volatility of option prices relative to the S&P 500 index, used in the literature as an indicator of global risk perception. Bloomberg.
Total external debt	CNB
Hedonic real estate price index	It takes into account qualitative factors in standardising residental unitts. CNB calculation.
Loan supply surplus/deficit in the domestic market	For details, see: Čeh, A-M., Dumičić, M. and Krznar, I.: "A Credit Disequilibrium Model and Periods of Credit Crunch", CNB Working Paper, I-30, January 2011
Share of non-performing loans in total placements (corporates)	CNB
Share of non-performing loans in total placements (households)	CNB
Loans to households and corporates	CNB
Loans to government	CNB
Loans to state-owned enterprises	CNB
Interest rate on total kuna loans not indexed to foreign currency	CNB
Interest rate on total kuna loans indexed to foreign currency	CNB
Interest rate on long-term kuna corporate loans indexed to foreign currency	CNB
Interest rate on short-term kuna corporate loans not-indexed to foreign currency	CNB
Interest rate on long-term kuna household loans indexed to foreign currency	CNB
Interest rate on short-term kuna household loans not indexed to foreign currency	CNB
Spread between interest rates on kuna loans indexed to foreign currency and foreign currency deposits	CNB
Spread between interest rates on total loans and total deposits	CNB
Spread between interest rates on kuna loans not indexed to foreign currency and kuna deposits	CNB
Overnight interest rate (Zagreb Money Market)	Zagreb Money Market
Interest rate on 3-month T-bills	Ministry of Finance
CROBEX	Zagreb Stock Exchange

Figure 3 Cumulative impact of shocks (one standard deviation) on the domestic GDP growth rate[a]



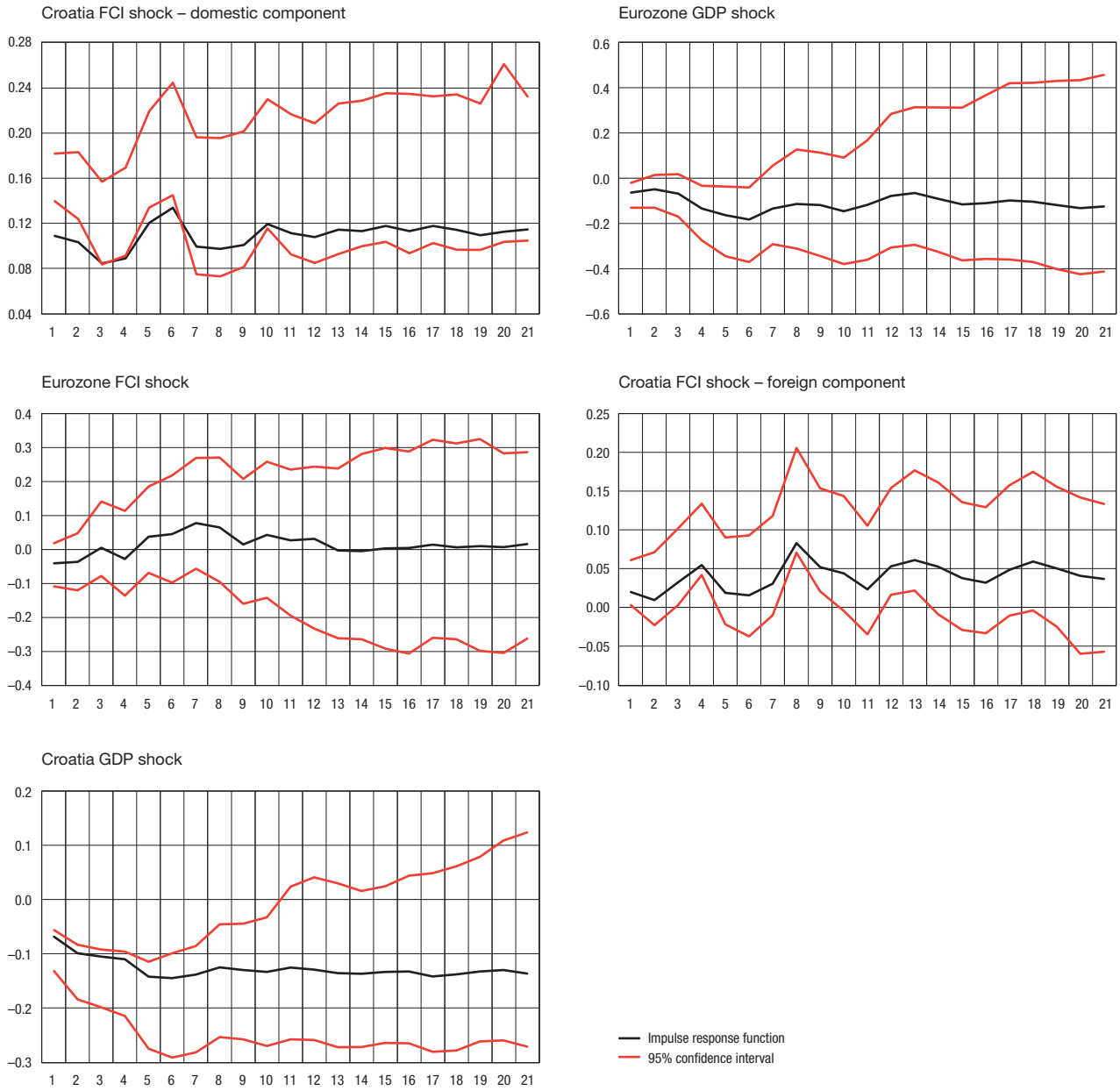
[a] X-axis – number of periods after the shock, y-axis – percentage points.
Source: Authors' calculations.

Figure 4 Cumulative impact of shocks (one standard deviation) on the growth rate of the foreign component of the domestic FCI[a]



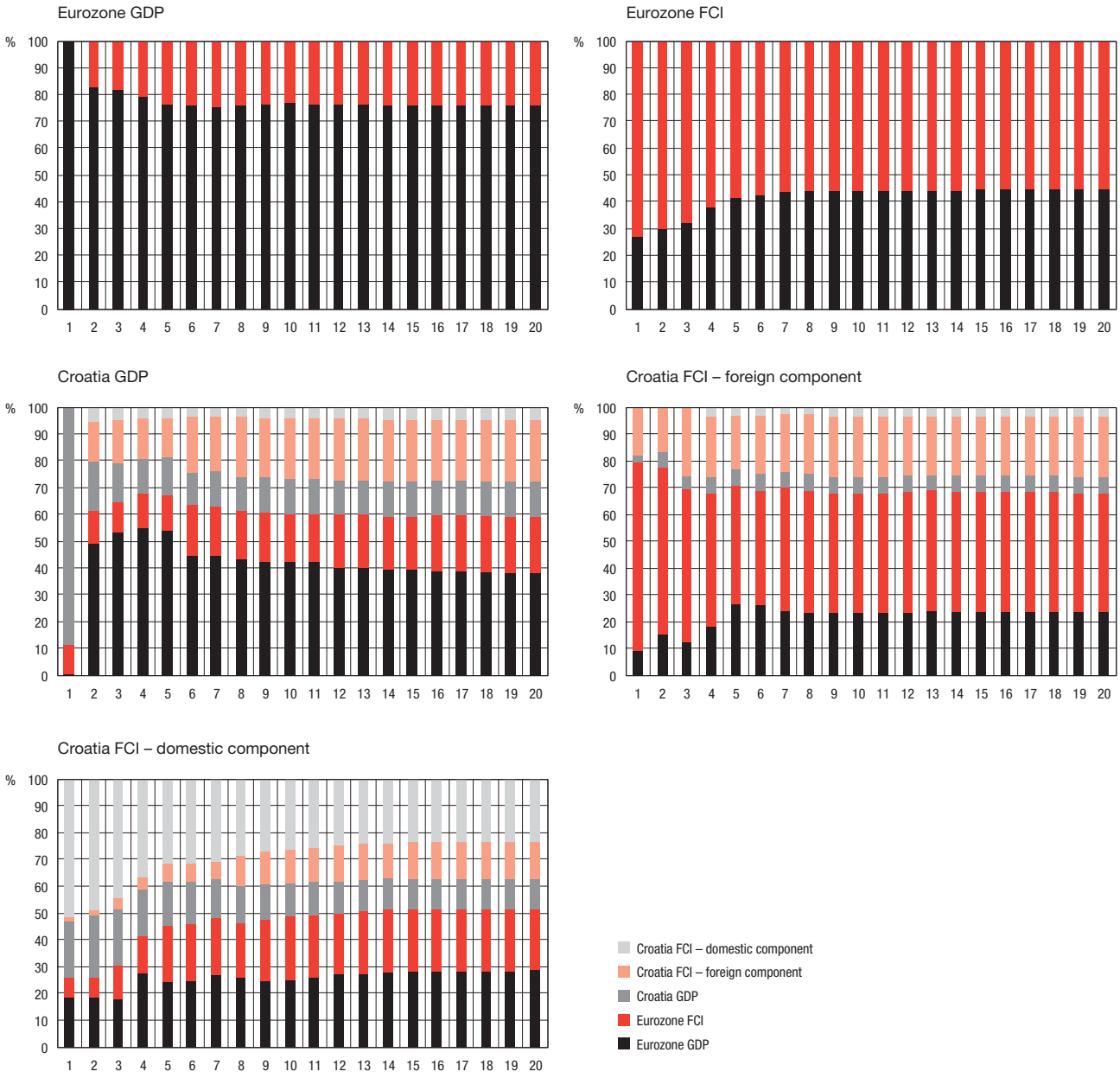
[a] X-axis – number of periods after the shock, y-axis – percentage points.
Source: Authors' calculations.

Figure 5 Cumulative impact of shocks (one standard deviation) on the growth rate of the domestic component of the domestic FCI[a]



[a] X-axis – number of periods after the shock, y-axis – percentage points.
Source: Authors' calculations.

Figure 6 Variance decomposition of a variable as a function of various shocks of the VAR model[a]



[a] X-axis – the number of periods after the shock, y-axis – the percentage of the explained variance.
Source: Authors' calculations.

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ISSN 1331-8586 (print) • ISSN 1334-0131 (online)