Makroekonomski učinci sistemskog stresa: pristup pomičnog indeksa prelijevanja

Škrinjarić, Tihana

Makroekonomski učinci sistemskog stresa: pristup pomičnog indeksa prelijevanja

Tihana Škrinjarić

Navodi u tekstu stavovi su autorice te ne moraju nužno izražavati stajalište ili mišljenje Hrvatske narodne banke.

travanj 2022.

SADRŽAJ

1. UVODNO

- Motivacija:
  - značaj sistemskog stresa (stvarni događaji)
  - prepoznato u literaturi (teorija i empirija, Borio i Lowe 2002, Borio i Drehmann 2009, Bloom 2009)
  - no, modeli bez mjera stresa i/ili makroprudencijalne politike
  - želimo korak bliže shvaćanju interakcija

- Cilj: istražiti interakciju sistemskog stresa i odabranih varijabli u Njemačkoj, pomoću indeksa prelijevanja šokova (Diebold i Yilmaz, 2012) u okviru VAR modela

- Doprinosi: nekoliko varijabli, dinamička analiza, detaljnija

- Zašto Njemačka?
  - Alter i Beyer (ECB, 2013): Njemačke, talijanske i austrijske banke najveći „davatelji" šokova (promjene CDS spreadova) u euro području (2009-2012)
  - Gross i Siklos (ESRB, 2018): Španjolska, Francuska, Njemačka i Švicarska su najveći „davatelji" (*emitters*) financijskog rizika (152 europskih CDS-ova, 2006-2017)
  - MMF (2016): Njemačka, Francuska, UK, SAD najveći „davatelji" šokova kapitalnih gubitaka bankovnog sustava
  - moguća usporedba s vezanim istraživanjima

2. VEZANA LITERATURA - ukratko

- Motivacija istraživanja nakon kriza; problematika mjerenja stresa

- Prvo radovi o načinu definiranja i mjerenja sistemskog stresa:
    - obuhvat (tržište novca, obveznica, dionica, FX, financijski posrednici); odražavanje transakcija; dostupno u realnom vremenu...
    - Hakkio i Keeton (2009) Kansas City Financial Stress Index
    - Holló i ostali (2012) **Composite Indicator of Systemic Stress**
    - Van Roye (2014) Financial Stress Market Indicator

- Potom istraživanja interakcije sistemskog stresa i ostatka ekonomije:
    - Li i St-Amant (2010): *threshold* VAR, za učinke stresa na monetarnu politiku, Kanada, inflacija i realna aktivnost jače reagiraju na kontrakcijsku MP (asimetričnost)
    - Van Roye (2014): *threshold* VAR, Njemačka, učinci stresa na IIP, inflaciju i k stopu, asimetričnost reakcija u ovisnosti o razdoblju višeg/nižeg stresa
    - Hartmann i ostali (2015): *regime switching* VAR, učinak stresa na IIP, k stopu, rast kreditiranja pvt sektoru, asimetričnost rezultata (samo u stresnijem razdoblju značajni rezultati)
    - Kremer (2016): VAR, Euro-zona, učinci stresa na BDP, inflaciju, k stopu, stres značajno utječe na sve varijable u modelu, no sam autor kritizira obični model

- „Jazevi" literature (*literature gaps*): dinamika, detaljnije analize prelijevanja šokova, obuhvat varijabli

3. METODOLOGIJA

- za ideju: VAR(1) za $N = 2$ varijable: $\boldsymbol{x_t} = \boldsymbol{Ax_{t\text{-}1}} + \boldsymbol{e_t}$, ako je $\boldsymbol{x_t}$ kovarijančno stacionaran, MA reprezentacija: $\boldsymbol{x_t} = \boldsymbol{\theta e_t}$, $\boldsymbol{\theta} = (\boldsymbol{I} - \boldsymbol{AL})^{-1}$, i uz pretpostavku Cholesky dekompozicije prikaz: $\boldsymbol{x_t} = \boldsymbol{A(L)u_t}$, $\boldsymbol{A(L)} = \boldsymbol{\theta(L)Q_t^{-1}}$, $\boldsymbol{u_t} = \boldsymbol{Q_t\,e_t}$

- prognoza u t+1: $\boldsymbol{x_{t+1,f}} = \boldsymbol{Ax_t}$; greška prognoze: $\boldsymbol{x_{t+1,f}} - \boldsymbol{x_{t+1}} = \boldsymbol{Au}_{t+1}$;

- varijanca prognoze: za x_1 ... $a_{11}^2 + a_{12}^2$, za x$_2$ ... $a_{21}^2 + a_{22}^2$ i iz toga dekompozicija varijanci:

$$\text{za } x_1 \text{ ... } \frac{a_{11}^2}{a_{11}^2 + a_{12}^2} = \tilde{a}_{11} \text{ i } \frac{a_{12}^2}{a_{11}^2 + a_{12}^2} = \tilde{a}_{12} \text{ i slično za } x_2 \text{ ... } \frac{a_{21}^2}{a_{21}^2 + a_{22}^2} = \tilde{a}_{12} \text{ i } \frac{a_{22}^2}{a_{21}^2 + a_{22}^2} = \tilde{a}_{22}$$

- indeks ukupnog prelijevanja šokova = $\tilde{a}_{12} + \tilde{a}_{12}$

- pomični prozori

- teorija i primjene u velikom uzletu: Diebold i Yilmaz (2009, 2012, 2015), Bostanci i Yilmaz (2020), Uluceviz i Yilmaz (2020), Bilgin i Yilmaz (2018), Antonakakis et al. (2016), Arčabić i Škrinjarić (2021a, 2021b)

4. REZULTATI

- Opis varijabli: (mjesečno, siječanj 1999. – prosinac 2020.), slučaj Njemačke

TABLE 1
Variables description

Abbreviation	Full name
DIIP	Year-on-year growth rate of index of industrial production
DHICP	Year-on-year growth rate of harmonized index of consumer prices
DIRATE	Year-on-year change of the 3-month Euribor rate
DLN	Year-on-year growth rate of nominal bank loans to the private sector
CISS	German Composite Indicator of Systemic Stress
SQ_CISS	Square root of CISS
DGDP	Year-on-year growth rate of gross domestic product

Source: Eurostat (2021), DBE (2021), ECB (2021).
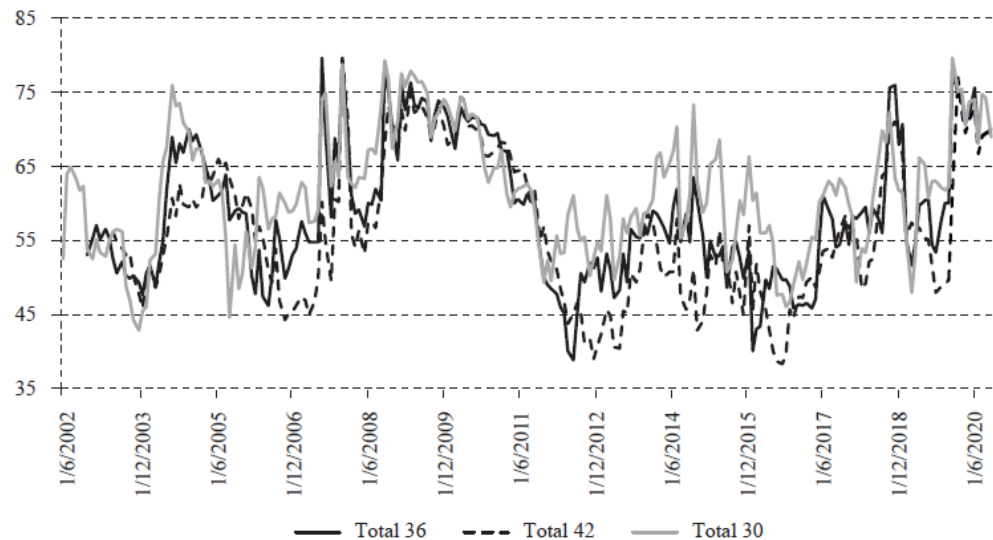
TABLE 2

Spillover table, full sample, in percent

Variable	DIIP	DHICP	DIRATE	DLN	CISS	From	T_from
DIIP	52.84	5.05	16.77	1.89	23.46	11.79	47.17
DHICP	21.15	63.80	2.29	0.66	12.09	9.05	36.19
DIRATE	12.35	1.27	56.89	1.17	28.32	10.77	43.11
DLN	0.07	1.38	9.61	84.55	4.38	3.86	15.44
CISS	3.03	4.25	2.21	0.45	90.06	2.49	9.94
To	9.15	2.99	7.72	1.04	17.06	-	-
T_to	36.60	11.95	30.88	4.17	68.25	-	37.96

Source: Author's calculation.

- za h = 12 mjeseci prognoze unaprijed, cijeli uzorak (statička analiza)

- CISS kao davatelj šokova, poredak:
  - kamatna stopa (očekivano s obzirom na reakcije monetarne politike na zbivanja obuhvaćena u CISS varijabli) i IIP (očekivano, s obzirom na rastuću literaturu o GaR)
  - inflacija, krediti – slaba reakcija (statička analiza, u skladu s ne-reagiranjem u Hartmann i ostali (2013))

- CISS kao primatelj šokova: inflacija, IIP, kamatna stopa, krediti – vrlo malo što je u skladu s literaturom da je teško predviđati financijski stres

FIGURE 1

Total spillover index, h = 12, rolling windows 30, 36 and 42 months

Source: *Author's calculation.*

Povećavanje prelijevanja šokova:

2003: Dotcom bubble i Worldcom bankrot
2007/2008: GFC
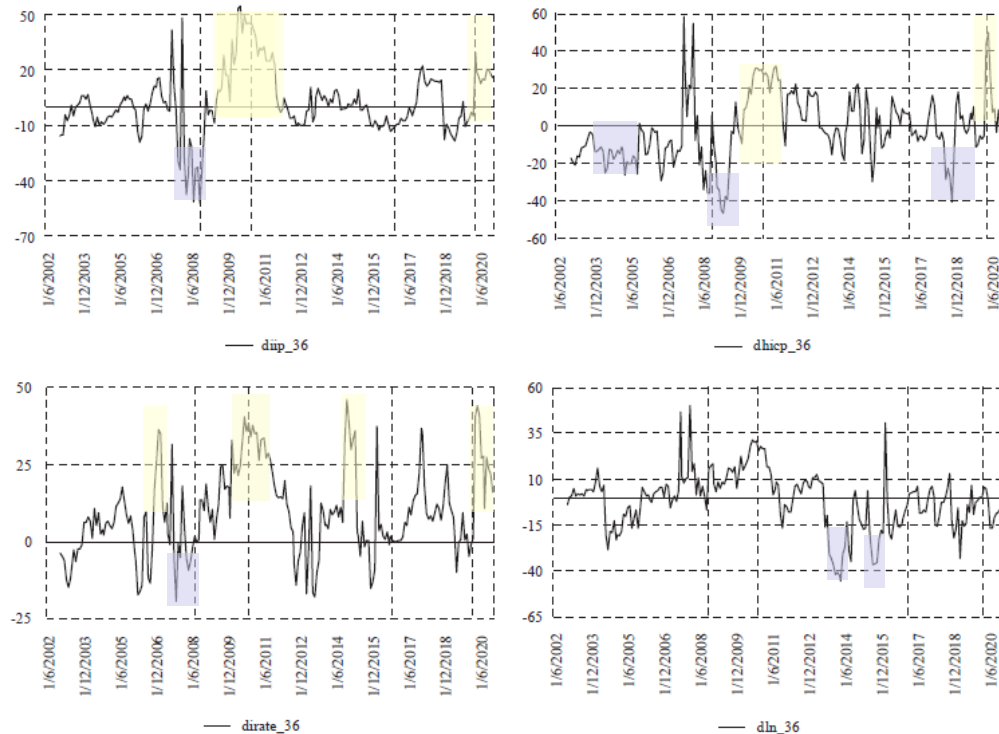2018: promjene očekivanja investitora zbog povećanja k. stopa FED-a
2020: COVID-19 (očekivanja bila da vrlo kratko: Boivin i dr. (2020), zbog brze reakcije (Ehnts i Paetz, 2021), banke dio rješenja (Giese i Haldane, 2020)

Smanjenja:
2011-2012: ECB najava o kupovini državnih obveznica, Weber dao ostavku pa se nastavila politika otkupa, dogovor da EFSF (European Financial Stability Facility) i ESM (European Stability Mechanism) izravno interveniraju

FIGURE 2

Net pair-wise spillover indices between each variable and CISS, h =12, rolling windows 36 months

Note: Dashed lines indicate dates from left to right: Global financial crisis, Euro crisis, Brexit referendum vote and COVID-19 crisis.

Source: Author's calculation.

- Praćenje indeksa za svaki par varijabli

DIIP:

- odsustvo u mirnijim razdobljima (Hakkio i Keeton, 2009; Hubrich i Tetlow, 2014)

- suprotno u stresnijem razdoblju (u skladu s GaR literaturom)

DHICP:

- CISS prima šokove prije GFC (Frankel, 2012)

DIRATE:

- češće primatelj šokova (u skladu s konvencionalnim pogledom na mon. pol., Bernanke i Gertler, 2001; Ben i ostali, 2010)
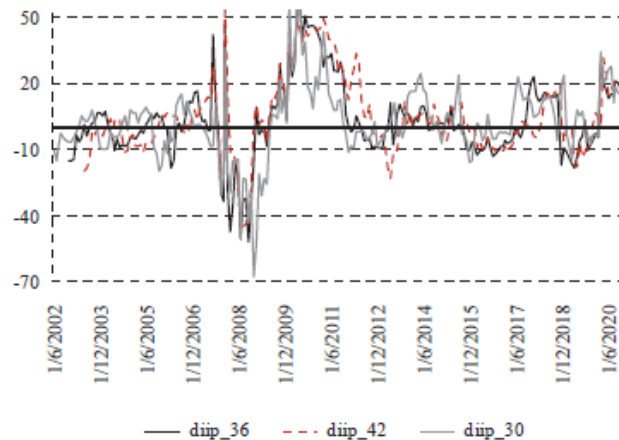
- uzima u obzir ne samo Y i π, nego i očekivanja u CISS-u

DLN:

- najstabilniji indeks, usporenija reakcija (Ivashina i Scharfstein, 2010; Harmann i ostali, 2013 – draw downs)

Robusnost rezultata

- Promjena duljine pomičnog prozora

- Promjena duljine horizonta predviđanja iz procjena

- BDP umjesto IIP

Net pair-wise spillover indices between each variable and CISS, h =12, rolling windows 30, 36 and 42months

Source: Author's calculation.

5. ZAKLJUČAK

- Motivacija (nedostatak teorijskih i empirijskih istraživanja; razumijevanje interakcije)

    - 12.4.2022. Laeven et al.: Monetary and macroprudential policies: trade-offs and interactions: „*New state-of-the-art empirical and conceptual frameworks need to be developed to assess in a timely manner wheter risk-taking is becoming excessive...*"

    - Navode radove iz 2021. i 2022.

    - 10.4.2022. Revelo i Levieuge: When Could Macroprudential and Monetary Policies Be in Conflict? „Further research could also focus on extending the analytical framework by inserting an endogenous risk-taking channel as an additional source of financial-side vulnerability caused by monetary policy."

- Sumarno:

    - mirnija razdoblja: manja reakcija na stres, realna aktivnost većinom reagira na stres

- Ovakav pristup:

    - dinamika interakcija

    - bogatije informacije u rezultatima

- Nedostaci: dulje razdoblje, druge varijable

- Budućnost: povezati s drugim pristupima (Suarez 2021, mapru funkcija korisnosti)

Hvala na pažnji!

Literatura

- Borio C, Lowe P (2002) Asset prices, financial and monetary stability: exploring the nexus. BIS Working Papers 114, Bank for International Settlements
- Borio C, Drehmann M (2009) Assessing the risk of banking crises: revisited. BIS Q Rev 1(2):29–46
- Bloom N (2009) The impact of uncertainty shocks. Econometrica 77(3):623–685
- Alter A, Beyer A (2013) The dynamics of spillover effects durignt the European Sovergn Debt Turmoil, ECB working paper series, No 1558, European Central Bank
- Gross C, Siklos P (2018) Analyzing credit risk transmission to the non-financial sector in Europe: a network approach, ESRB working paper series, No 78, European Systemic Risk Board
- Diebold FX, Yimaz K (2015) Financial and Macroeconomic Connectedness: A Network Approach to Measurement and Monitoring, Oxford University Press, April 2015
- Bostanci G, Yilmaz K (2020) How Connected is the Global Sovereign Credit Risk Network?, Journal of Banking and Finance, forthcoming, 2020.
- Uluceviz E,Yilmaz K.(2020) Measuring Real–Financial Connectedness in the Swiss Economy, Swiss Journal of Economics and Statistics, 156(1).
- Bilgin N. M. Yilmaz K.(2018) Producer Price Inflation Connectedness and Input-Output Networks, Koc University-TUSIAD Economic Research Forum, Working Paper No. 1813
- Hakkio SC, Keeton WR (2009) Financial Stress: What Is It, How Can It be Measured, and Why Does It Matter? Economic Review, 94(2), 5-50.
- Hartmann P. [et al.] (2015) Melting down: Systemic financial instability and the macroeconomy.
- Holló D, Kremer M, Lo Duca M (2012) CISS – A composite indicator of systemic stress in the financial system. ECB Working Paper, No 1426.
- Van Roye B (2014) Financial stress and economic activity in Germany. Empirica, 41, 101-126
- Mallick SK, Sousa RM (2013) The real effects of financial stress in the Eurozone. *International Review of Financial Analysis*, 30, 1-17.
- Kremer M (2015) Macroeconomic effects of financial stress and the role of monetary policy: a VAR analysis for the euro area. International Economics and Economic Policy, 13(1), 105-138.
- Diebold FX, Yilmaz K (2009) Measuring Financial Asset Return and Volatility Spillovers with Application to Global Equity Markets. The Economic Journal, 119(534), 158-171
- Diebold FX, Yilmaz K (2012) Better to Give than to Receive: Predictive Directional Measurement of Volatility Spillovers. International Journal of Forecasting, 28(1), 57-66
- Arčabić V, Škrinjarić T (2021) Sharing is caring: Spillovers and synchronization of business cycles in the European Union. Economic Modelling, 96, 25–39.
- Antonakakis N, Badinger H (2016) Economic growth, volatility, and cross-country spillovers: new evidence for the G7 countries. Econ. Modell. 52 (Part B), 352–365.
- Škrinjarić T (2021a) Asymmetric Spillovers Between the Stock Risk Series: Case of CESEE Stock Markets, Computational Management Applications of Computational Intelligence in Business Management / Patnaik, Srikanta ; Tajeddini, Kayhan ; Jain, Vipul (ur.). Cham: Springer, 2021. 97-135
- Škrinjarić T (2021b) Međuovisnost prinosa, rizika i volumena online pretraživanja tržišnog indeksa: pristup prelijevanja šokova na Zagrebačkoj burzi, Ekonomski pregled : mjesečnik Hrvatskog društva ekonomista Zagreb, 72, 1; 3-33
- Boivin J, Giannoni M, Stevanović D, (2020) Dynamic effects of credit shocks in a datarich environment. Journal of Business & Economic Statistics,
- 38(2),. 272-284.
- Ehnts D, Paetz M (2021) COVID-19 and its economic consequences for the Euro Area. Eurasian Economic Review, 11, 227-249
- Giese J, Haldane A. (2020) COVID-19 and the financial system: a tale of two crises. Oxford Review of Economic Policy, 36(S1), S200-S214
- MMF (2016) Germany: Financial Sector Assessment Program -- Financial System Stability Assessment; 2016 International Monetary Fund; June 2016

- DBE, 2021. *DBE 2021 database.*
- Eurostat, 2021. *Database.*
- ECB, 2021. *ECB Database.* Frankfurt am Main: European Central Bank.