THE IMPORTANCE OF FINANCIAL CONDITION INDICES IN SOUTH-EASTERN EUROPE

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Abstract

In this paper, we construct the Financial Conditions Index of 11 European economies - Bulgaria, Czech Republic, Croatia, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Germany, and Turkey. We aim to reveal the sensitivity of the FCIs to the dynamics of the global financial conditions and to investigate and establish dependencies between the constructed FCIs and those of the USA and Germany. We prove that FCI is sensitive to the upcoming shocks from the USA and Germany. When studying the sensitivity of the FCIs to the U.S and German indices we prove that the impact of the American conditions is substantially stronger. We may conclude that the tightening of financial conditions causes a slowdown in GDP growth in the future while a weakening stimulates inflation. We proved that local financial conditions incorporate faster and more strongly the influence of global financial shocks than changes in domestic policy rates.

Key words: Financial Conditions Index, Global Financial Conditions, Sensitivity, Monetary Policy

JEL Code: C22, G02

Introduction

Financial condition indices (FCIs) are an indispensable instrument in analyzing, forecasting, and supervising national financial systems and in tracking down the interdependence between real and financial sectors. According to some authors, the usefulness of the FCIs comes from their incorporation of high-frequency data and the opportunity this gives for extracting information about

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changes in market expectations for inflation and output (Mayes and Virén, 2001). Since the last financial crisis, European countries have faced various challenges: consolidating their budgets while at the same time promoting economic growth and a collapse in the gross domestic product (Stoilova, 2017). According to Stavrova (2017): "The process of global financial and economic development has reached a varying degree...".

The further development of the FCIs technique explicitly requires an understanding of both how traditional and evolving financial markets relate to each other and how they interact with economic conditions (Brave and Butters, 2011). The experience of some countries confirms that FCI can successfully forecast the overall economic trend, and it is a better leading indicator of GDP and CPI than single variables (Guihuana and Yub, 2014).

All these features make the FCIs one of the most important tools of financial and economic forecasting at the disposal of Central banks and international financial institutions. Up to now the specific role of FCIs in forecasting and analyzing the economies of South European countries was neglected so the task of the present paper is to fill this gap, emphasizing the role of common international and global factors.

The main objectives of this research are:

1. Construction of Financial Conditions Index of the explored economies;
2. Determination of sensitivity of the FCIs to the dynamics of the global financial conditions;
3. Investigation and establishment of dependencies between the constructed FCIs and those of the USA and Germany;
4. Revealing of a transmission mechanism between global, monetary shocks and the constructed FCIs;
5. Comparative analysis of the impact of the global financial shocks under the pre-crisis, crisis, and post-crisis period.

Restrictive conditions of this research are determined in the following aspects:

*   *Time range -* this research is restricted in the time interval from 2000-2017;
*   *Methodological restrictions* –they are set by the statistical properties of the researched data imposing the application of specific econometric tests and models giving opportunity for the reflection. The proposed and used methodology does not claim to be the only possible and applicable when inspecting and proving the research thesis of this study.
*   *Place restrictions* – the analysis and the inspection of the research thesis are concentrated in the following 11 European countries - Bulgaria, Czech

Republic, Croatia, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Germany, and Turkey.

Literature Review

After the global financial crisis 2008-2009, the attention was focused on the relationship between financial conditions and the real economy. A financial condition index (FCI) summarizes the information about the future state of the economy contained in current financial variables. It is supposed that FCI should measure financial shocks – exogenous shifts in financial conditions that influence or otherwise predict the future economic activity and monetary policy reaction. The construction of FCI is an intricate process because it should include variables reflecting past economic activity which could contain the relevant extrapolative information. According to Roy, Biswas, and Sinha (2015), the structure of the financial system is an important determinant of the various channels of transmission. In economies with sophisticated financial systems, the transmission channels are diverse and may change over time. If the policy transmission is taking place solely via financial conditions, FCI indicates whether a change in policy will alter the economic prospects. The relation between financial conditions and economic activity evolves; the importance of factors other than monetary policy on financial conditions may vary over time; the response of financial conditions to policy changes may vary; forces other than financial conditions necessarily affect the performance of the real economy.

Freedman (1994) applied MCI (monetary conditions index) to explore the financial and monetary conditions. He constructed a weighted average of changes in the interest rates and the exchange rate. The financial conditions index exists in several different variants:

1. Chicago Fed Financial Conditions Index- (NFCI) **-** U.S Financial Conditions in money markets, debt and equity markets, traditional and "shadow" banking system. Positive values of the NFCI indicate financial conditions that are tighter than average, while negative conditions indicate financial conditions that are looser than average;

2. Kansas City Fed Financial Stress Index (KCFSI) - a measure of the stress in the U.S financial system based on 11 market variables.

3. St. Louis Fed Financial Stress Index (STSLSFI) **-** It measures the financial stress in the markets and is constructed from 18 data series: seven interest rate series, six yield spreads, and five other indicators. The negative value of this index suggests below-average financial market stress, while positive value suggests above-average market stress.

4. Deutsche Bank Financial Condition Index- the latter is constructed via a principal components approach. The first principal component is extracted

from a set of seven financial variables: exchange rate, bond, stock, and housing market indicators. The weights are determined by the use of regression of the real GDP growth on the financial variables and lagged GDP growth.

According to Guihuan and Yu (2014), the Financial Conditions Index (FCI) is a comprehensive index that is based on the combination of several variables, such as currency price and asset prices. It can overcome the shortage of some conventional indexes, such as money supply and interest rate, in measuring the financial conditions and forecasting the economic trend. They conclude that FCI has become an important reference index in financial analyzing and policymaking in some central banks and international institutions. The variables that they select for the FCI construction are money supply, interest rate, exchange rate, stock prices, and housing prices. They choose the percent change rate of the variables as indicators to construct the FCI, which effectively reflect dynamics and avoid errors arising from the gap measuring. The authors construct FCI through the principal component analysis method and a dynamic factor model. Then, the FCIs constructed via the comparison of the two methods, and the robustness of the FCI is tested. The main results indicate that FCI can reflect China's financial conditions and maybe a crucial predicting indicator as well; FCI can also forecast the overall economic trend, and in particular, it is a better leading indicator of GDP and CPI than single variables.

Koop and Korobilis (2014) demonstrate the usefulness of the FCI as a forecasting tool. In their paper, they calculated the FCI by factor augmented vector autoregressive models with time-varying coefficients and stochastic volatility. They track the growth in the US economy by the so devised FCI. The authors attempt also to forecast inflation, output growth, and unemployment rate by the so composed device.

Mayes and Viren (2001) use panel datasets of Western Europe to explore how asset prices and particularly house and stock prices, can provide useful additional indicators of future changes in output and inflation. According to them, the most useful role of the FCIs comes from the incorporation of high-frequency data and the opportunity that the letter gives for extracting information about changes in market expectations of inflation and output. This method is useful for market participants to make judgments about the likely central bank reactions. At the same time, it helps the central banks to assess the stance of policy between forecasts. The authors conclude in particular that at quarterly frequency intervals central banks will prefer to use the traditional economic forecasting methods while summary indicators like FCIs will have only a limited role. To monitor the evolution of the financial conditions, potentially in real-time, Auer (2017) constructs FCIs for each of the three main Central and Eastern EU member states outside the euro area (Hungary, Poland, and the Czech Republic). FCI is

constructed as an unobserved factor estimated using the EM algorithm. After having assessed their performance in providing information about future economic activity, these FCIs are used to describe the dynamics of the financial conditions in the three mentioned economies for the period between 2001 and 2016. The conclusions of this study reveal that after their integration into the EU, the countries enjoyed very accommodative financial conditions until 2008; the Czech Republic and Hungary subsequently turned out to be more exposed than Poland to the spillover effects from both the global financial crisis and the Eurozone sovereign debt quandary.

Hatzius et al. (2010) explore the relationship between financial conditions and economic activity. They build an FCI that features three key innovations: a broad range of quantitative and survey-based indicators; use of unbalanced panel estimation techniques resulting in a longer time series than available for the other indexes; the predictive power of financial conditions for future economic activity. During most of the past two decades, the constructed FCI shows a tighter link with future economic activity than existing indexes, although some of this undoubtedly reflects the fact that the selected variables are partly based on the observation of the recent financial crisis. As of the end of 2009, the FCI showed financial conditions at somewhat worse-than-normal levels. The main reason is that various quantitative credit measures (especially issuance of asset-backed securities) remained unusually weak for an economy that resumed expansion.

Swiston (2008) constructed a U.S FCI to reveal the endogenous response of selected financial variables and the real economic activity to the exogenous shocks applying VAR models. According to this research, the availability of credit and FCI are the leading drivers of the business cycle.

Akarli et al. (2012) constructed an FCI for seven Central Eastern European, Middle Eastern, and African economies (Czech Republic, Hungary, Poland, Russia, Turkey, Israel, South Africa). The index includes three domestic (real 3- month interbank rate, the spread between the 10-year interest rate and the 3-month rate as a proxy of the yield curve, the difference between private borrowing cost and risk-free domestic rates) and two external factors (CDS spreads and the real effective exchange rate). They enter the FCI by weights derived from a VAR exercise calculating the cumulative impact on GDP growth after 3-4 quarters.

Kara, Özlü, and Ünalmış (2012) built an FCI for Turkey that weights a number of domestic and foreign variables based on a 4-quarter ahead cumulative response of GDP growth to a one-unit shock to each variable. Their work also emphasizes that in the case of Turkey it makes a considerable difference for the series' weights whether or not one controls for external factors.

Todorov (2017) concludes that Bulgaria is characterizing by ineffective money market which stays under the equilibrium levels during stagnation. Stoykova (2017) and Tsenkov, and Stoitsova-Stoykova (2017) prove that SEE capital markets

except Montenegro are not efficient in the context of the efficient market hypothesis (EMH). Moreover, the consumer sentiment information and inflation expectations affect the financial market dynamics of SEE stock indices. The analysis shows that there is no linkage between industrial expectations and the dynamics of the SEE capital markets. Test results potentially present that the consumer and inflation expectations have predictive power for the performance of SEE capital markets.

Methodology

In this research, Financial Conditions Indices FCI was constructed for 11 European countries - Bulgaria, Czech Republic, Croatia, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Germany, and Turkey. The explored period covers 2000 -2017. The effective construction of FCI involves the following steps:

1. Optimal data selection (financial variables) for FCI construction;

2. Data selection to eliminate those variables that are correlated with the economic cycle;

3. Applying the appropriate econometric approach;

4. Analysis of the dynamics of FCI and its relationship to economic activity.

This study is based on Arregui, Elekdag, Gelos, Lafarguette, and Seneviratne (2018). The present research explores the impact of global factors on the financial conditions of the national markets. The idea is to cover as many segments of the financial system as possible. We opt for the FCI to include equity, house price index, bonds, interbank markets, and exchange rate. The aim is to capture the various channels through which monetary and macro-prudential policies can affect the economy. We use the following variables as benchmark variables: Financial Conditions Index of Germany (PCA); Chicago Fed Financial Conditions Index- (NFCI); Kansas City Fed Financial Stress Index (KCFSI); St. Louis Fed Financial Stress Index (STSLSFI).

Principal Component Analysis

According to Tanchev (2016): "Before proceeding to the election of the econometric method, it is necessary to apply a test to establish the stationarity".

We apply Principal Component Analysis to construct an index of financial conditions for the explored countries, based on the following studies (Hatzius et al, 2010; Brave and Butters, 2011; Darracq and Paries et al., 2014, Traykov et al, 2018). According to them, the FCI should contain financial variables. This means that it can be considered as a measure of the financial shock or the so-called exogenous changes in financial conditions that could affect future economic activity. Following the empirical approaches based on the existing literature, we have included the following variables:

Table 1. Variables for FCI construction

Variables	Description	Source
Term Spreads	The yield on 10-year government bonds minus the yield on three-month treasury bills;	IMF staff
Interbank market spread	Overnight borrowing and long-term borrowing	Euribor-rates.eu
Interest Rate spread	Difference between the lending rate and deposit rate in percentage	World Bank, IMF statistics
Efficient Exchange Rate		BIS
Nominal Exchange Rate		BIS
Credit Growth	Percentage change of credit of NFC and households (% of GDP)	BIS
Sovereign spread	EMU convergence criterion bond yields minus EMU convergence criterion bond yields of the benchmark country	Eurostat
Broad Money (% of GDP)	Broad money as a percentage of GDP	World Bank
Equity returns	The returns of equity prices	IMF statistics
House Price Returns	Percentage change in the house price index	BIS

Rolling Regression

Rolling approaches are often used in time series analysis to assess the stability of the model parameters concerning time. A common assumption of time series analysis is that the model parameters are time-invariant. However, as the economic environment often changes, it may be reasonable to examine whether the model parameters are also constant over time. One technique to assess the constancy of the model parameters is to compute the parameter estimates over a rolling window with a fixed sample size through the entire sample. If the parameters are truly constant over the entire sample, then the rolling estimates over the rolling

windows will not change much. If the parameters shift at some point in the sample, then the rolling estimates will show how the estimates have changed over time.

Dynamic Factor Model

The DFA framework has been introduced and developed by Coppi and Zannella (1978) and then re-examined by Coppi et al. (1986) and Corazziari (1997). The goal of the methodology is to decompose the variance and covariance matrix S relative to X (IT, J), where the role of the units is played by the pair "units-times". The matrix S, concerning the JxT observations over the I units, may be decomposed into the sum of three distinct variance and covariance matrices:

$$S= {}^*SI+ {}^*ST+ SIT, \tag{1}$$

Where:

*SI= matrix of the static structure of the units = matrix of variance and covariance of the average of the units to time.

*ST= matrix of the average dynamic of the system = variance and covariance matrix of the average of the times.

SIT= matrix of the differential dynamics of the single units = variance and covariance matrix of the interactions between units and times.

The three-factor version of the model can be represented as follows:

$$FCI_{c,t} = \delta_{1,c}x_{1,t} + \delta_{2,c}x_{2,t} + \delta_{3,c}x_{3,t} \tag{2},$$

Where

$x_{1,t}$ – The first common time-varying factor;

$\delta_{1,c}$ - Country - specific weight (c- country, t- time period);

Granger Causality Test

According to this test, if time series X is Granger-Causes another time series Y that implies the past value of X should contain information about Y so that helps predict Y above and beyond the information contained in the prior value of "Y" alone. To determine the direction of causality between the FCI, inflation, and growth this test is done. This model has the following common form:

$$y_t = \alpha_0 + \alpha_1 y_{t-1}+\dots+\alpha_1 y_{t-1} + \beta_1 x_{t-1}+\dots+\beta_1 x_{t-1} + \varepsilon_t \tag{3}$$

$$x_t = \alpha_0 + \alpha_1 x_{t-1}+\dots+\alpha_1 x_{t-1} + \beta_1 y_{t-1}+\dots+\beta_1 y_{t-1} + u_t \tag{4}$$

Correlation

The technique of Correlation Analysis is a technique, related with some of the following limitations: it estimates the contemporaneous relationship between

the variables (Patonov, 2016). Correlation is any of a broad class of statistical relationships involving dependence, though in common usage it most often refers to the extent to which two variables have a linear relationship with each other.

$$Corr(X,Y) = \frac{Cov(X,Y)}{\sqrt{Var(X)Var(Y)}}$$

(5)

Findings

An analysis of FCI dynamics

FCI dynamics may be interpreted as changes in the financial conditions that are exogenous to the business cycle. In macroeconomic theory, these exogenous financial conditions should capture investors' preferences for liquidity, i.e. they reflect the changes in the LM curve. These variations are not induced directly by central banks' money supply shifts and may be considered as endogenous for income. If investors' liquidity preferences upturn is triggered by exogenous shocks, it will be more difficult for businesses and households to obtain financing, so we assume that financial conditions are tightening. This translates into an increase in FCI and into the LM curve moving to the left.

Graph 1. The dynamic of the constructed FCI of the explored countries
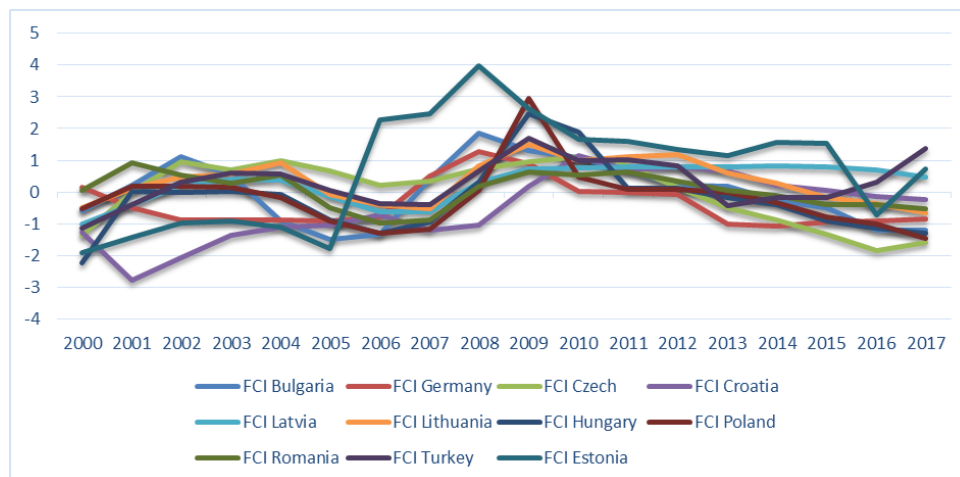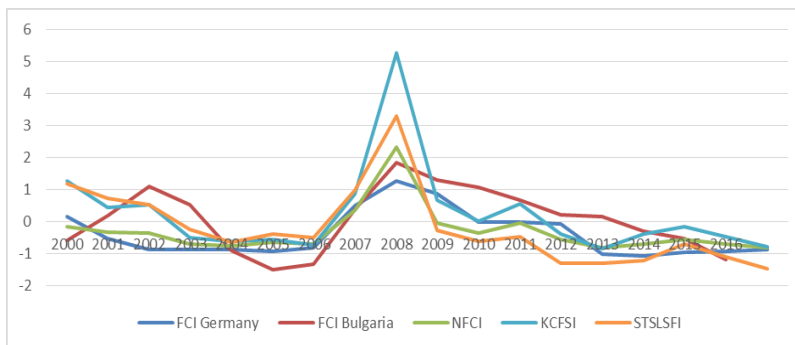

Source: Authors' calculations

Graph 2 shows the dynamics of the benchmark indexes. We observe a high increase in values during the last global financial crisis – 2008. This happens both in the U.S and the German financial markets. The values of the German FCI decrease quickly and after 2010 the index attains negative values. The conclusion is that the FCI's positive (negative) values indicate that financial conditions are tighter than the average, which corresponds to a higher than average corporate spread and lower than the average growth.
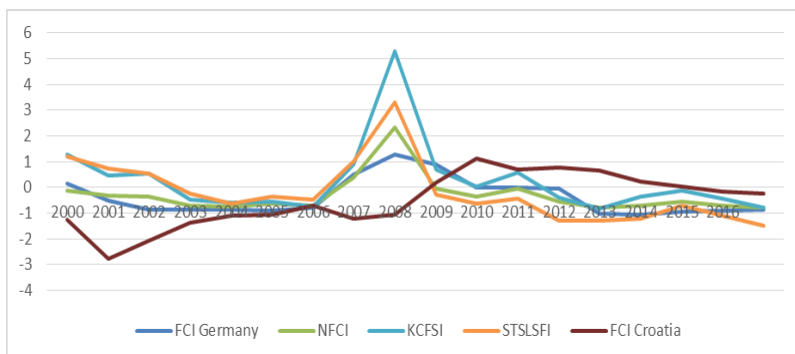
Graph 2. The dynamic of the benchmarks
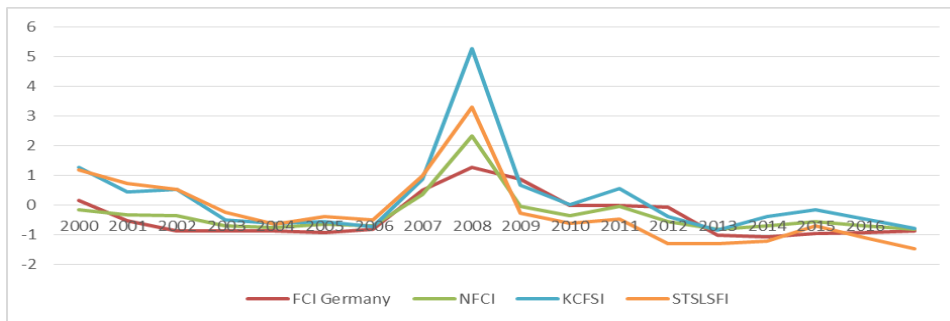
Source: Authors' calculations

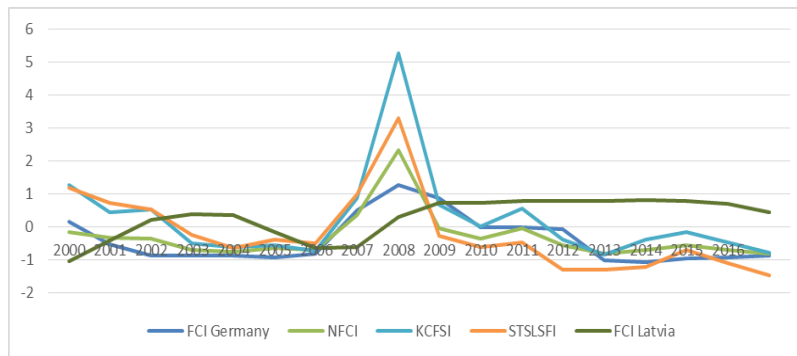**Graph 3.** A comparison between Benchmarks and Bulgarian FCI

Source: Authors' calculations

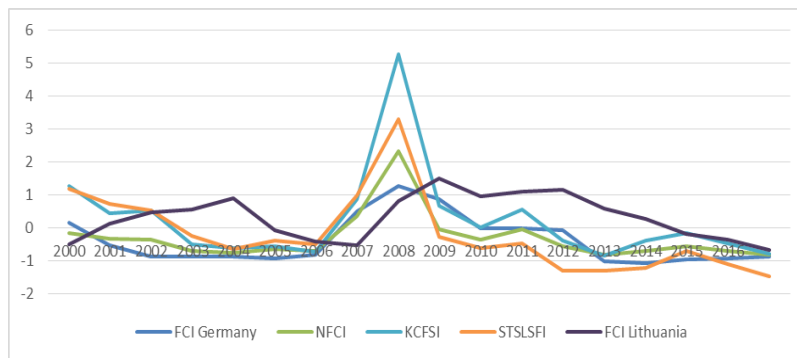**Graph 4.** A comparison between Benchmarks and Croatian FCI

Source: Authors' calculations

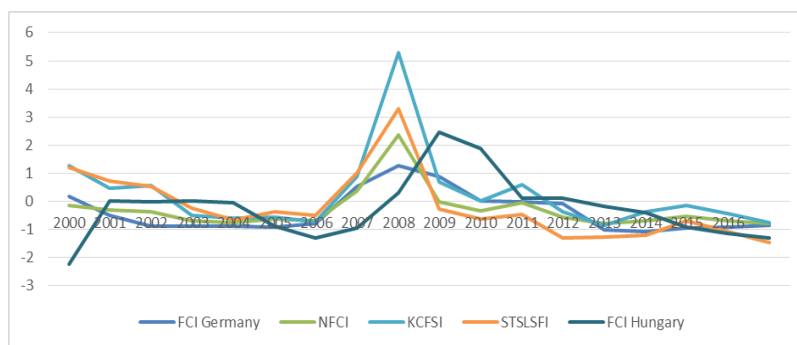**Graph 5.** A comparison between Benchmarks and Latvian FCI

Source: Authors' calculations

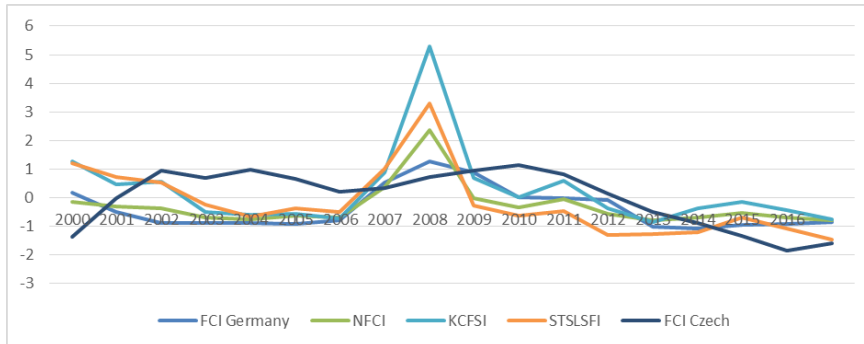**Graph 6.** A comparison between Benchmarks and Lithuanian FCI

Source: Authors' calculations

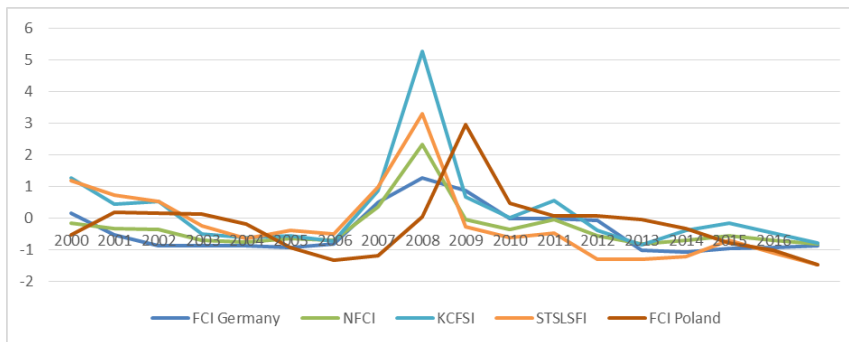**Graph 7.** A comparison between Benchmarks and Hungarian FCI

Source: Authors' calculations

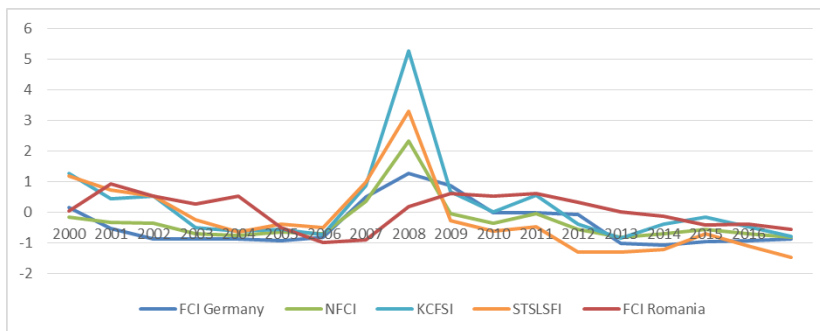**Graph 8.** A comparison between Benchmarks and Czech FCI

Source: Authors' calculations

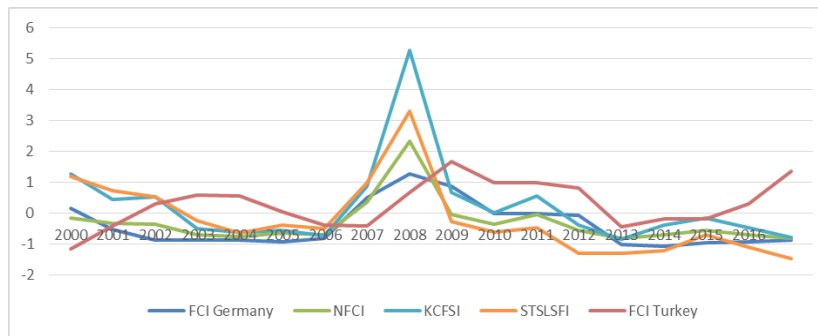**Graph 9.** A comparison between Benchmarks and Polish FCI

Source: Authors' calculations

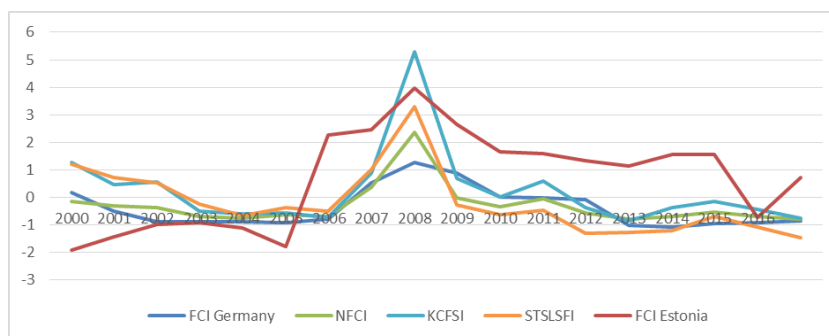**Graph 10.** A comparison between Benchmarks and Romanian FCI

Source: Authors' calculations

Graph 11. A comparison between Benchmarks and Turkish FCI

Source: Authors' calculations

Graph 12. A comparison between Benchmarks and Estonian FCI

Source: Authors' calculations

The graphs help us to compare the dynamics of the constructed financial conditions indexes and the benchmark ones. The graphs depict the standard deviations of the explored indices. The fluctuations of the constructed FCIs of the European countries move relatively synchronously with benchmark indices, including both the German and US markets.

We demonstrate that:

> ➢ The Hungarian and Polish FCIs have positive values for a short period, namely from 2008 to 2012. In 2012 the FCIs' values are approximately equivalent to zero;

> ➢ The Turkish FCI is positive for the years 2002-2005, 2008-2012 with a significant increase in its value again from 2016;

> ➢ The Croatian, the Latvian, and the Lithuanian FCIs are also influenced by the financial crisis. The financial distress affects their financial environment later, namely, we observe that the highest values of FCIs are after 2009. This reveals a long period of tight financial conditions. For Latvia, this period begins in 2008, as its FCI reaches its peak in 2014 and maintains its trend to 2017;

➢ Comparing the FCIs of Bulgaria and Romania, we reveal that Bulgaria accounts for a change in financial conditions faster, stronger, and longer. This can be explained by the impact of the Currency Board Arrangement in Bulgaria.

➢ Among all of the explored European economies, Estonian FCI has the highest value in 2008 – almost equivalent to 4. This is a value that is almost 4 times higher than the FCI values of all of the scrutinized economies, except for the Bulgarian one, which in 2008 is approximately equal to 2. The Estonian Financial Conditions Index retains high values: between 1.5-2.5 points until 2015;

➢ In comparative terms, we must focus our attention on the dynamics of the FCI of the Czech Republic. This is a country where the constructed index has not undergone significant changes during the financial crisis. Financial conditions tightened significantly in the Czech Republic only in 2010. After 2010 the value of FCI is characterized by a continuous declining trend.

Based on the results, we can conclude that negative financial trends have a longer effect on the growth in the emerging economies than in the developed ones represented in our case by the USA and Germany. Countries with autonomous monetary policy (Czech Republic, Romania, Poland, Hungary, and Turkey) adjust faster and more successfully to the negative external shocks. In the case of Turkey, we observe a self-inflicted negative financial shock after 2016.
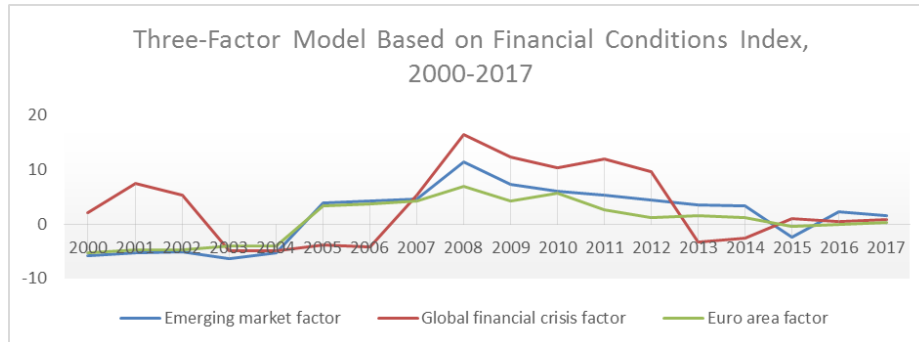
Financial Conditions Evolution

To construct an essential model of the financial conditions of the explored European economies, we apply a dynamic factor model. Based on a study by Arregui, Elekdag, Gelos, Lafarguette, and Seneviratne (2018), we find that financial conditions can be summarized by three factors that have characterized the three major episodes of the historical crisis over the last two decades. In particular, we determine the existence of an "emerging market" factor, a "euro area" factor, and a "global financial crisis" factor.

Based on a dynamic factor model, three latent factors have been identified (Graph13). They summarize the main models in the country's financial condition indices. Higher values indicate tighter than the average financial conditions. Each factor increases during the global financial crisis. The emerging market and euro area factors stand out with long-term positive values. The euro area factor reaches a high value in 2010. This level is close to 2008 one. We should summarize that for the explored countries, the global financial factor reflects their financial conditions relatively well. These results support the theory of Arregui, Elekdag, Gelos, Lafarguette, and Seneviratne (2018) and Miranda-Agrippino and Rey (2015) that

the presence of global factor is in line with the hypothesis of a global financial cycle.

Graph 13. Three-Factor Model, based on FCI

Source: Authors' calculations

To evaluate the stability, we construct a principal global factor by PCA. Graph 14 reveals the dynamics of global financial conditions. They are constructed by a dynamic factor model, global financial conditions constructed through principal component analysis, VIX, and the German Financial Conditions Index. We find that the indicators of global financial conditions are moving in line with VIX and the German index. These results may be considered as a confirmation of the theory that global financial conditions are determined by developed market economies.

Graph 14. Dynamic of global financial conditions
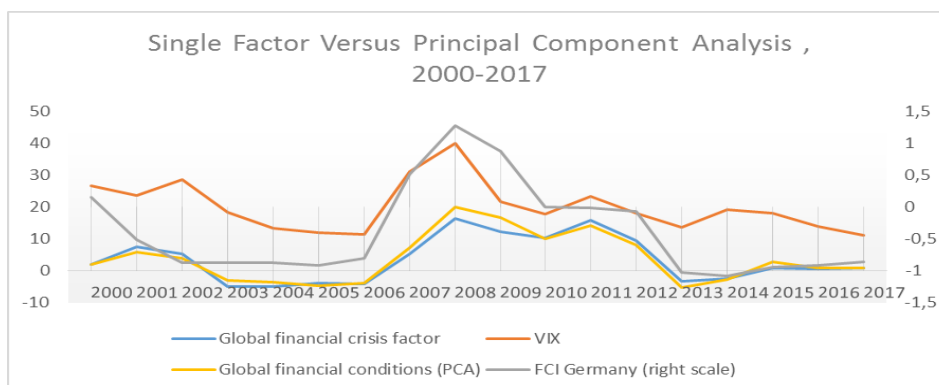
Source: Authors' calculations

A significant proportion of the fluctuations in the countries' financial conditions may be explained by global financial shocks. It is proved by the results of the applied regression model. The aforementioned conclusion is confirmed by the value of R-squared in the panel regression model. The Member States' index is regressed by the variable of the global financial cycle. The dynamics of global factors can explain 43.78% of the financial conditions of the explored European economies.

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Table 2. Results from the regression model (FCI- dependent variable)

Dependent Variable: RFCI				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.055866	0.102092	-0.547210	0.5923
RGF(DFA)	0.060591	0.017731	3.417222	0.0038
R-squared	0.437726	Mean dependent var		-0.060214
Adjusted R-squared	0.400241	S.D. dependent var		0.543493
S.E. of regression	0.420903	Akaike info criterion		1.217304
Sum squared resid	2.657395	Schwarz criterion		1.315329
Log-likelihood	-8.347087	Hannan-Quinn criteria.		1.227048
F-statistic	11.67740	Durbin-Watson stat		1.339962
Prob(F-statistic)	0.003820			

Source: Authors' calculations

Due to the absence of strong evidence of the increasing impact of global financial conditions in recent years, we apply rolling regression with a rolling window of 3 and 5 years. Graph 15 illustrates how the share of FCI volatility is explained by changes in global financial conditions. In particular, it presents the total variation explicated by the first principal component of FCI using a rolling window of 3 and 5 years. The share of fluctuations in FCI due to global financial conditions reveals the cyclical patterns, especially in the pre-crisis and crisis periods. It is revealed that a relatively constant dynamic prevails during the last 4 years. These results confirm the thesis of Forbes and Rigobon (2002), namely that the interdependence increases when the volatility is increasing.

Graph 15. Variance Attributable to Global Conditions 2000-2017

Variance Attributable to Global Conditions 2000-2017 (In percent)
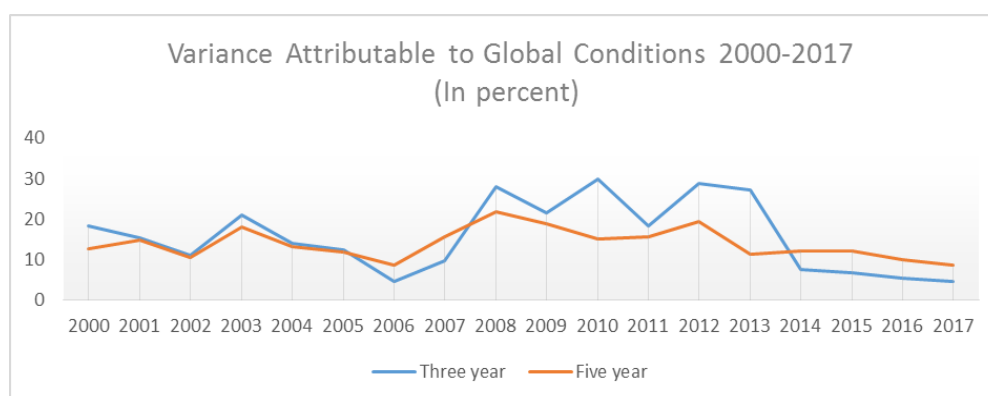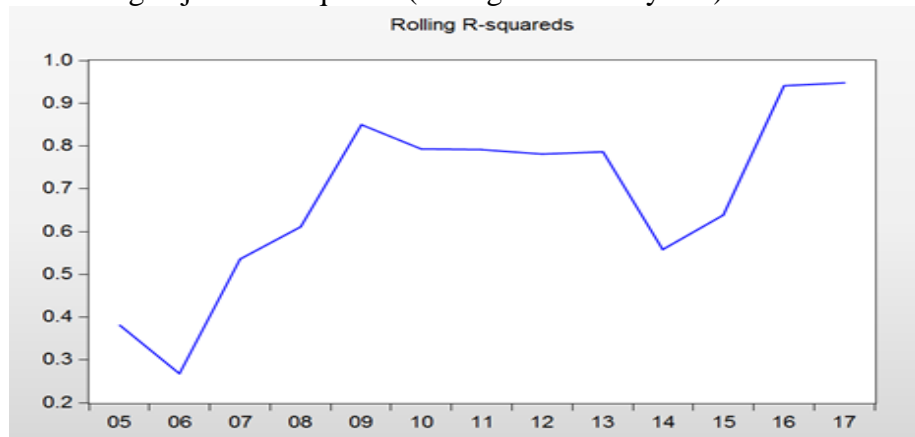
Source: Authors' estimates

We confirm also the cyclic models (Graph 15) by R-squared statistics based on recursive regression with a rolling window of 3 and 5 years (Graph 16 and 17).

Graph 16. Rolling adjusted R-squared (rolling window 3 years)
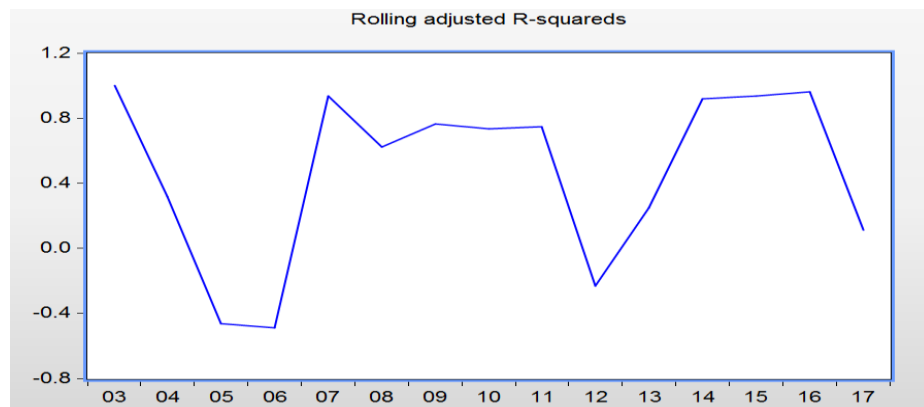
Source: Authors' estimates

Graph 17. Rolling adjusted R-squared (rolling window 5 years)

Source: Authors' estimates

Because of the heterogeneity of the explored economies, we aim to evaluate the influence of the exchange rate on the FCI. We add the following variables in its construction:

1. Monetary independence;

2. Exchange rate stability;

3. Real effective exchange rate;

4. Net export.

The adequacy and the specific role of the exchange rate depend on the economy, its financial openness, and it is a level of development. Overall, the appreciation of national currency will make its assets more expensive for foreigners. Therefore, it may be more difficult for national firms to issue capital. In the emerging economies exists a connection between the appreciation of the exchange rate and the financial conditions. The appreciation itself can be a result of large capital inflows leading to a "weakening" of financial conditions and often

reflects positive prospects for the economic growth of the respective country with the corresponding inflation pressure (due to the expected effects of Balassa-Samuelson). According to Sahoo (2017), an open floating exchange rate economy should pay attention to cash transmission through the effect of the exchange rate on the net exports. The effects of the interest rate should also be included, as they fall in the exchange rate of the currency leads to a fall in the internal real interest rate. In this way, national goods become cheaper than foreign goods and lead to an increase in net exports. The increase in net exports leads to an increase in total production. The exchange rate channel can be determined by the monetary expansion chart: M↑ ⇒ ir↓ ⇒ E↑ ⇒ NX↑ ⇒Y↑

Graph 18. Three-Factor Model, based on FCI (includes exchange rate factor)
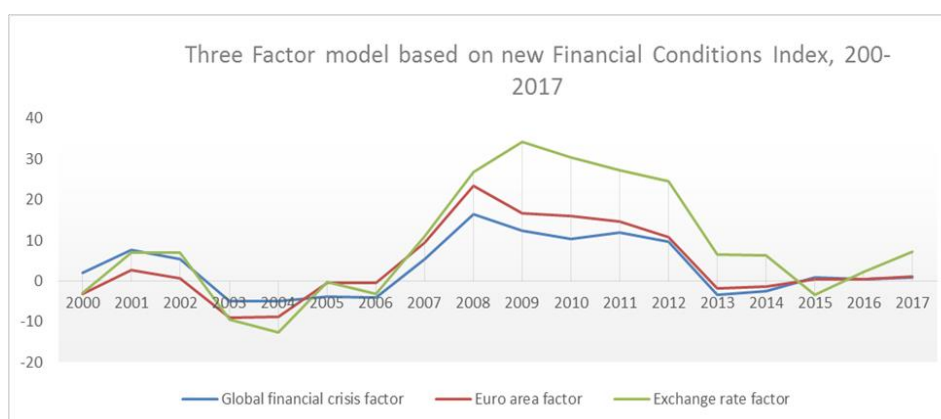
Source: Authors' estimates

Country Characteristics and Sensitivity to Global Financial Conditions

At this stage aim to determine whether the FCI is correlated with the U.S FCI and the German FCI, which requires a panel approach. We explore the way the country characteristics strengthen or weaken the correlation between the FCI and the U.S FCI and the German FCI. As an index of financial conditions in the USA, we use the Chicago Fed Financial Conditions Index (NFCI). We applied panel regressions. The models include country fixed effects, and standard errors are clustered at the country level.

$$FCI_{c,t} = \propto_i + \beta_1 FCI_t^{US} + \beta_2 CCHAR_{c,t-1} + \beta_3 FCI_t^{US} * CCHAR_{c,t-1} + \beta_4 Z_{c,t-1} + \varepsilon_{i,t} \qquad (6)$$

$$FCI_{c,t} = \propto_i + \beta_1 FCI_t^{Germany} + \beta_2 CCHAR_{c,t-1} + \beta_3 FCI_t^{Germany} * CCHAR_{c,t-1} + \beta_4 Z_{c,t-1} + \varepsilon_{i,t} \quad (7)$$

Where

$FCI_{c,t}$- denotes the domestic financial conditions (for country *c* in year *t*);

$CCHAR_{c,t-1}$-country characteristics (trade openness; financial openness, exchange rate stability index, financial development index, rule of law), linkages to the United States and Germany (for country *c* in year *t-1*);

$Z_{c,t-1}$-Additional controls (Commodity price, inflation, current account balance to GDP, total reserves to GDP).

From the applied regressions, we prove that:

➢ The global variables- the U.S FCI, Commodity Price Inflation, and the German FCI have a significant positive impact on the constructed index of financial conditions. It should be noted that the weight of the coefficient taking into account the impact of the US index (0.755102) is almost twice as stronger as that of the German FCI (0.381532);

➢ Trade openness, financial openness, Financial Development, and Capital Account Openness, Current Account Balance to GDP, Total Reserves to GDP Real GDP Growth, and exchange rate stability all have statistical significance in the regression equation accounting for the impact of the US shocks. Trade openness. Capital Account Openness and Exchange rate stability index have a positive impact on the national financial conditions of the studied economies, Financial Development and Financial Openness have a negative inverse effect on FCI ;

➢ In the regression equation reflecting the German shocks, we reveal the significance of the following variables - Capital Account Openness, Financial Openness, Exchange Rate Stability Index, Financial Development, Real GDP Growth, Total Reserves to GDP. The Financial Openness variable for other countries excluding Germany is statistically significant and has a positive impact on FCI.

➢ Reserves and GDP growth are statistically significant and have negative values in both regression equations.

When directly comparing the weights of the coefficients of the regression equation, which includes the US shocks (1), and the one considering the German ones (2), we can say that the values of the weights of the coefficients in equation (1) are higher than with the same in equation (2). An exception is observed in the Financial Development and Exchange Rate Stability Index, i.e. the degree of development and the stability of the exchange rate are factors that determine the impact of the German financial shocks

From the results in Table 3, we may conclude that the constructed FCI is sensitive to the upcoming shocks from the USA and Germany. The focus of attention should be on the U.S ones. These results support the thesis of Tsenkov (2015). Exploring the Bulgarian capital market, he proved that in the post-crisis period, DJIA had a stronger leading influence on SOFIX than DAX.

Table 3. Sensitivity to U.S and German Financial Conditions

Sensitivity to Global Financial Conditions USA	FCI	FCI	Sensitivity to Global Financial Conditions Germany
C	0.278906 (0.0018)**	0.572795 (0.0059)**	C
Current Account Balance to GDP	-0.036242 (0.0750)*	0.024910 (0.2269)	Current Account Balance to GDP
Real GDP Growth	-0.063753 (0.0027)**	-0.040489 (0.0898)*	Real GDP Growth
Inflation	-0.001988 (0.8508)	0.003006 (0.7789)	Inflation
Total Reserves to GDP	-0.035023 (0.0014)**	-0.029915 (0.0118)**	Total Reserves to GDP
U.S FCI	0.755102 (0.0093)**	0.381532 (0.0386)**	German FCI
Commodity Price Inflation	0.005342 (0.0004)***	0.005485 (0.0009)***	Commodity Price Inflation
Capital Account Openness	1.361142 (0.0299)**	1.022445 (0.0416)**	Capital Account Openness
Capital Account Openness X U.S FCI	2.257162 (0.0167)**	1.341709 (0.0553)*	Capital Account Openness X German FCI
Trade Openness	0.065177 (0.0084)**	9.620405 (0.3282)	Trade Openness
Trade Openness X U.S FCI	0.208081 (0.0023)**	-1.093455 (0.3270)	Trade Openness X German FCI
Rule of Law	-0.011943 (0.1673)	-0.007664 (0.4098)	Rule of Law
Rule of Law X U.S FCI	-0.011943 (0.1673)	-0.004963 (0.5995)	Rule of Law X German FCI
Financial Openness	-4.962627 (0.0624)*	-3.507122 (0.0990)*	Financial Openness
Financial Openness X U.S FCI	-8.273244 (0.0387)**	-4.649772 (0.1165)	Financial Openness X German FCI
Financial Development	-2.317467 (0.0498)**	-2.859620 (0.0156)**	Financial Development
Financial Development X U.S FCI	-2.502863 (0.0075)**	-4.221255 (0.0018)**	Financial Development X German FCI
Exchange Rate stability Index	0.894137 (0.0056)**	0.746587 (0.0251)**	Exchange Rate stability Index
Exchange Rate stability Index X U.S FCI	1.197644 (0.0048)**	0.710412 (0.0801)*	Exchange Rate stability Index X German FCI
Observations	180	180	Observations
R-squared	0.462218	0.376586	R-squared

Source: Authors' Calculations

Note: P-values in parentheses. ***p<0.01, **p<0.05, *p<0.1

Financial conditions index (FCI), inflation and growth

To test the predictive ability of Financial conditions Index (FCI), correlation analysis, and Granger Causality Test are used. The results of the correlation test indicate that FCI can predict GDP growth, but not inflation. The correlation between FCI and GDP is (-0.357508). This shows a moderate negative relation between FCI and GDP. It means, that if the financial conditions tighten, the GDP growth goes down. The correlation coefficient between FCI and inflation levels is (0.022271) which is much less than the correlation between FCI and GDP, although it shows a positive relation. So, the correlation coefficient is so weak that, we cannot accept FCI as a predictive indicator of inflation.

Table 4. Correlation analysis

	FCI	INFLATION	REAL_GDP_GROWTH
FCI	1.000000		
INFLATION	0.022271	1.000000	
REAL_GDP_GROWTH	-0.327508	0.049431	1.000000

Source: Authors' Calculations

The results of the Granger-Causality test are present in Table 5 and Table 6. We prove that FCI "Granger cause" inflation and GDP growth.

Table 5. Results from Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.	Conclusion
GDP does not Granger Cause FCI	160	0.12048	0.8866	Accept Ho
FCI does not Granger Cause GDP		3.82208	0.0240	FCI→GDP

Source: Authors' Calculations

Table 6. Results from Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.	Conclusion
Inflation does not Granger Cause FCI	160	1.93488	0.1479	Accept Ho

FCI does not Granger Cause Inflation	3.76415	0.0253	FCI→Infl

Source: Authors' Calculations

Based on the results above, we may conclude that the tightening of financial conditions in the studied European economies causes a slowdown in GDP growth while a weakening stimulates inflation. The degree of significance proves that FCI is a reliable measurement of financial shocks. It is sensitive to the exogenous shocks which may lead to changes in the economic activity.

Transmission of Global Financial and Domestic Monetary Policy Shocks to FCI

The study of the transmission of domestic monetary policy and global financial conditions to domestic financial conditions is based on panel vector autoregressive (panel VAR) models. The baseline system includes the NFCI— again, as a proxy for global financial conditions—because we proved that its influence is twice stronger than the one of the German FCI. The growth is measured in terms of the change in industrial production and inflation as a variation of the consumer price index. Monetary policy is taken into account via a monetary-policy-related interest rate (short-term money market rate). The baseline panel VAR is estimated with three lags based on AIC. The baseline model is presented in the following equations:

$$Y_{c,t} = AY_{c,t-1} + BX_t + \varepsilon_{c,t} \tag{8}$$

$$Y_{c,t} = [\Delta IP_{c,t} \ \Delta CPI_{c,t} \ FCI_{c,t} \ \Delta i_{c,t} \ ] \tag{9}$$

Where

$\Delta IP_{c,t} \ \Delta CPI_{c,t} \ FCI_{c,t} \ \Delta i_{c,t}$ denote (log) industrial production, inflation, the change in domestic policy rates, and the U.S. and country-specific FCIs (for country c in month t) respectively; Xt is added for robustness analysis and includes various global controls including global industrial production growth, commodity prices, and a measure of global interest rates (U.S. shadow rate measures). Impulse responses are drawn from Cholesky decompositions under the assumption that domestic interest rates move last and the NFCI moves first. The results from the applied regression model and the impulse response function confirm the results from the dynamic factor model and the regression with fixed effects: global financial shocks have a significant impact on the domestic financial conditions in the explored economies. Global financial shocks have a notable impact on countries' domestic financial conditions. It seems that local financial conditions incorporate faster and more strongly the influence of global financial shocks than changes in domestic policy rates. These results confirm the thesis that timely and effective monetary policy reactions may often be difficult (Arregui et al, 2018). We

should notify nevertheless that monetary policy dynamics have a relatively strong impact on FCI.

To test the stability of the panel regression, we add the following variables: nominal interest rate, real interest rate, the change in U.S shadow rate (Xia Wu), change ineffective federal funds. The results do not change when the exchange rate is added as a variable.

Graph 19. The response of Domestic Financial Conditions to Shocks
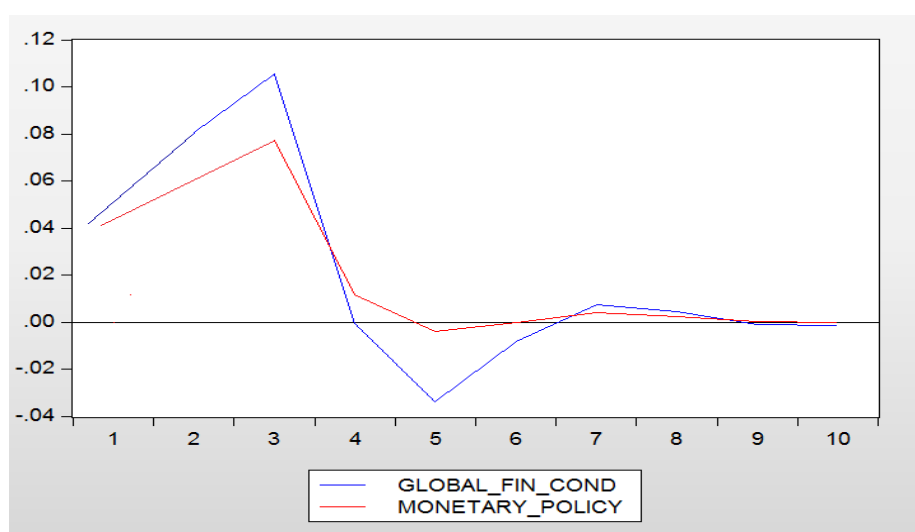
Source: Authors' estimates

Table 7. Share of Domestic FCI variation Attributable to Selected Shocks (In percent)

Variables Added to Model	Monetary Policy Shock		Global Financial Shock	
	Peak Magnitude	Time to Peak (Years)	Peak Magnitude	Time to Peak (Years)
Exog: Commodity Price Inflation	13.8	2	14.5	1
Exog: Commodity Price Inflation, Growth in Global Industrial Production, Change in U.S shadow rate	12.1	2	17.8	1

Exog: Commodity Price Inflation, Growth in Global Industrial Production, Change in Effective federal funds rate	16.7	2	23.5	1
Endog: Change in NEER	23.7	1	18.5	1
Endog: Change in REER	19.4	1	20.8	1

Source: Authors' estimates

Based on the results in Graph 20, we try to reveal whether the influence of global shocks from the USA was changing during the pre-crisis, crisis, and post-crisis periods. We establish that the influence is strong during the explored period. It increases its value during the crisis and remains steady in the post-crisis period. This sustained and significant impact during a post-crisis period may be explained by the adoption of a "precautionary" strategy of the explored economies. They respond to the dynamics of the U.S financial conditions very sensitively to counteract the negative effects of global shocks.

Graph 20. The Influence of Global Financial Conditions: pre-crisis,

Crisis and post-crisis period
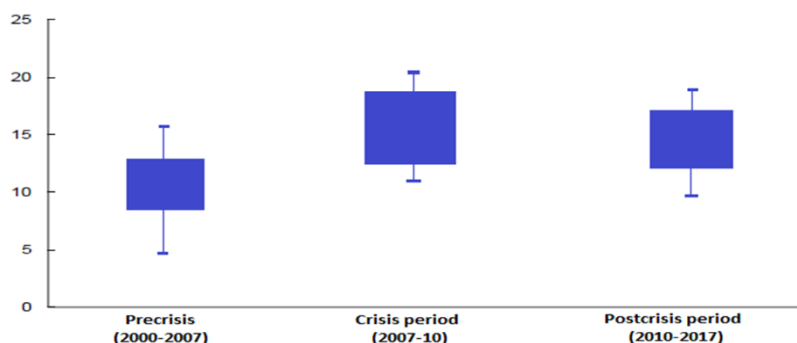
Source: Authors' calculations

Also, we attempt to evaluate the share of domestic FCI fluctuations attributable to the global financial conditions and domestic monetary policy shocks. Using the VAR models, we employ variance decompositions to quantify the relative importance of external shocks to domestic financial conditions. The results confirm that a considerable share of domestic FCI fluctuations is attributable to the global financial conditions shifts or domestic policy rate variations, namely almost 38.16%. This share of variation weakens and during the fifth year, its value is equal to 35.28%.

Table 8. Share of Domestic FCI Variation Attributable to Selected Shocks

Variables	Year	Variance Decomposition		
		Global Financial Conditions	Domestic Monetary Policy	Others
Exog: Commodity Price Inflation	3	28.3	16.3	55.4
	5	20.5	10.1	69.4
Exog: Commodity Price Inflation, Growth in Global Industrial Production, Change in U.S shadow rate	3	25.1	14.8	60.1
	5	27.2	16.2	56.6
Exog: Commodity Price Inflation, Growth in Global Industrial Production, Change in Effective federal funds rate	3	23.6	17.2	59.2
	5	20.7	15.8	63.5
Endog: Change in NEER	3	20.9	11.3	67.8
	5	18.3	13.6	68.1
Endog: Change in REER	3	16.2	17.1	66.7
	5	17.3	16.7	66

Source: Authors' estimates

Conclusions

The present research allows for important conclusions. First of all, it confirms that the constructed FCI is sensitive to the upcoming shocks from the USA and Germany. The different countries however demonstrate distinct sensitivity to the global economic shocks. The countries with fixed exchange rates like Bulgaria and Estonia (during the 2008 crisis) were especially vulnerable, while the Check Republic confirms the positive role of the floating exchange rate and the implementation of sophisticated monetary policy. Negative financial trends have a longer impact on growth in the emerging economies compared to the benchmark developed countries. Countries with autonomous monetary policy (Czech Republic, Romania, Poland, Hungary, and Turkey) adjust faster and more successfully to the negative external shocks. In the case of Turkey, we observe a self-inflicted negative financial shock after 2016.

For external impact on domestic FCIs of the studied countries, we distinguish three factors- global, Eurozone, and emerging. The global financial

factor is especially well correlated with internal FCIs. The presence of the global factor is in line with the hypothesis of the existence of a global financial cycle.

We tried also to track the changes in the influence of global shocks from the USA on the scrutinized countries during pre-crisis, crisis, and post-crisis periods. We establish that the impact is strong during the whole period. It increases its value during the crisis and remains steady in the post-crisis period. This sustained and significant impact during the post-crisis period may be explained by the adoption of a "precautionary" strategy by the explored economies. As a rule, they respond to the dynamics of the U.S financial conditions very perceptively to counteract the negative effects of the global shocks.

When studying the sensitivity of the FCIs to the benchmark U.S and German indices we find out that the impact of the American conditions is substantially stronger. Another particularity is the intermediary role of the forex stability in the case of German financial conditions' impact on the financial systems of the Eastern European countries. This is probably because the exchange rate fluctuations may help these countries to counteract the real shocks originating from the German economy.

We may conclude also, that tightening of financial conditions causes a slowdown in GDP growth in the future while a weakening stimulates inflation. The degree of significance proves that FCI is a reliable measurement of financial shocks. It is sensitive to the exogenous shocks which may lead to changes in the economic activity.

Interestingly enough, it seems that local financial conditions incorporate faster and more strongly the influence of global financial shocks than changes in domestic policy rates. These results confirm the thesis that timely and effective monetary policy reactions may often be difficult. We should notify nevertheless that monetary policy dynamics have a relatively strong impact on FCI.

Finally, we confirm that a considerable share of domestic FCI fluctuations is attributable to the global financial conditions shifts or domestic policy rate variations, namely almost 38.16%. This share of variation weakens and during the fifth year, its value is equal to 35.28%.

The future research will be focused on the dynamic of the FCI during the COVID-19 pandemic and its influence on the monetary conditions of the explored countries.

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