Macroeconomic News, the Financial Cycle and the Commodity Cycle: the Chinese Footprint

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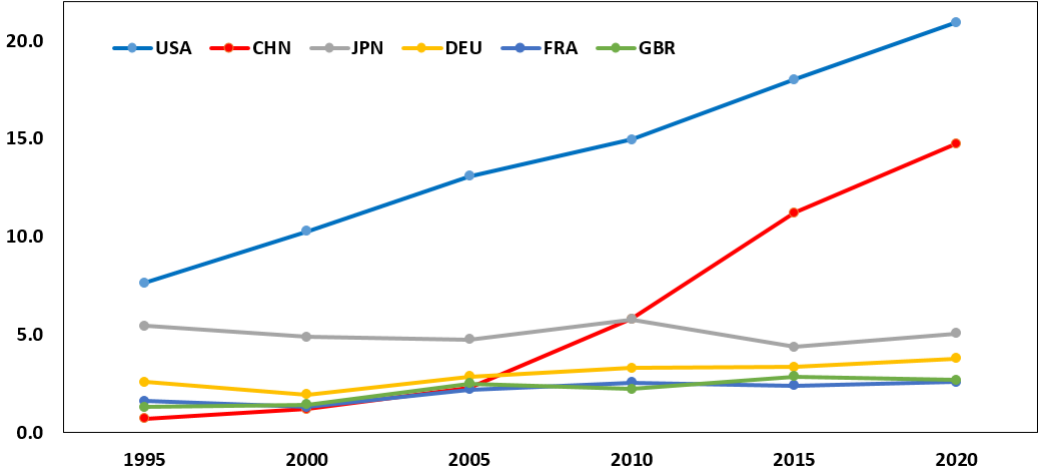Bank of Italy

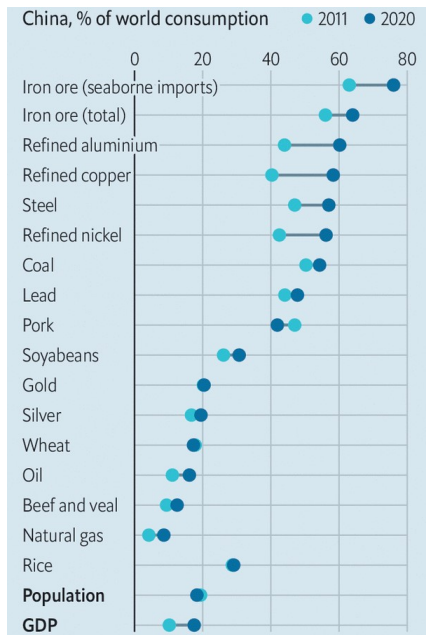BOFIT conference - Chinese path to modernization

24 April 2023

China is the second largest world economy...

Average nominal GDP (USD trillions)

...and has a substantial footprint in global commodity markets

China, % of world consumption ● 2011 ● 2020

Commodity	
Iron ore (seaborne imports)	
Iron ore (total)	
Refined aluminium	
Refined copper	
Steel	
Refined nickel	
Coal	
Lead	
Pork	
Soyabeans	
Gold	
Silver	
Wheat	
Oil	
Beef and veal	
Natural gas	
Rice	
Population	
GDP	

Source: Economist

Overview of the paper - 1

- ► We study the impact of China economy on international markets (see Miranda-Agrippino et al. (2020), Barcelona et al. (2022), Antonelli et al. (2022))

    - ► Nascent, but rapidly growing, literature in this field as China gradually opens its financial markets and increases its footprint on the global economy.

    - ► Chinese authorities pursue policy targets through a range of fiscal and monetary instruments, which could muddle the identification of the specific policy tools being employed.

- ► We propose a measure of the Chinese macroeconomic impact based on professional forecasters' expectations

    - ► Overcome the debate on the use of official data to assess the health of the Chinese economy (Fernald et al. (2021), Clarck et al. (2017), Barcelona et al. (2022))

    - ► Allow for a causal interpretation of (high-frequency) macroeconomic news (Boehm and Kroner (2020), Faust et al. (2007))

Overview of the paper - 2

- ▶ We find that Chinese macroeconomic developments affect international markets

  - ▶ China drives the global **financial** cycle: global equity markets and risk sentiment positively (negatively) react to unexpected good release in terms of industrial production, trade balance, retail sales, PMI index (inflation data)

  - ▶ China drives the global **real** cycle: commodity markets and risk sentiment positively (negatively) react to unexpected good release in terms of industrial production, PMI index (inflation data and total social financing)

  - ▶ Sizable impact, although less statistical significant, also at lower frequencies (weekly and monthly)

- ▶ Cumulated positive surprises are associated with increase in global trade and industrial production

  - ▶ In response to a 1 standard deviation shock to the Chinese macro-surprise index, global industrial production increases by 0.5%, global trade by near 0.6%.

The definition of macroeconomic surprises

| Local Date	Count down	Local Time				Indicator Name	Period	Reuters Poll	Actual	Surprise	Prior	Revised	Min	Max	Count	Smart Econo...	Predict... Surprise
15 Nov		03:00				Urban Investment (YTD)YY	Oct	5,9%	5,8%	-0,10%	5,9%		5,6%	6,1%	21	5,90%	0,00%
15 Nov		03:00				Industrial Output YY	Oct	5,2%	5,0%	-0,20%	6,3%		4,3%	6,5%	22	5,21%	0,01%
15 Nov		03:00				Retail Sales YY	Oct	1,0%	-0,5%	-1,50%	2,5%		-2,5%	3,1%	22	0,80%	-0,20%
30 Nov	≈	02:30				NBS Manufacturing PMI	Nov	49,0	48,0	-1,00	49,2		48,5	49,7	27	49,02	0,02
1 Dec		02:45				Caixin Mfg PMI Final	Nov	48,9	49,4	0,50	49,2		43,3	49,2	17	48,31	-0,59
7 Dec	≈	04:00				Trade Balance USD	Nov	78,10B	69,84B	-8,260B	85,15B		63,20B	90,00B	27	76,902B	-1,198B
9 Dec	≈	02:30				PPI YY	Nov	-1,4%	-1,3%	0,10%	-1,3%		-2,3%	-0,9%	31	-1,44%	-0,04%

$$\delta_{j,t} = \frac{\psi_{j,t} - \psi_{j,t}^*}{\sigma_j}$$

Monthly macroeconomic announcement classified in Refinitiv as medium or high market impact

Overview of macroeconomic series and financial/commodity markets

Macroeconomic series	Financial markets	Commodity markets
PPI YY	Australia (AE, Com)	Commodity general index
CPI YY	Brazil (EME, Com)	All metals index
Caixin Manufacturing PMI	China (EME)	Industrial metals index
NBS Manufacturing PMI	Chile (EME, Com)	Energy index
Industrial output	EU-Eurostoxx (AE)	Oil price (Brent)
Urban investments	Hong Kong (EME)	
Retail sales	India (EME)	
New yuan loans	Japan (AE)	
Total social financing	Mexico (EME, Com)	
Trade balance	South Korea (EME)	
	South Africa (EME, Com)	
	Turkey (EME)	
	United Kingdom (AE)	
	United States (AE)	
	VIX	
	US NEER	

Time series of our surprises
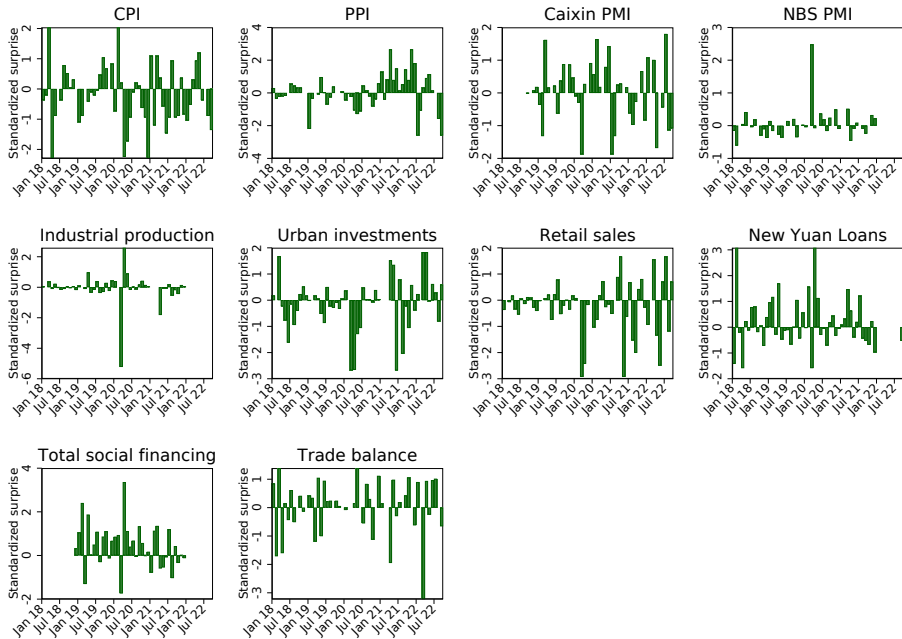
Empirical strategy

Pooled estimates, Time span: January 1, 2018 to December, 30, 2022.

$$r_{i,t} = \alpha_0 + \sum_j \beta_j \delta_{j,t} + \gamma_0 FCI_t + \sum_k \theta_k \delta_{US,k,t} + \gamma_1 FCI_{US,t} + \gamma_2 Covid + m_t + \epsilon_{i,t}$$

$r_{i,t}$ are the daily (t) returns of our dependent variables (financial market variables or commodity prices)

$\delta_{j,t}$ are the daily surprises (set to zero on non-announcement days)

FCI_t is a measure of financial condition for China

$Covid$ is a dummy taking value of 1 at the outbreak of Covid in China (January 23 to April 8, 2020).

IMPORTANT: control for US macroeconomic surprises and FCI

Results - equity markets

	Only China	China & H. Kong	All markets	Adv. econom.	EME econom.	Comm. produc.	Only USA
CPI	12.30	9.30	5.84	10.75*	2.93	7.14	27.62*
	(0.88)	(0.85)	(1.50)	(1.95)	(0.56)	(1.04)	(1.83)
PPI	-18.70	-27.37**	-23.72***	-23.05***	-24.11***	-23.87***	-36.17***
	(-1.35)	(-2.27)	(-6.19)	(-4.59)	(-4.60)	(-3.53)	(-2.78)
Caixin PMI	-2.33	-7.86	-8.76	-2.46	-12.54*	-2.45	-20.83
	(-0.10)	(-0.50)	(-1.46)	(-0.23)	(-1.76)	(-0.26)	(-0.73)
NBS PMI	16.77	40.82*	41.80**	6.91	62.64***	48.35	-11.88
	(0.82)	(1.69)	(2.37)	(0.31)	(2.86)	(1.28)	(-0.40)
Indust. prod.	61.75***	63.04***	100.92***	93.74***	104.93***	136.91***	141.06***
	(3.97)	(6.26)	(7.05)	(4.67)	(5.47)	(5.70)	(4.42)
Urban invest.	14.88	7.50	8.96	1.06	13.75	23.52	11.38
	(0.67)	(0.47)	(1.24)	(0.14)	(1.30)	(1.43)	(0.58)
Retail sales	-8.48	-2.23	18.25**	19.79***	17.09	28.22*	39.07**
	(-0.40)	(-0.15)	(2.51)	(2.86)	(1.58)	(1.69)	(2.00)
New Yuan L.	9.38	-7.17	-5.09	-10.07	-2.24	-3.00	-6.37
	(0.50)	(-0.51)	(-1.03)	(-1.35)	(-0.35)	(-0.40)	(-0.27)
Total social fin.	-15.83	-2.08	-0.48	4.82	-2.97	-16.00	-15.23
	(-0.64)	(-0.13)	(-0.09)	(0.62)	(-0.39)	(-1.56)	(-0.65)
Trade balance	46.33**	41.76***	24.86***	25.94***	24.30***	15.37**	39.43*
	(2.21)	(2.58)	(5.05)	(3.42)	(3.78)	(2.06)	(1.79)
N	1181	2360	16808	6102	10706	6023	1213
R^2	0.03	0.03	0.04	0.05	0.04	0.06	0.11

Results - global risk aversion

	US NEER	VIX index
CPI	6.21**	-0.36
	(2.15)	(-1.53)
PPI	7.53***	0.42***
	(2.59)	(2.54)
Caixin PMI	11.21***	0.27
	(2.63)	(0.77)
NBS PMI	-1.79	-1.62***
	(-0.21)	(-2.99)
Indust. prod.	-11.56***	-2.59***
	(-3.32)	(-3.73)
Urban investm.	-0.42	-0.41
	(-0.13)	(-1.12)
Retail sales	-7.46**	-0.61
	(-2.15)	(-1.58)
New Yuan Loans	0.80	-0.33
	(0.20)	(-0.84)
Total social financing	-2.47	0.16
	(-0.46)	(0.45)
Trade balance	-9.51***	-0.78**
	(-2.92)	(-2.34)
N	1206	1212
R^2	0.07	0.14

Results - commodity markets

	All comm. indices	General index	Ind. metals index	Energy index	Oil price
CPI	-0.97	3.29	-25.33	19.25	16.34
	(-0.10)	(0.19)	(-1.54)	(0.72)	(0.55)
PPI	-56.93***	-58.97***	-26.35**	-92.08***	-88.15***
	(-7.32)	(-4.57)	(-2.08)	(-4.91)	(-3.91)
Caixin PMI	15.38	-3.04	19.63	-25.12	69.14
	(0.82)	(-0.10)	(0.99)	(-0.50)	(1.02)
NBS PMI	54.93***	52.44	94.75***	62.08	38.25
	(2.88)	(1.62)	(6.76)	(1.08)	(0.61)
Indust. prod.	71.68***	68.41**	28.32***	107.37**	129.72***
	(2.82)	(2.27)	(3.59)	(2.14)	(2.60)
Urban investm.	17.93	17.70	31.44**	10.89	1.32
	(1.54)	(0.88)	(2.55)	(0.32)	(0.04)
Retail sales	-5.97	-12.08	-18.75	-1.20	8.47
	(-0.56)	(-0.57)	(-1.44)	(-0.04)	(0.28)
New Yuan Loans	-37.85***	-39.02*	-22.75	-60.89*	-57.26*
	(-3.27)	(-1.77)	(-1.36)	(-1.88)	(-1.74)
Total social financing	-22.69	-26.49	28.02	-59.86	-67.62
	(-1.55)	(-1.08)	(1.30)	(-1.31)	(-1.45)
Trade balance	-15.08	-8.98	-14.44	-13.45	-28.73
	(-1.34)	(-0.42)	(-0.62)	(-0.49)	(-0.89)
N	6077	1217	1175	1205	1267
R^2	0.03	0.05	0.05	0.05	0.05

Explanatory power of China surprises at lower frequencies

$$r_{i,t} = \alpha_0 + \sum_{j=0}^{1} \beta_j index_{t-j} + \gamma_0 FCI_t + \sum_{j=0}^{1} \theta_j index_{US,k,t} +$$
$$+ \gamma_1 Covid + \delta_{US,k,t} + \gamma_3 FCI_{US,t} + m_t + \epsilon_{i,t}$$

$r_{i,t}$ are the weekly or monthly (t) returns of our dependent variables (financial market variables or commodity prices)

$Index_t$ surprise index at frequency t, time T which is either week or month. The index cumulates macroeconomic surprises over time.

FCIs are financial condition indeces at lower frequencies

Impact of China surprises at lower frequencies - equity

	Only China	China & H. Kong	All markets	Adv. econom.	EME econom.	Comm. produc.	Only USA
Weekly surp.	-7.53	-7.29	20.05***	24.61***	17.60***	27.47***	33.75**
	(-0.68)	(-0.89)	(4.38)	(3.24)	(3.10)	(3.28)	(2.10)
Weekly surp. (t-1)	16.99	24.94***	28.45***	24.32***	30.87***	34.81***	17.14
	(1.55)	(2.94)	(5.01)	(3.38)	(3.93)	(2.94)	(1.22)
N	257	516	3624	1295	2329	1295	259
R^2	0.15	0.16	0.17	0.20	0.16	0.18	0.21

	Only China	China & H. Kong	All markets	Adv. econom.	EME econom.	Comm. produc.	Only USA
Monthly surp.	3.13	10.82	-0.91	-4.74	0.28	-1.19	-2.17
	(0.11)	(0.55)	(-0.14)	(-0.52)	(0.03)	(-0.12)	(-0.10)
Monthly surp. (t-1)	11.75	12.80	34.52***	31.55***	35.89***	42.73***	40.77
	(0.53)	(0.73)	(4.53)	(3.09)	(3.42)	(3.10)	(1.48)
N	59	118	826	295	531	295	59
R^2	0.04	0.04	0.19	0.25	0.17	0.23	0.26

Impact of China surprises at lower frequencies - commodity

	All comm. indices	General index	Ind. metals index	Energy index	Oil price
Weekly index	29.93	23.32	-25.82*	67.08	99.94*
	(1.46)	(0.84)	(-1.77)	(1.30)	(1.69)
Weekly index (t-1)	57.59***	47.53**	26.55**	97.13*	82.55
	(3.13)	(1.99)	(2.16)	(1.87)	(1.58)
N	1290	258	258	258	258
R^2	0.09	0.20	0.09	0.14	0.13

	All comm. indices	General index	Ind. metals index	Energy index	Oil price
Monthly index	-26.86	-16.67	-33.96	-27.85	-33.35
	(-1.63)	(-0.56)	(-1.43)	(-0.57)	(-0.66)
Monthly index (t-1)	54.56*	48.96	2.70	97.57	108.11
	(1.89)	(1.21)	(0.11)	(1.37)	(1.46)
N	290	58	58	58	58
R^2	0.28	0.40	0.23	0.40	0.39

Impact of China surprises at lower frequencies - risk aversion

	US NEER	VIX index
Weekly index	-0.87	-0.61***
	(-0.62)	(-3.75)
Weekly index (t-1)	-5.63**	-0.22
	(-2.01)	(-1.25)
N	252	258
R^2	0.17	0.26

	US NEER	VIX index
Monthly index	-3.87	-0.12
	(-0.63)	(-0.55)
Monthly index (t-1)	-11.09**	-0.35
	(-2.07)	(-1.26)
N	57	58
R^2	0.21	0.30

BVAR analysis

- ▶ Evaluate the dynamic correlation between our series of Chinese surprises and the real economy by means of a Bayesian VAR model.

- ▶ We order the index constructed by aggregating surprises at the monthly frequency as the first variable in a Cholesky identification (internal instrument) to compute impulse response functions of global industrial production and trade.

- ▶ The endogenous variable enters in log-levels and the VAR is estimated over the sample 2018-2022 employing a Minnesota prior with two lags.

$$\left[\begin{array}{c} s_t \\ y_t \end{array}\right] = A(L) \left[\begin{array}{c} s_{t-1} \\ y_{t-1} \end{array}\right] + B \left[\begin{array}{c} \varepsilon_t^s \\ \varepsilon_t^y \end{array}\right] \quad L = 0, 1$$

- ▶ s_t is the Chinese surprise index at monthly frequency and y_t are global industrial production and trade.

Results - BVAR - IRFs to a monthly aggregate positive surprise
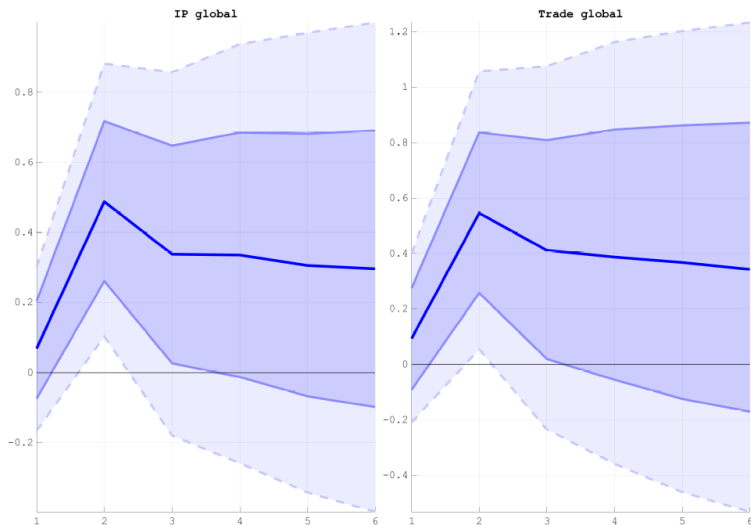
The Bayesian VAR is estimated on data 2018M1 - 2022M12 with one lag under flat (Jeffreys') prior. The plot report

median (blue solid line) together with 68% (blue shaded areas) and 90% (light blue shaded areas) credible sets.

Final remarks

- China is becoming a global driver of real and financial global cycles and there exists a causal link between Chinese macroeconomic news and the international equity and commodity markets.

- Macroeconomic surprise measures appear especially interesting in the case of China and allow for causal interpretation of new available information on international markets.

- Future research could address the channel through which the Chinese footprint propagates to the rest of the world

- Future research could also focus on the study of Chinese macro-spillovers in a more (financially) fragmented world