

Vulnerable Funding in the Global Economy

Third Catalan Economic Society Conference (CESC)

Helena Chuliá
(Universitat de Barcelona & Riskcenter-IREA)

Ignacio Garrón
(Universitat de Barcelona)

Jorge M. Uribe
(Universitat Oberta de Catalunya & Riskcenter-IREA)

3/06/2023

Contenido

This paper

Methodology

Data

Results

Conclusions

General motivation

- ▶ Giglio et al. (2016) and Adrian et al. (2019) early document that financial conditions have significant predictive power on real economic activity during distressed macroeconomic scenarios.
- ▶ This relationship has been examined and evaluated over a large set of different countries (Brownlees and Souza, 2021; Figueres and Jarociński, 2020; Prasad et al., 2019) and macroeconomic variables (Adams et al., 2021).
- ▶ Yet, the intermediate risk channel has not been fully explored: US financial conditions and financial markets abroad.

This paper

Research questions

- ▶ How US financial conditions in the US impact funding markets (credit and stocks) around the world, under macro-financial distress scenarios?
- ▶ How can we broadly account for US financial conditions?
- ▶ What is the most likely reason for a given country's vulnerability to US financial shocks?

Related literature: Growth at Risk

- ▶ Giglio et al. (2016) and Adrian et al. (2019) early document that financial conditions have significant predictive power on real economic activity during distressed macroeconomic scenarios.
- ▶ Extensive evidence for macroeconomic variables (Brownlees and Souza, 2021; Kiley, 2021; Adams et al., 2021; Lopez-Salido and Loria, 2022)

Contribution

- ▶ We rather focus on the intermediate step, *vulnerable funding* instead of vulnerable growth.
- ▶ US financial conditions → Decline in funding markets abroad (credit and stocks).

Related literature: US financial conditions

- ▶ Financial condition is a broad concept which refers to the current state of financial variables that influence economic behavior and the future state of the economy (Hatzius et al., 2010).
- ▶ The National Financial Conditions Index (NFCI) is preferably used as a financial condition index for the US (Adrian et al., 2019).
- ▶ Ludvigson et al. (2021) construct a new financial uncertainty index (FUI) for the US that provides exogenous response to output fluctuations.

Contribution

- ▶ Our framework uses two different financial conditions indicators to support our claims: NFCI and FUI.

Related literature: Impact of US financial shocks on global markets

- ▶ US financial shocks impact global markets.
 - ▶ International credit view: capital flows, international exposition to credit markets, domestic cost of credit (Kalemli-Özcan, 2019; Bräuning and Ivashina, 2020; Di Giovanni et al., 2022).
 - ▶ Portfolio view: uncertainty effect (Fernández-Villaverde et al., 2011; Bordo et al., 2016).
- ▶ Determinants of financial vulnerability to external shocks.
 - ▶ Size and financial Depth (Carrière-Swallow and Céspedes, 2013; Kalemli-Özcan, 2019).
 - ▶ Foreign direct Investment (Alfaro et al., 2004).

Contribution

- ▶ We analyze the cross sectional determinants of vulnerable funding.

Main findings

1. US financial shocks have a larger and more significant impact on the lowest quantiles of credit and stock prices than on the central and upper quantiles.
2. Real credit growth largely responds to shocks to US financial conditions up to three years after they originated.
3. Stock markets react more sensitively and rapidly (mainly within one quarter ahead) to financial uncertainty shocks
4. Funding markets (credit and stocks) with lower credit to GDP, higher U.S. investment relative to country's GDP and a higher Chinn-Ito index are more vulnerable to US financial shocks

Methodology: Quantile regression

1. Multi-country factor augmented quantile-regression models Koenker and Bassett (1978); Koenker (2005).
2. The base-line specification is given by Equation 1:

$$\underbrace{y_{it+h}(\tau)}_{\text{Credit or stock}} = \beta_{0i}(\tau)y_{it} + \beta_{1i} \underbrace{us.fc_t}_{\text{NFCI or FUI}} + \delta_{1i}(\tau)' \underbrace{X_t}_{\text{Global factors}} + \epsilon_{it}(\tau)$$

$i = 1, \dots, N$ country, $h = \{0, 1, 4, 8, 12\}$ forecasting horizon, and $\tau \in (0, 1)$ to the τ -th quantile.

3. We standardized all the variables to have comparative β between countries.
4. Smooth extended tapered block bootstrap S.E. proposed by Gregory et al. (2018) for quantile regressions.

Methodology: Global macroeconomic and financial factors

- ▶ We use a dynamic factor model (Doz et al., 2012) as others (Brave et al., 2011).
- ▶ First factor: global macroeconomic factor (GDP growth, inflation, credit stocks, bond yields).
- ▶ Second factor: global financial factor (credit stocks, bond yields).
- ▶ Restrictions on the second factor (Plagborg-Møller et al., 2020).

Methodology: Cross-sectional determinants

OLS regressions for each τ and h .

$$\underbrace{\beta_{1i}(\tau)}_{\text{Vulnerability}} = \beta_2(\tau) \underbrace{\overline{Credit/GDP_i}}_{\text{Financial depth}} + \beta_3(\tau) \underbrace{\overline{US.FDI_i}}_{\text{US FDI on country i}} + \beta_4(\tau) \underbrace{\overline{Chinn - Ito_i}}_{\text{Chinn-Ito}} + e_i(\tau)$$

Constant is considered.

Data

1. Long quarterly macro and finance database from 1960Q1 to 2019Q4 Monnet and Puy (2019).
 - ▶ Global financial factor (N=89; T=240) contains real credit growth, stock returns and changes in sovereign bond yields.
 - ▶ Global macroeconomic factor (N=174; T=240) also includes real GDP growth, inflation.
 - ▶ Real credit growth (N=44) and stock market returns (N=25).
2. National Financial Condition Index (NFCI) from 1971Q1 to 2019Q4¹.
3. Financial uncertainty indicator Ludvigson et al. (2021) from 1960Q3 to 2019Q4².
4. Credit/GDP (N=44, 1960-2019), Chinn-Ito (N=25, 1970-2019), US direct investment abroad/GDP (N=44, 1989-2019)

¹<https://www.chicagofed.org/publications/nfci/index>

²<https://www.sydneyludvigson.com/macro-and-financial-uncertainty-indexes>

Data

- Our global factors point-out to the existence of a global cycle that commoves with the U.S. recession periods as identified by the NBER.

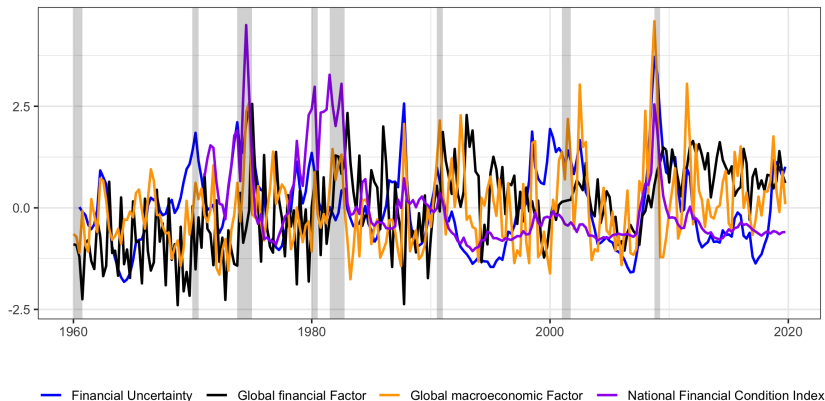


Figure 1: Global factors and US financial conditions

Standardized variables. Time span 1960Q1 to 2019Q4. Red shaded area represents NBER recessions at the end of the period.

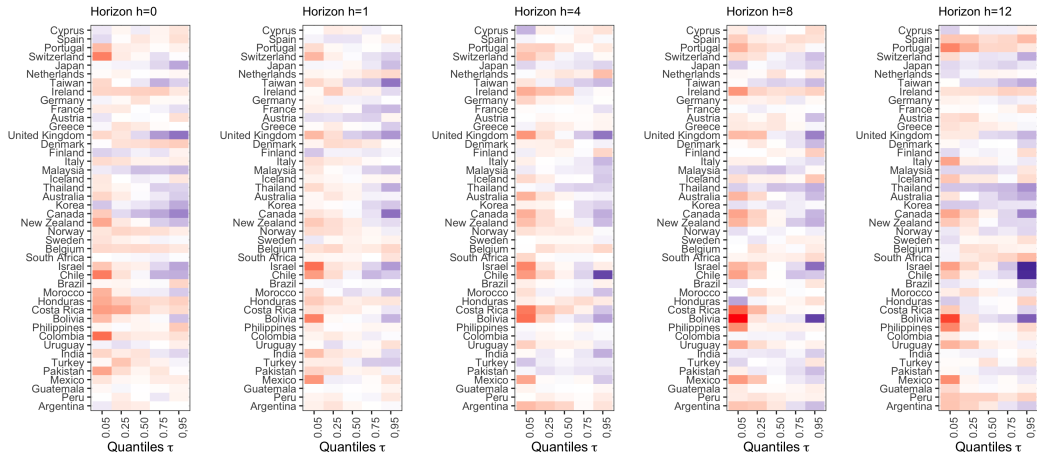
Results for Credit-at-risk

$$\underbrace{y_{it+h}(\tau)}_{\text{Real credit growth}} = \beta_{0i}(\tau)y_{it} + \underbrace{\beta_{1i}}_{\text{NFCI}} \underbrace{us.fc_t}_{\text{NFCI}} + \delta_{1i}(\tau)' \underbrace{X_t}_{\text{Global factors}} + \epsilon_{it}(\tau)$$

$i = 1, \dots, 44$ country, $h = \{0, 1, 4, 8, 12\}$ forecasting horizon, and $\tau \in (0, 1)$ to the τ -th quantile. We standardized all the variables to have comparative β between countries.

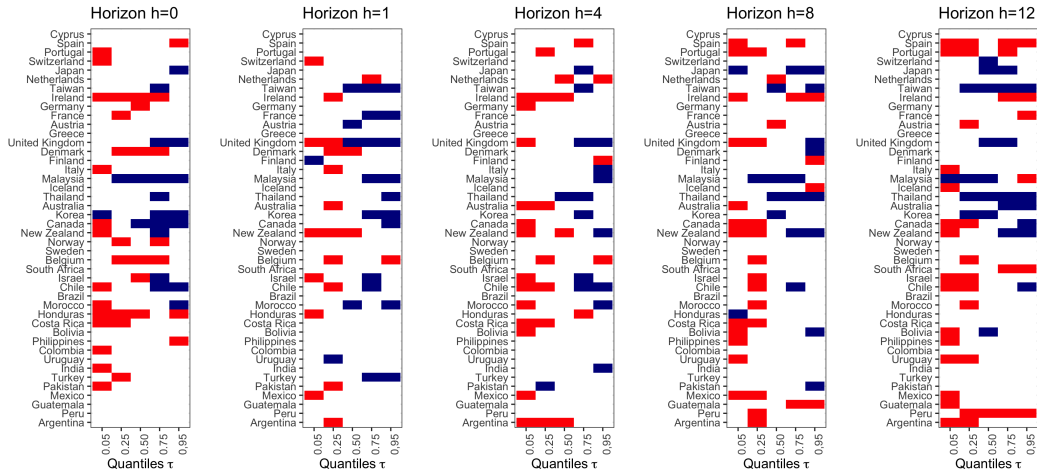
Results 1

Countries ordered by Credit-to-GDP (descendent)



Results 1: Coefficients

Countries ordered by Credit-to-GDP (descendent)



Results: Cross sectional analysis of β_{1i}

Horizon	Variable	q=0.05	q=0.25	q=0.50	q=0.75	q=0.95
0	Constant	-0.265***	-0.126***	-0.062*	0.022	0.041
	US inv./GDP (%)	-0.006	-0.003**	-0.002	-0.003	0.000
	Credit/GDP (%)	0.002	0.001	0.000	0.000	0.000
	Chinn-Ito index	0.027	0.027	0.012	0.032	0.043
1	Constant	-0.265***	-0.076**	-0.016	0.028	0.059
	US inv./GDP (%)	-0.002	-0.004**	-0.002**	-0.003*	-0.001
	Credit/GDP (%)	0.002**	0.000	0.000	0.000	0.000
	Chinn-Ito index	-0.003	0.017	0.015	0.012	0.020
4	Constant	-0.315***	-0.069*	-0.039	0.036	0.176***
	US inv./GDP (%)	-0.007*	-0.005**	-0.004***	0.000	-0.002
	Credit/GDP (%)	0.003***	0.000	0.001	0.000	-0.001
	Chinn-Ito index	-0.066**	-0.018	-0.006	0.000	0.008

Robust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1: Cross-sectional determinants

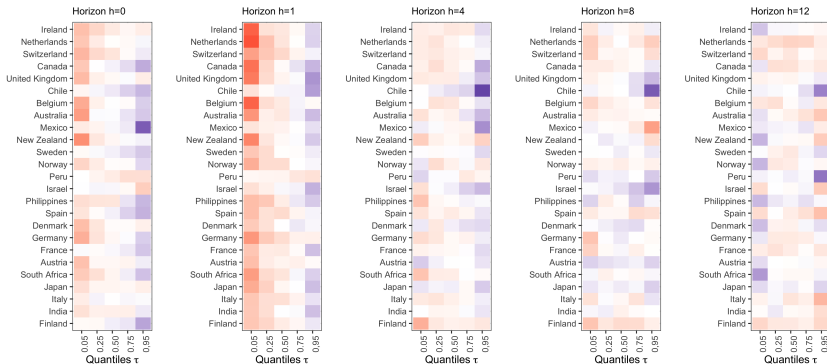
Results for Equity-at-risk

$$\underbrace{y_{it+h}(\tau)}_{\text{Stocks prices growth}} = \beta_{0i}(\tau)y_{it} + \underbrace{\beta_{1i}}_{\text{FUI}} \underbrace{us.fc_t}_{\text{FUI}} + \delta_{1i}(\tau)' \underbrace{X_t}_{\text{Global factors}} + \epsilon_{it}(\tau)$$

$i = 1, \dots, 256$ country, $h = \{0, 1, 4, 8, 12\}$ forecasting horizon, and $\tau \in (0, 1)$ to the τ -th quantile. We standardized all the variables to have comparative β between countries.

Results 2: Coefficients

Countries ordered by U.S. investment relative to country's GDP
(descendent)



Countries ordered by U.S. investment relative to country's GDP
(descendent)



Results: Cross sectional analysis of β_{1i}

Horizon	Variable	q=0.05	q=0.25	q=0.50	q=0.75	q=0.95
-4*0	Constant	-0.219***	-0.122***	-0.077***	-0.007	-0.001
	US inv./GDP (%)	-0.006***	-0.002**	-0.001	-0.001	0.000
	Credit/GDP (%)	0.001	0.001**	0.001**	0.000	0.000
	Chinn-Ito index	0.031	0.020*	0.016	0.021	0.043*
-4*1	Constant	-0.201***	-0.076***	-0.037**	-0.009	-0.029
	US inv./GDP (%)	-0.004**	-0.003**	-0.002***	-0.001	0.003
	Credit/GDP (%)	0.001**	0.000	0.000	0.001*	0.001
	Chinn-Ito index	0.012	0.022**	0.014*	0.010	0.020
-4*4	Constant	-0.235***	-0.033	-0.030*	0.030	0.184***
	US inv./GDP (%)	-0.003	-0.003***	-0.003***	0.000	0.001
	Credit/GDP (%)	0.002***	0.000	0.000	0.000	-0.001*
	Chinn-Ito index	-0.008	0.007	0.010	0.010	0.012

Robust standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Cross-sectional determinants

Robustness checks and other results in the paper

1. Relationship between coefficients: GaR vs EaR and CaR.
2. Add both US financial condition indicators in the same specification.
3. Consider 4 lags of the dependent variable.
4. Consider country-specific financial condition indicators for each country for a subsample of 24 OECD countries.
5. Study LAC countries subsample (macroprudential policies).

Conclusions

1. Financial conditions in the United States have significant predictive power on the lowest quantiles of credit growth and stock market prices around the global economy.
2. Real credit growth largely responds to shocks to US financial conditions up to three years after they originated.
3. Stock markets react more sensitively and rapidly (mainly within one quarter ahead) to financial uncertainty shocks
4. Funding markets (credit and stocks) with lower credit to GDP, higher U.S. investment relative to country's GDP and a higher Chinn-Ito index are more vulnerable to US financial shocks
5. We show that international funding markets are a source of persistence and amplification of financial conditions shocks across the global economy.

Bibliography I

- Adams, P. A., Adrian, T., Boyarchenko, N., and Giannone, D. (2021). Forecasting macroeconomic risks. *International Journal of Forecasting*, 37(3):1173–1191.
- Adrian, T., Boyarchenko, N., and Giannone, D. (2019). Vulnerable growth. *American Economic Review*, 109(4):1263–1289.
- Alfaro, L., Chanda, A., Kalemli-Ozcan, S., and Sayek, S. (2004). FDI and economic growth: The role of local financial markets. *Journal of International Economics*, 64(1):89–112.
- Bordo, M. D., Duca, J. V., and Koch, C. (2016). Economic policy uncertainty and the credit channel: Aggregate and bank level U.S. evidence over several decades. *Journal of Financial Stability*, 26:90–106.
- Bräuning, F. and Ivashina, V. (2020). U.S. monetary policy and emerging market credit cycles. *Journal of Monetary Economics*, 112:57–76.
- Brave, S. A., Butters, R. A., Brave, S., and Butters, R. A. (2011). Monitoring financial stability: a financial conditions index approach. *Economic Perspectives*, 35(Q I):22–43.

Bibliography II

- Brownlees, C. and Souza, A. B. (2021). Backtesting global Growth-at-Risk. *Journal of Monetary Economics*, 118:312–330.
- Carrière-Swallow, Y. and Céspedes, L. F. (2013). The impact of uncertainty shocks in emerging economies. *Journal of International Economics*, 90(2):316–325.
- Di Giovanni, J., Kalemli-Özcan, S., Ulu, M. F., and Baskaya, Y. S. (2022). International Spillovers and Local Credit Cycles. *The Review of Economic Studies*, 89(2):733–773.
- Doz, C., Giannone, D., and Reichlin, L. (2012). A Quasi-Maximum Likelihood Approach for Large, Approximate Dynamic Factor Models. *The Review of Economics and Statistics*, 94(4):1014–1024.
- Fernández-Villaverde, J., Guerrón-Quintana, P., Rubio-Ramírez, J. F., and Uribe, M. (2011). Risk matters: The real effects of volatility shocks. *American Economic Review*, 101(6):2530–2561.
- Figueres, J. M. and Jarociński, M. (2020). Vulnerable growth in the euro area: Measuring the financial conditions. *Economics Letters*, 191:109126.

Bibliography III

- Giglio, S., Kelly, B., and Pruitt, S. (2016). Systemic risk and the macroeconomy: An empirical evaluation. *Journal of Financial Economics*, 119(3):457–471.
- Gregory, K. B., Lahiri, S. N., and Nordman, D. J. (2018). A smooth block bootstrap for quantile regression with time series. *Annals of Statistics*, 46(3).
- Hatzius, J., Hooper, P., Mishkin, F., Schoenholtz, K., and Watson, M. (2010). Financial Conditions Indexes: A Fresh Look after the Financial Crisis. Technical report, National Bureau of Economic Research, Cambridge, MA.
- Kalemli-Özcan, S. (2019). U.S. Monetary Policy and International Risk Spillovers. *NBER Working Papers N°26297*.
- Kiley, M. T. (2021). Unemployment Risk. *Journal of Money, Credit and Banking*, 54:1407–1424.
- Koenker, R. (2005). *Quantile regression*. Cambridge University Press.
- Koenker, R. and Bassett, G. (1978). Regression Quantiles. *Econometrica*, 46(1):33.

Bibliography IV

- Lopez-Salido, D. and Loria, F. (2022). Inflation at Risk. *Available at SSRN*: <https://ssrn.com/abstract=4002673>.
- Ludvigson, S., Ma, S., and Ng, S. (2021). Uncertainty and Business Cycles: Exogenous Impulse or Endogenous Response? *American Economic Journal: Macroeconomics*.
- Monnet, E. and Puy, D. (2019). One Ring to Rule Them All? New Evidence on World Cycles. *IMF Working Paper No. 19/202*.
- Plagborg-Møller, M., Reichlin, L., Ricco, G., and Hasenzagl, T. (2020). When Is Growth at Risk? *Brookings Papers on Economic Activity*, 2020(1):167–229.
- Prasad, A., Elekdag, S., Jeasakul, P., Lafarguette, R., Alter, A., Xiaochen Feng, A., and Wang, C. (2019). Growth at Risk: Concept and Application in IMF Country Surveillance. *IMF Working Papers*, 19(36):1.