

A New Financial Stress Index for Ukraine

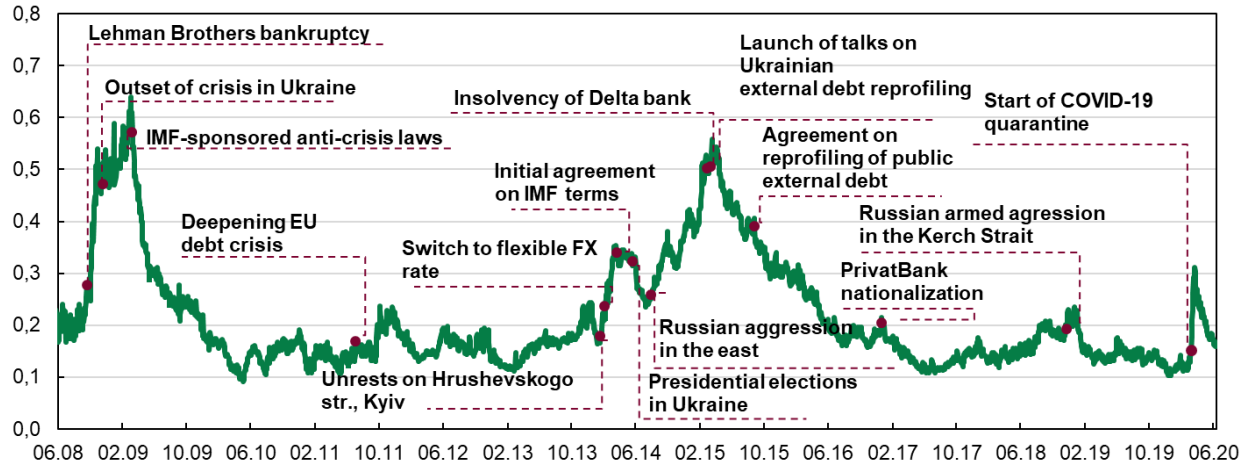
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Financial Stress Index v 1.0



Weaknesses:

- Sensitivity to one-indicator movement (high volatility during normal time);
- Underestimation of stress level in crisis time;
- Several indicators do not show desired performance.

Selection and testing of indicators

Selection of general pool:

- In general pool of indicators we include 1) indicators from FSI 1.0; 2) relevant indicators from other indices; 3) different maturity of indicators (such as CDS etc);
- 47 indicators tested.

Crises periods:

- We created 3 dummies based on: 1) GDP growth; 2) Survey of experts – periods of crises; 3) Survey of experts – peaks of crises.

Testing of indicators:

- Logit
- AUROC
- St. deviation and means
- Graph analysis

Final list of indicators

BANKING sub-index

- 1) Ukrainian OverNight Index Average
- 2) KIEBOR 1M
- 3) Price of Ukrainian banks' Eurobonds
- 4) LCR
- 5) Support of NBU to banks

GOVERNMENT DEBT sub-index

- 1) Ukrainian credit default swaps (CDS), 5-year
- 2) Sovereign risk of Ukrainian Eurobonds
- 3) Yield of domestic bonds in UAH
- 4) Bid-ask spread of Ukrainian Eurobonds

CORPORATE sub-index

- 1) Yield of corporate Eurobonds
- 2) Stock Index
- 3) Volatility of stock index

HOUSEHOLD BEHAVIOUR sub-index

- 1) Ukrainian Index of Retail Deposit Rates (UIRD), 3-month
- 2) Change of retail deposits in UAH over the last 30 days
- 3) Change of retail deposits in USD over the last 30 days

FOREIGN CURRENCY MARKET sub-index

- 1) USD/UAH exchange rate
- 2) Volatility of USD/UAH exchange rate
- 3) Expectations for national currency devaluation
- 4) Yield of non-deliverable forward, 3-month
- 5) Currency intervention of the NBU

Aggregation of subindices

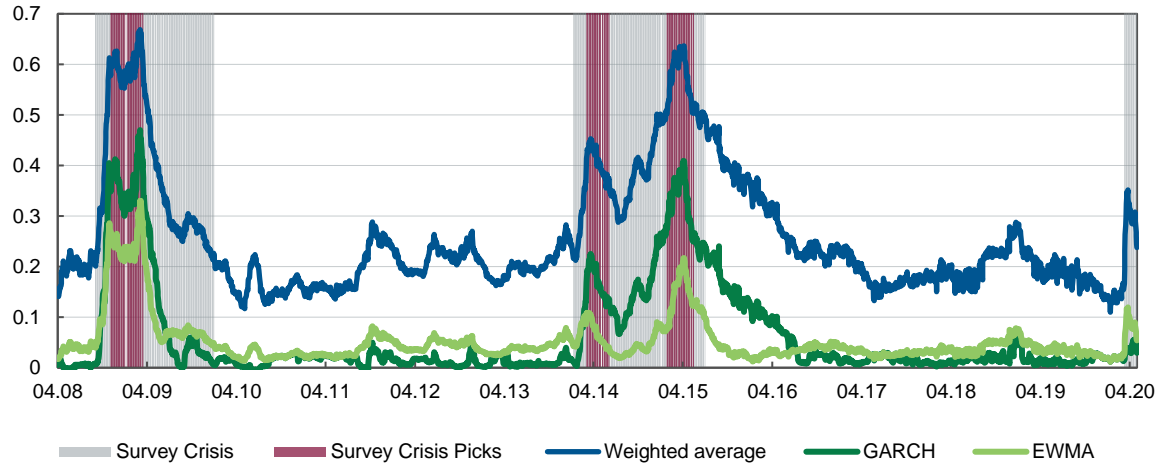
- Weighted average;
- Parallel to portfolio theory:
 - exponentially-weighted moving average (EWMA);
 - generalized autoregressive conditional heteroscedasticity (GARCH).

$$FSI_t = (s_t \circ w) C_t (s_t \circ w)^T$$

where s_t is the vector of the values of the sub-indices in period t , w is the vector of weights for the sub-indices and C_t is the dynamic correlation matrix for the sub-indices in period t , given by

$$C_t = \begin{bmatrix} 1 & \rho_{12,t} & \rho_{13,t} & \rho_{14,t} & \rho_{15,t} \\ \rho_{12,t} & 1 & \rho_{23,t} & \rho_{24,t} & \rho_{25,t} \\ \rho_{13,t} & \rho_{23,t} & 1 & \rho_{34,t} & \rho_{35,t} \\ \rho_{14,t} & \rho_{24,t} & \rho_{34,t} & 1 & \rho_{45,t} \\ \rho_{15,t} & \rho_{25,t} & \rho_{35,t} & \rho_{45,t} & 1 \end{bmatrix}$$

Comparison of aggregation methodologies



	Weighted average	EWMA	GARCH
Crisis 2008-2009	+	+	+
Crisis 2014-2015	+	-	+
Crisis 2020	+	+	+ -
Volatilities during normal times	-	+ -	+
Peaks in crises	+ -	+ -	+
AUROC Survey Crisis	0.939	0.874	0.886
AUROC Survey Crisis Peaks	0.978	0.946	0.978

FSI 2.0





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Appendix. Weight of subindices

	Banking	Household	Government debt	Corporate	Foreign currency market
Logit coefficient adjusted	19,5%	13,5%	20,8%	22,0%	24,2%
Ratio to GDP	20%	12%	26%	10%	32%
FSI 1.0	30%		25%	10%	35%
AUROC of survey dummy	0,83	0,77	0,92	0,91	0,90
AUROC of picks in survey dummy	0,87	0,84	0,87	0,94	0,92
RESULTS	20%	15%	20%	20%	25%