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Understanding oil&gas markets and their financial implications

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Agenda

- Oil market: Supply/Demand Balance
- Natural gas market: Supply/Demand Balance
- Financial implications: macroeconomics, portfolio

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Commodity markets

- Commodity markets deal with the **buying and selling of raw materials** - commodities.

- There are **two basic ways** in which **commodity trading** can take place:
  - **Physical Markets** or **Over The Counter (OTC) market**, are those in which traders buy and sell the actual commodity and settle the deal in cash. In these markets commodities could be traded **spot** or **forward.**
  - **Exchange based** or **Paper Markets** are those in which exchanges provide facilities for trading commodities contracts. These contracts have standardised terms and conditions and the exchange acts as the counterparty between buyers and sellers. Usually **futures** and **options** contracts are traded in exchange based markets.

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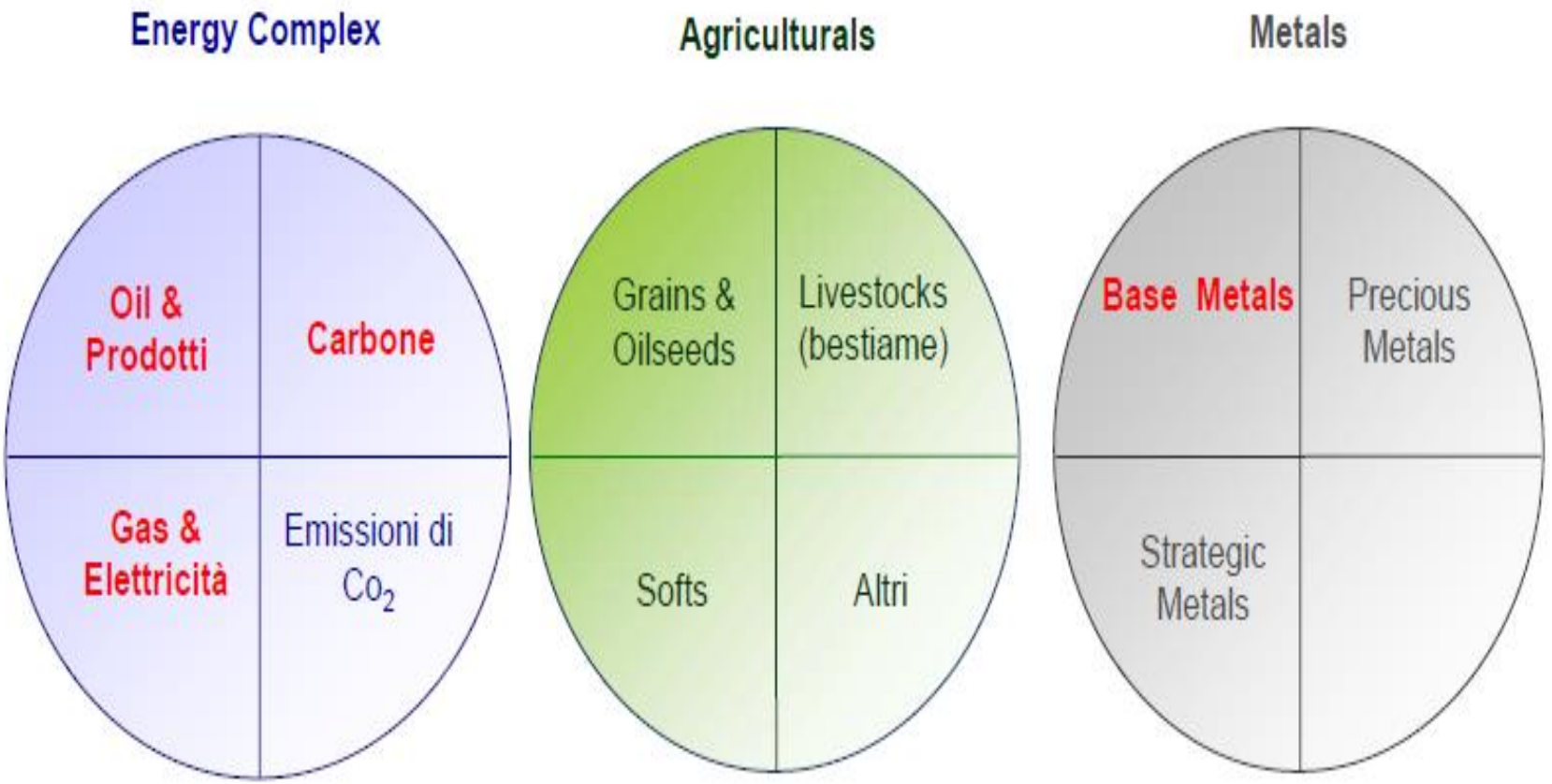
Commodities: classification



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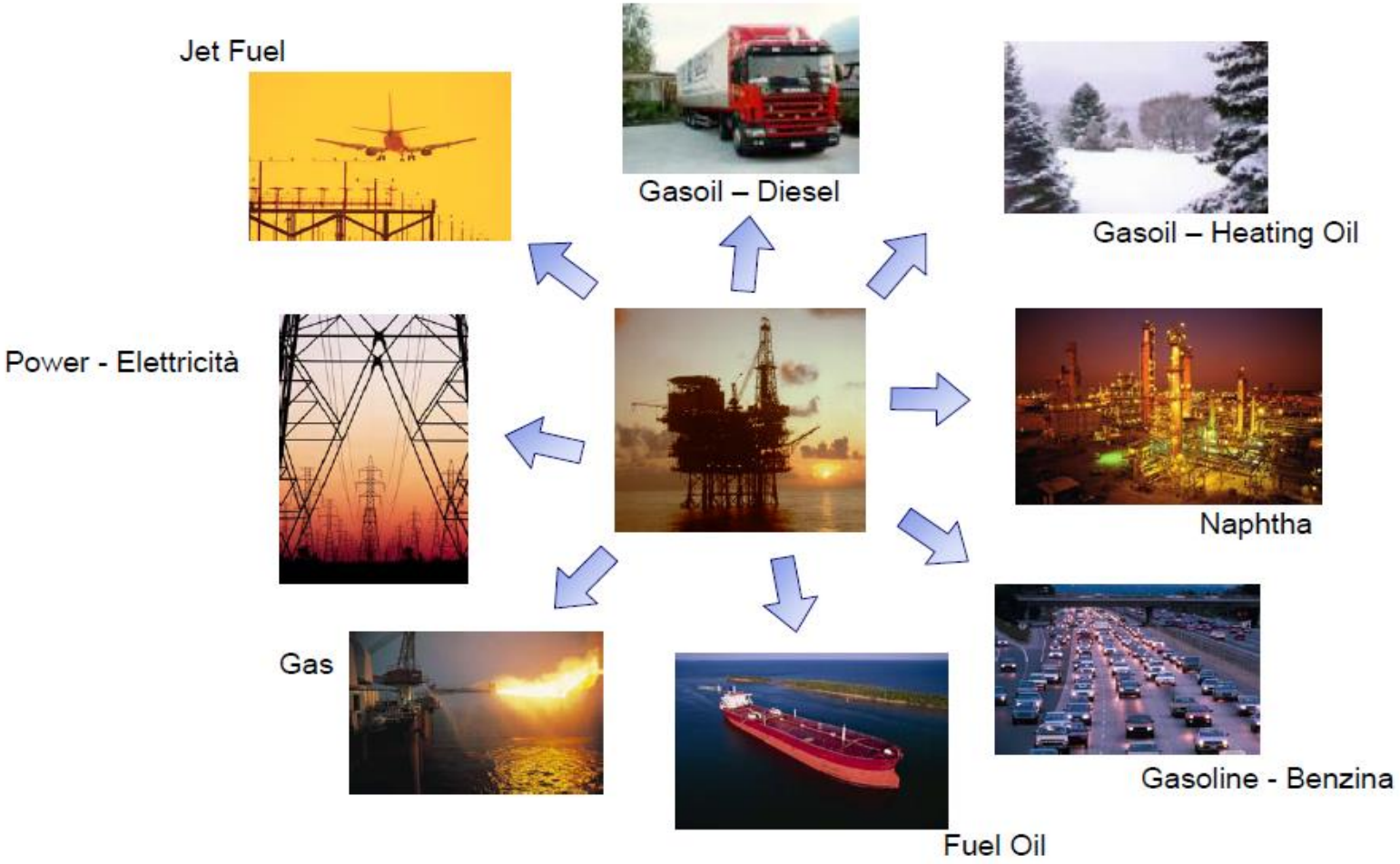
Commodities: energy complex



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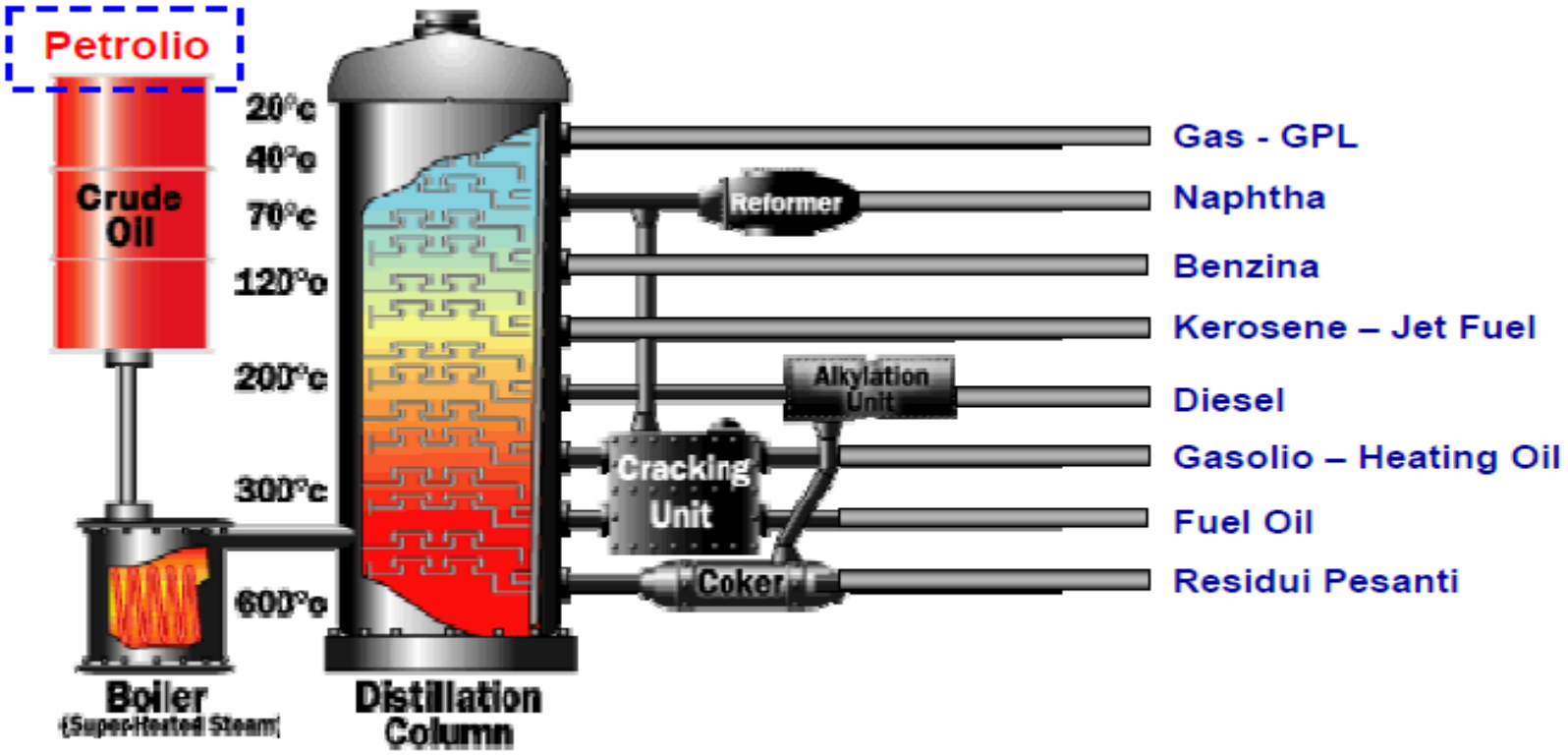
Commodities: energy complex



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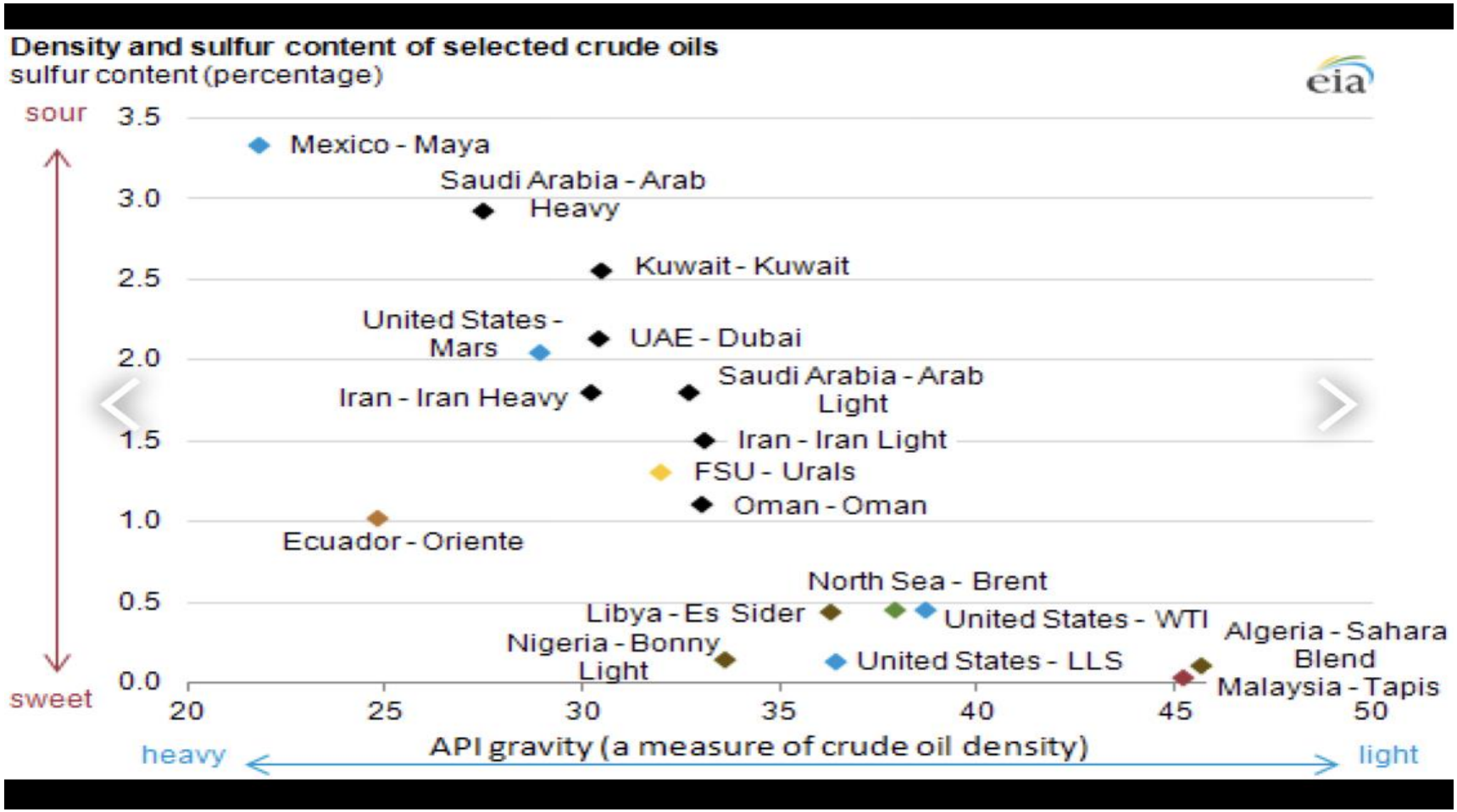
Oil quality



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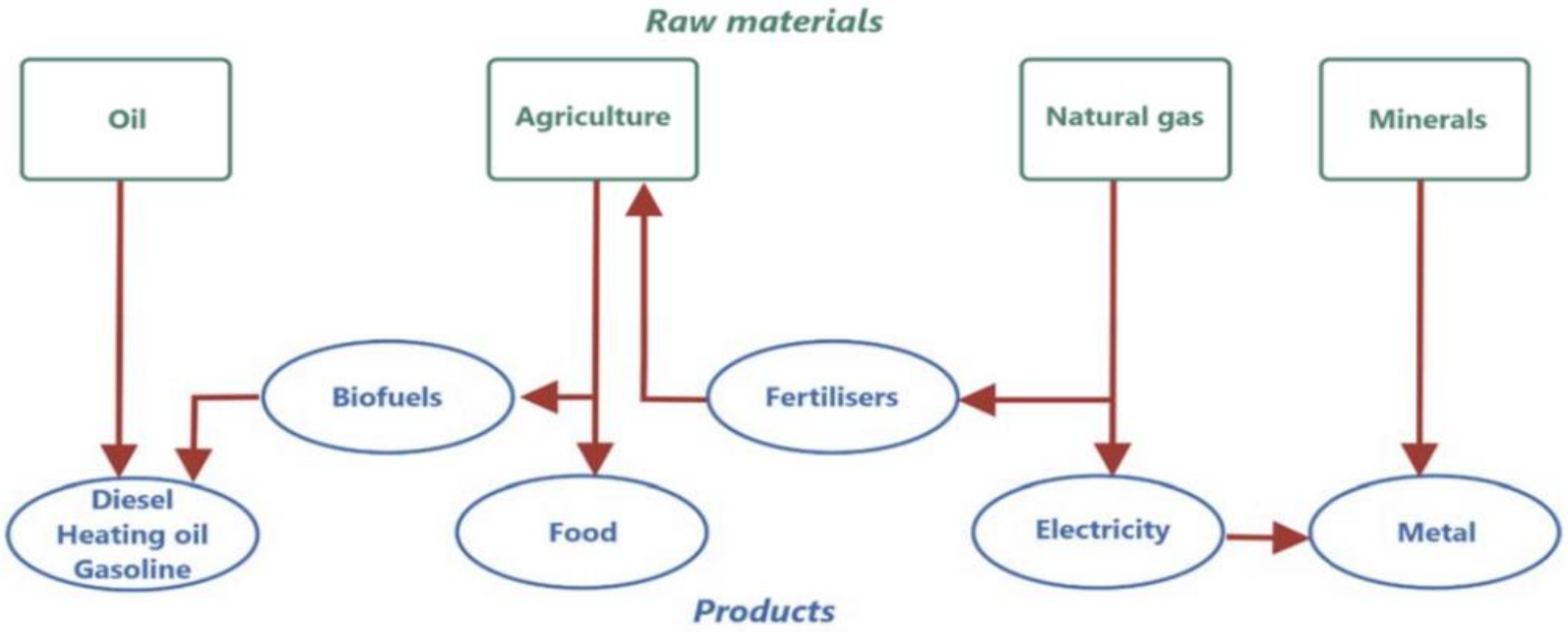
Commodity markets: shocks and spillovers BIS

Some key connections in the commodity space — Graph 1



Source: Authors' elaboration.

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Forward curve commodity future

1) Contango: forward curve with increasing prices, *cost of carry*: storage costs plus insurance costs. Negative roll yield.
2) Backwardation: forward curve with decreasing prices..*convenience yields* higher than cost of carry. Positive roll yields.

- Impact on storage convenience.

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Commodities: forward curve henry hub-TTF

Click for Chart	Current Session			
	Last	Time	Set	Chg
Cash	2.439	19:00 Mar 15	2.439s*	-0.134
Apr'23	2.466	03:31 Mar 16	-	0.027
May'23	2.570	03:31 Mar 16	-	0.024
Jun'23	2.783	03:09 Mar 16	-	0.024
Jul'23	2.986	03:07 Mar 16	-	0.028
Aug'23	3.035	02:39 Mar 16	-	0.038
Sep'23	2.982	03:31 Mar 16	-	0.018
Oct'23	3.082	02:31 Mar 16	-	0.039
Nov'23	3.389	03:15 Mar 16	-	0.019
Dec'23	3.778	03:14 Mar 16	-	0.014
Jan'24	3.966	03:15 Mar 16	-	0.009
Feb'24	3.846	03:15 Mar 16	-	0.005

Contract	Last	Change	Open	High
TGJ23 (Apr '23)	42.630	-0.275	43.250	44.375
TGK23 (May '23)	43.000	-0.322	44.600	44.600
TGM23 (Jun '23)	43.400	-0.313	44.995	44.995
TGN23 (Jul '23)	44.370	+0.495	44.225	44.370
TGQ23 (Aug '23)	44.725	+0.534	44.725	44.725
TGU23 (Sep '23)	44.961s	-1.251	46.500	46.980
TGV23 (Oct '23)	46.999s	-1.161	48.590	48.590
TGX23 (Nov '23)	50.613s	-1.206	52.155	52.155
TGZ23 (Dec '23)	52.099s	-1.261	53.695	53.695
TGF24 (Jan '24)	52.565s	-1.200	53.295	53.295
TGG24 (Feb '24)	52.470s	-1.230	53.750	53.750
TGH24 (Mar '24)	51.075s	-1.225	51.800	51.800
TGJ24 (Apr '24)	48.275s	-1.100	49.000	49.500
TGK24 (May '24)	47.610s	-1.101	0.000	47.610
TGM24 (Jun '24)	47.265s	-1.088	0.000	47.265
TGN24 (Jul '24)	47.419s	-1.084	0.000	47.419
TGQ24 (Aug '24)	48.164s	-0.924	0.000	48.164
TGU24 (Sep '24)	48.469s	-0.914	0.000	48.469
TGV24 (Oct '24)	48.668s	-0.965	0.000	48.668
TGX24 (Nov '24)	51.308s	-0.965	0.000	51.308
TGZ24 (Dec '24)	51.918s	-0.965	0.000	51.918

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Supply/Demand Balance of oil

- Supply: *shale oil*, OPEC plus
- *Supply Shock*: Middle East shocks, Suez Channel
- *Spread* WTI-Brent.
- Demand: in winter *heating oil*, in summer *driving season*, with *gasoline*.
- Macroeconomic data: job market, industrial production, retail sales, consumer confidence.
- Monetary policy: quantitative easing versus tightening, interest rate hikes.
- Market data: usd index, risk off, risk on.

Agenda

- Oil market: Supply/Demand Balance
- Natural gas market: Supply/Demand Balance
- Financial implications: macroeconomics, portfolio

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TTF and power price

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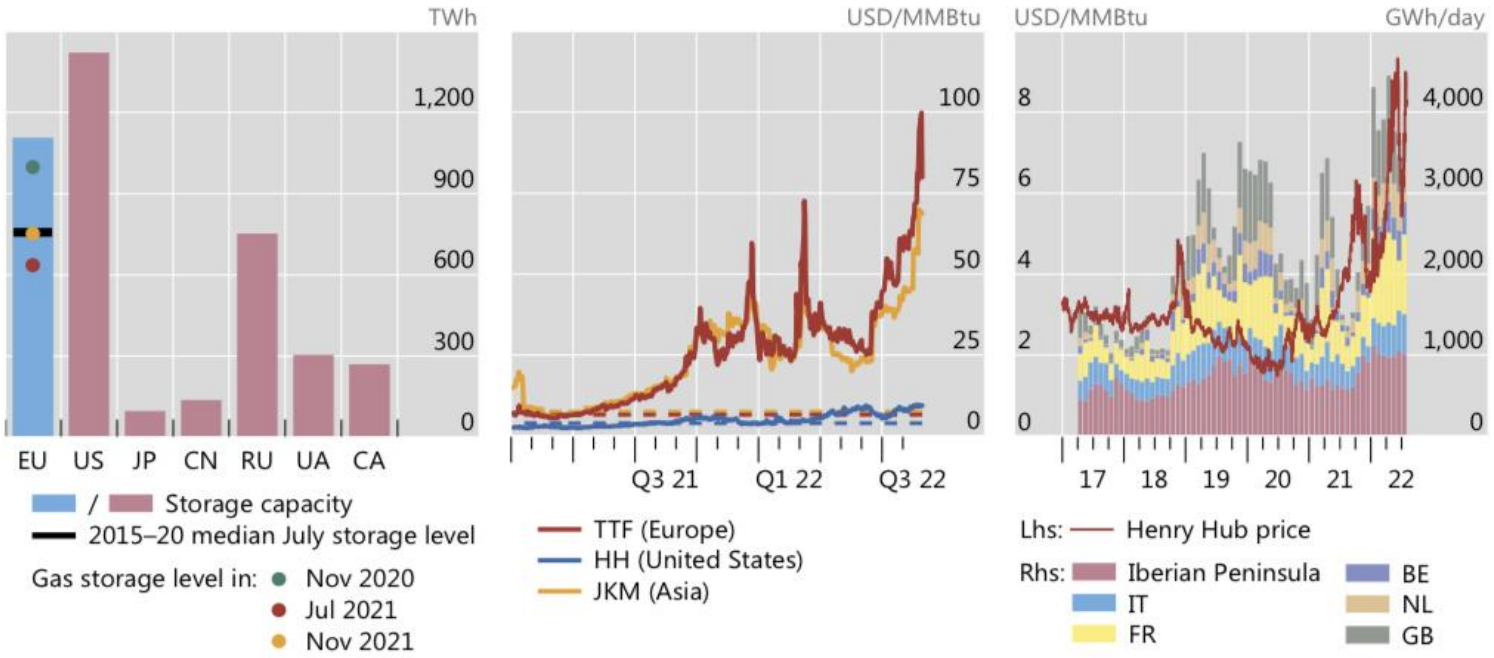
Commodity markets: shocks and spillovers BIS

Natural gas markets under stress

Graph 7



HH = Henry Hub; JKM = Japan-Korea Marker; TTF = Title Transfer Facility.

[1] The dashed lines indicate long-term medians starting from 2000 (subject to data availability).

Sources: AGSI; Bloomberg; Refinitiv Eikon; national data; authors' calculations.

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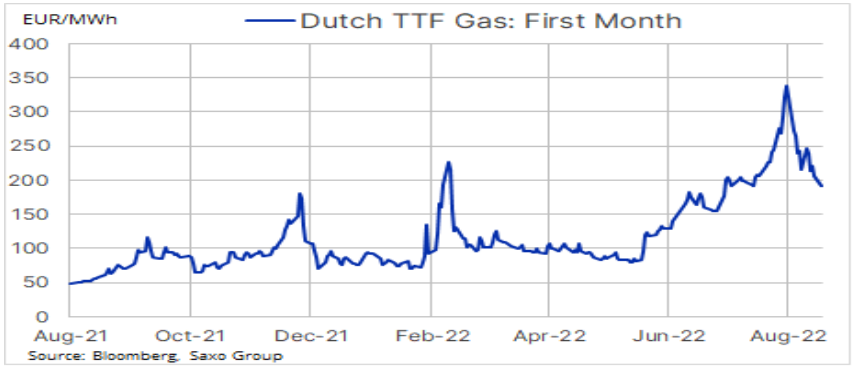
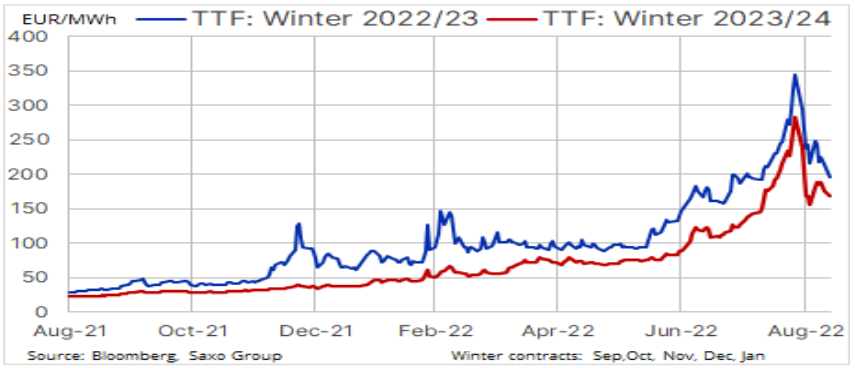
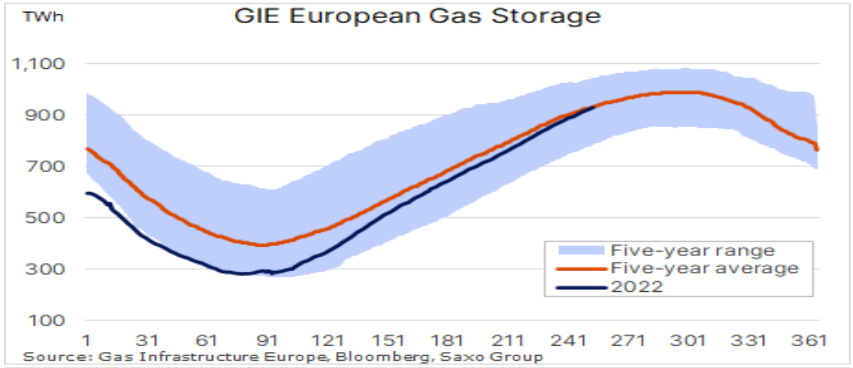
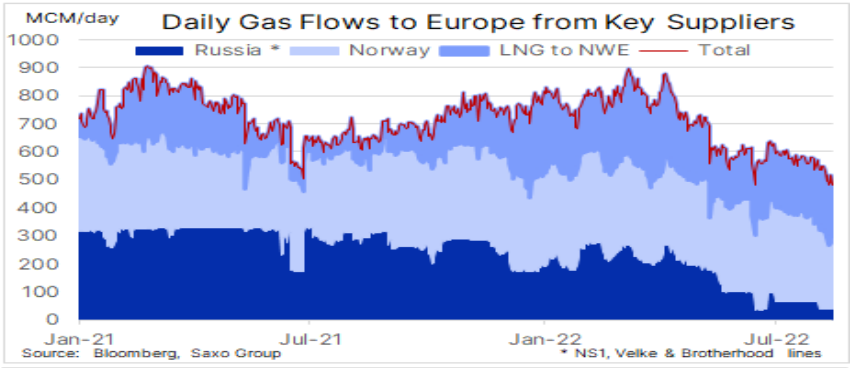
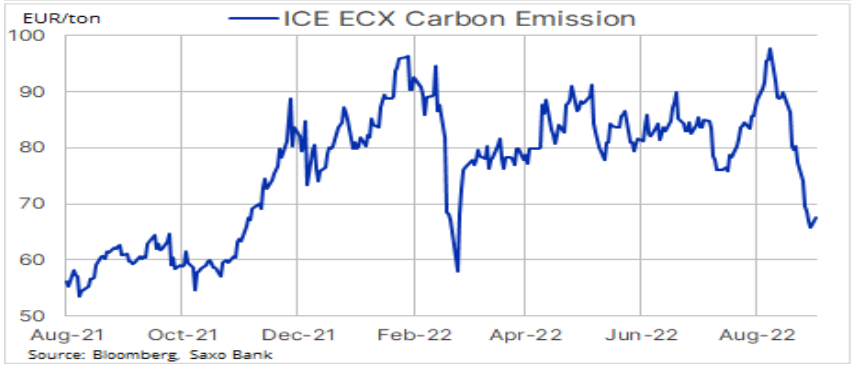
Natural gas, power market

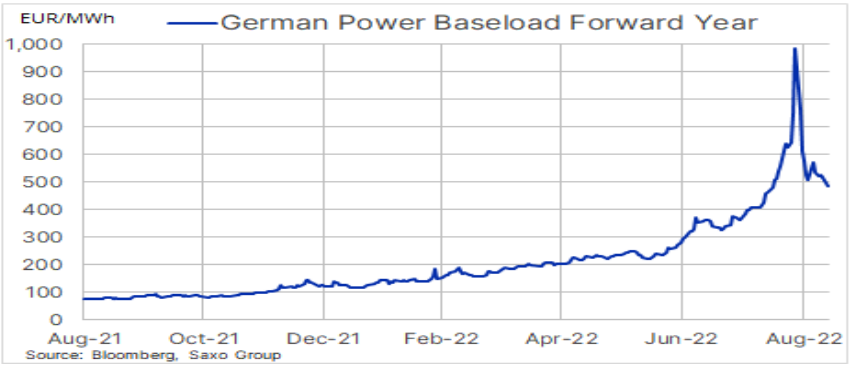












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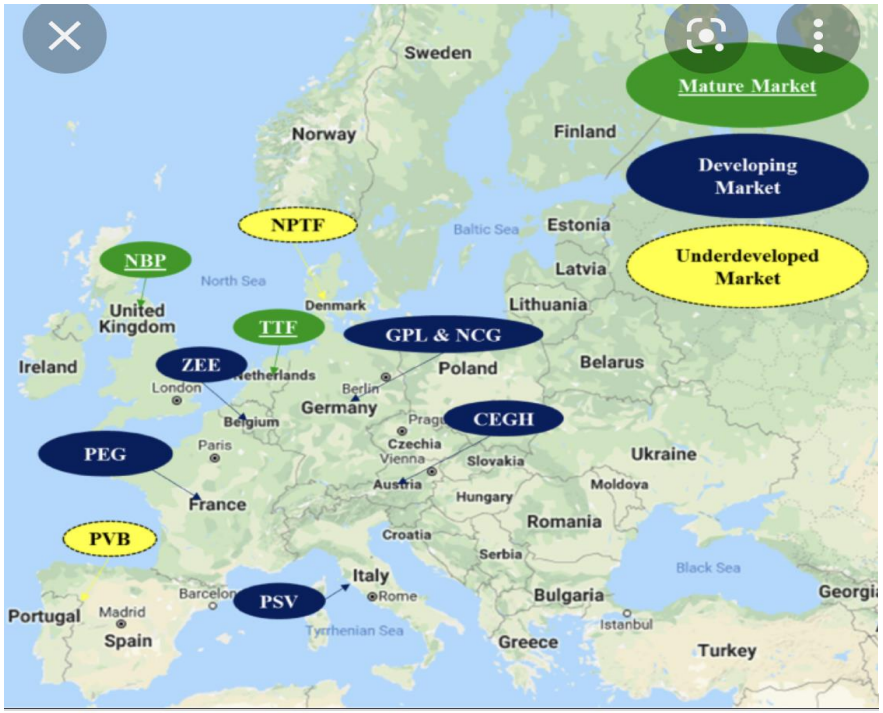
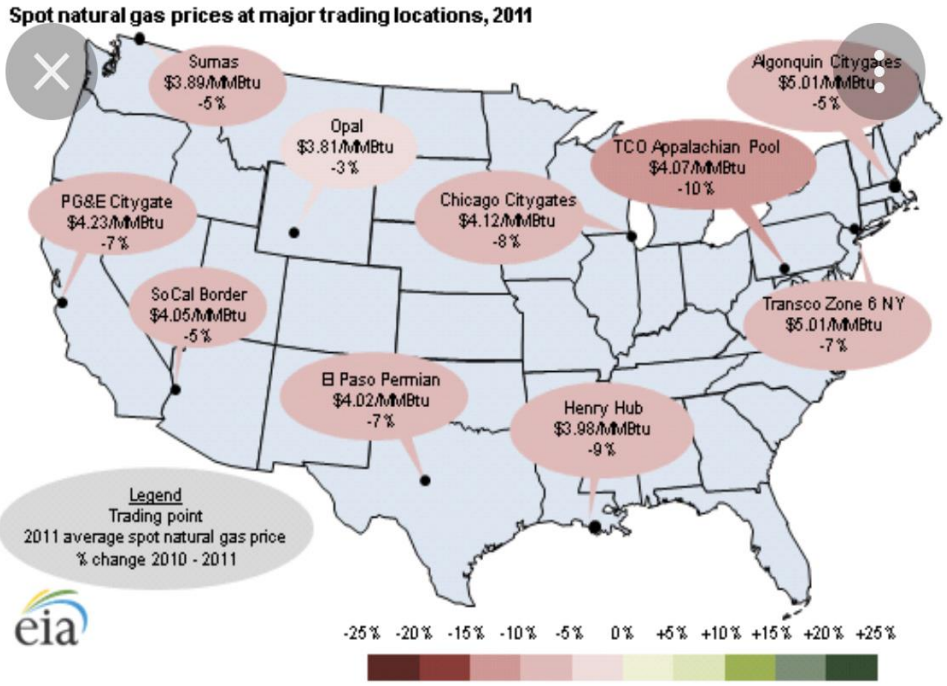
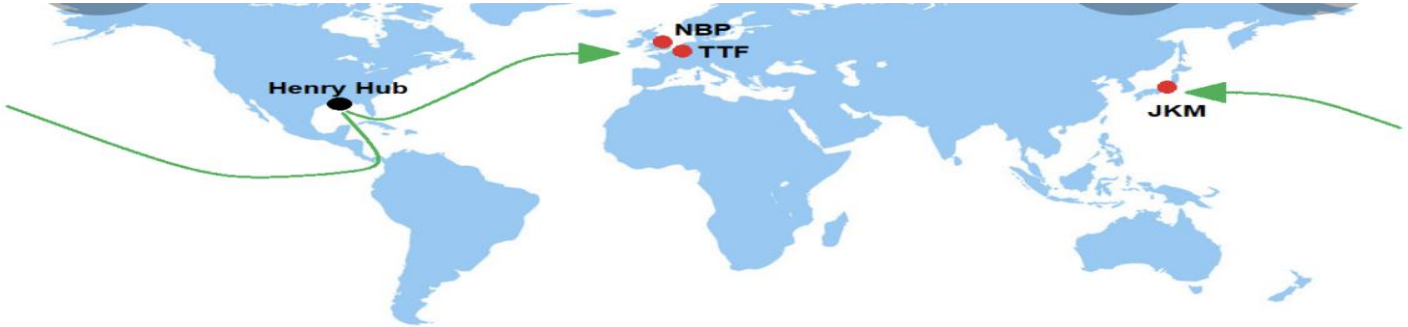
Worldwide gas markets







Natural gas pricing and market microstructure: literature

- Brown and Yucel (2008). What drives natural gas prices? The Energy Journal, weather, storage, fuel switching between natural gas and residual fuel oil.
- Nick and Thoenes (2014). What drives natural gas prices? — A structural VAR approach, Energy Economics. In the short-run natural gas prices are affected by temperature and supply shocks. Coal and oil prices are major determinants for natural gas prices in the long-run.
- Chen, Wang and Zhu (2022). Toward the integration of European gas futures market under COVID-19 shock: A quantile connectedness approach, Energy Economics, TTF and NBP the most liquid.

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Natural gas market issues

- **Spot price and physical market**

✓Supply/demand balance

✓Flows from different countries

✓Total production, stocks

- **Financial markets: financial instruments, forward curve, different expirations and deliveries**

✓Contango e backwardation

✓Weather impact

✓Liquidity

✓Risk management

✓Relationship physical-financial markets

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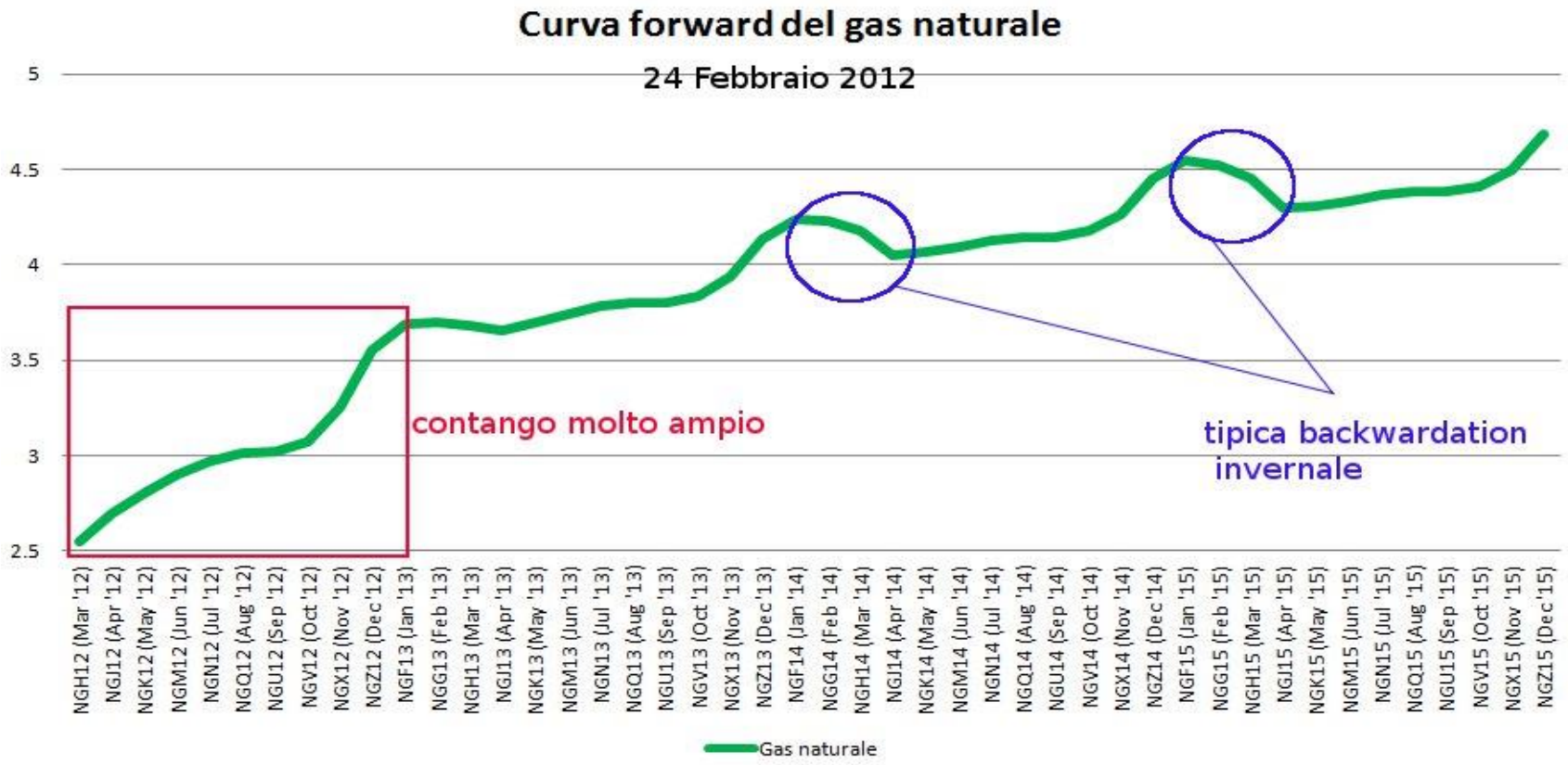
Contango/backwardation in natural gas



Fonte:http://livingstone.borse.it

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Supply/Demand balance Henry Hub, total supply, EIA

Supply table | Demand table | Daily supply/demand graph

U.S. natural gas supply - Gas Week: (3/2/23 - 3/8/23)

	Average daily values (billion cubic feet)		
	this week	last week	last year
Marketed production	113.0	113.1	108.0
Dry production	100.7	100.8	95.3
Net Canada imports	4.3	5.0	4.8
LNG pipeline deliveries	0.1	0.1	0.1
Total supply	105.1	105.9	100.2

Data source: S&P Global Commodity Insights
Note: This table reflects any data revisions that may have occurred since the previous week's posting. Liquefied natural gas (LNG) pipeline deliveries represent natural gas sendout from LNG import terminals.

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Supply/Demand balance Henry Hub, total demand, EIA

Supply table | Demand table | Daily supply/demand graph

U.S. natural gas consumption - Gas Week: (3/2/23 - 3/8/23)

	Average daily values (billion cubic feet)		
	this week	last week	last year
U.S. consumption	85.1	91.2	80.3
Power	30.1	31.5	24.6
Industrial	23.6	23.9	24.1
Residential/commercial	31.3	35.9	31.6
Mexico exports	5.4	5.4	5.5
Pipeline fuel use/losses	7.2	7.4	6.9
LNG pipeline receipts	13.2	12.7	12.6
Total demand	110.9	116.7	105.2

Data source: S&P Global Commodity Insights
Note: This table reflects any data revisions that may have occurred since the previous week's posting.
Liquefied natural gas (LNG) pipeline receipts represent pipeline deliveries to LNG export terminals.

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Supply/Demand balance Henry Hub

Release: March 16, 2023

Working gas in underground storage, Lower 48 states

Summary text | CSV | JSN

	Stocks billion cubic feet (Bcf)				Historical Comparisons: Year ago (03/03/22)		5-year average (2018-22)	
Region	03/03/23	02/24/23	net change	implied flow	Bcf	% change	Bcf	% change
East	416	451	-35	-35	323	28.8	354	17.5
Midwest	515	544	-29	-29	370	39.2	411	25.3
Mountain	92	99	-7	-7	93	-1.1	95	-3.2
Pacific	81	99	-18	-18	162	-50.0	170	-52.4
South Central	925	922	3	3	587	57.6	640	44.5
Salt	261	261	0	0	153	70.6	182	43.4
Nonsalt	664	661	3	3	435	52.6	458	45.0
Total	**2,030**	**2,114**	**-84**	**-84**	**1,537**	**32.1**	**1,671**	**21.5**

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EU market supply/demand balance Burbraggen, Kepler

European Gas Market Overview: Real Time Consumption, Storage, Production & Imports

	OECD Europe Gas Market	Date	31/08/2022	2019	2020	2021	2022E	2023F	2021	2022	2022/2021	2023/2022	2022/2021
	Burggraben analysis (in bcm)	From	To	Full Year	Full Year	Full Year	Full Year	Full Year	YTD	YTD	Full Year E	Full Year F	YTD
	Indigenous Production:							BGH F					
A	Norway	NOR	UK; GER; FR; BEL	108.6	109.7	115.4	123.8	115.0	80.3	82.6	7.3%	-7.1%	2.8%
B	United Kingdom	UK	UK	49.7	48.1	43.8	46.8	50.0	27.8	31.2	7.0%	6.8%	12.5%
C	Netherlands	NL	NL	31.4	25.4	23.6	17.4	19.0	16.5	11.6	-26.0%	9.0%	-29.5%
D	Romania	ROM	ROM	8.9	8.0	7.9	7.9	8.2	5.3	5.3	0.1%	3.6%	-0.4%
E	Other EU	EU	EU	19.9	17.4	17.0	17.1	16.7	11.2	11.4	0.8%	-2.3%	2.0%
F	**Indigenous Production**	**EU + NOR**	**EU**	**218.5**	**208.6**	**207.6**	**213.1**	**208.9**	**141.0**	**142.1**	**2.7%**	**-2.0%**	**0.8%**
	Pipeline Imports:												
G	**Nord Stream I & II**	**RUS**	**GER/various**	**54.5**	**55.1**	**55.1**	**27.8**	**0.0**	**35.6**	**27.8**	-49.5%	-100.0%	-21.9%
H	**Yamal Pipeline - Kondratki**	**RUS>Belarus**	**POL/GER**	**32.2**	**29.4**	**25.6**	**1.3**	**0.0**	**20.5**	**1.3**	-94.9%	-100.0%	-93.7%
I	**Brotherhood Pipeline - Velké**	**RUS>UKR**	**SLK/CEE**	**57.0**	**35.5**	**28.0**	**11.9**	**12.2**	**18.2**	**11.9**	-57.6%	2.5%	-34.8%
	Brotherhood Pipeline - Beregovo	RUS>UKR	HUN	15.1	6.7	6.1	0.3	0.0	5.1	0.3	-95.3%	-100.0%	-94.4%
J	**Russian Pipeline Imports**	**RUS**	**EU**	**180.5**	**136.3**	**126.6**	**46.2**	**12.2**	**88.1**	**45.6**	-63.5%	-73.7%	-48.2%
K	**Central Asian Pipeline Imports**	**TUR/AZB**	**CEE/ITA**	**0.7**	**6.0**	**19.5**	**21.9**	**22.0**	**11.9**	**14.6**	12.6%	0.4%	23.2%
L	**North African Pipeline Imports**	**North Africa**	**ITA & ESP**	**26.8**	**25.3**	**38.0**	**33.8**	**36.0**	**25.9**	**22.5**	-10.9%	6.4%	-12.9%
M	**Total Pipeline Imports**			**208.1**	**167.6**	**184.1**	**102.0**	**70.2**	**125.8**	**82.8**	-44.6%	-31.2%	-34.2%
N	**LNG Imports**	**US/Q/RUS/N/A**	**EU/UK**	**116.0**	**113.4**	**106.2**	**160.1**	**271.3**	**68.4**	**106.7**	50.7%	69.5%	56.1%
O	of which from Russia	RUS	EU/UK	20.6	19.3	18.8	22.6	19.5	13.0	15.1	20.4%	-13.7%	15.5%
P	**Grandtotal Supply**			**542.5**	**489.6**	**497.9**	**475.2**	**515.4**	**335.2**	**331.6**	-4.6%	8.5%	-1.1%
Q	**Consumption before Storage**			**477.1**	**457.5**	**478.4**	**430.0**	**430.0**	**316.0**	**277.9**	-10.1%	0.0%	-12.0%
R	**Storage level at year-end / period**			**65.4**	**32.1**	**19.4**	**45.2**	**85.4**	**19.2**	**85.4**	132.2%	89.1%	343.7%
S	**Storage level change (net filled)**							**85.4**		**53.7**			

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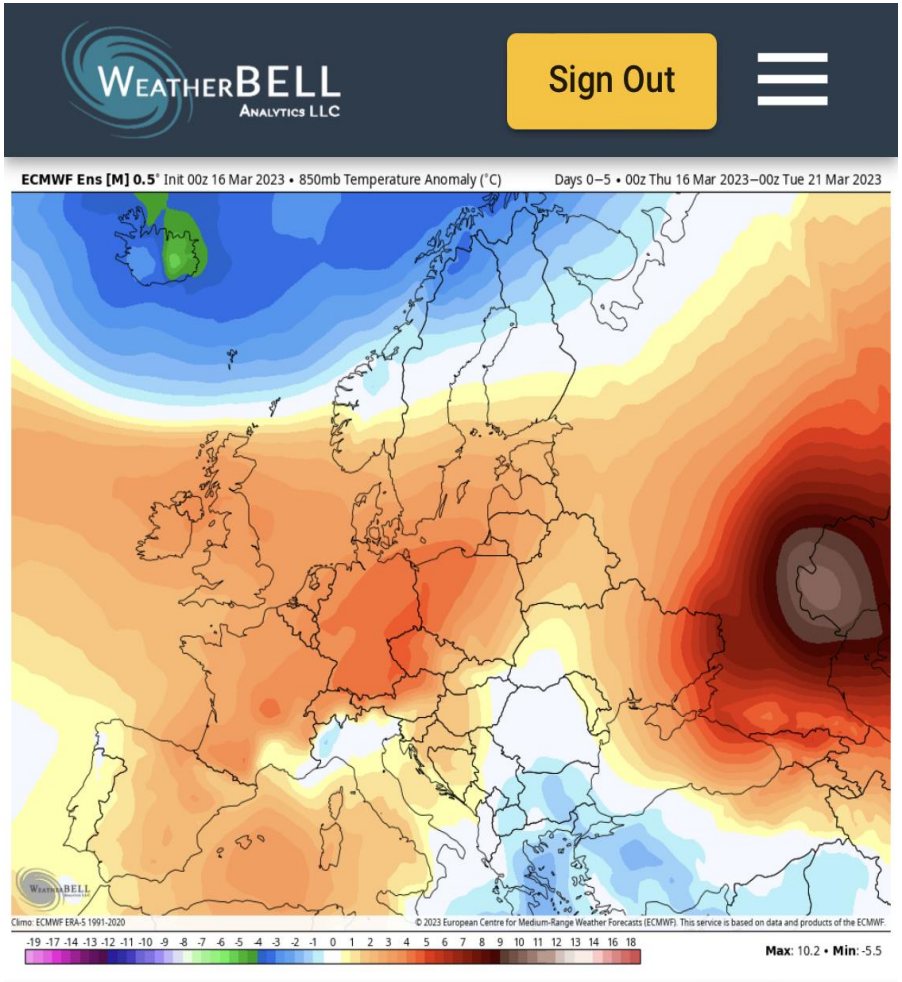
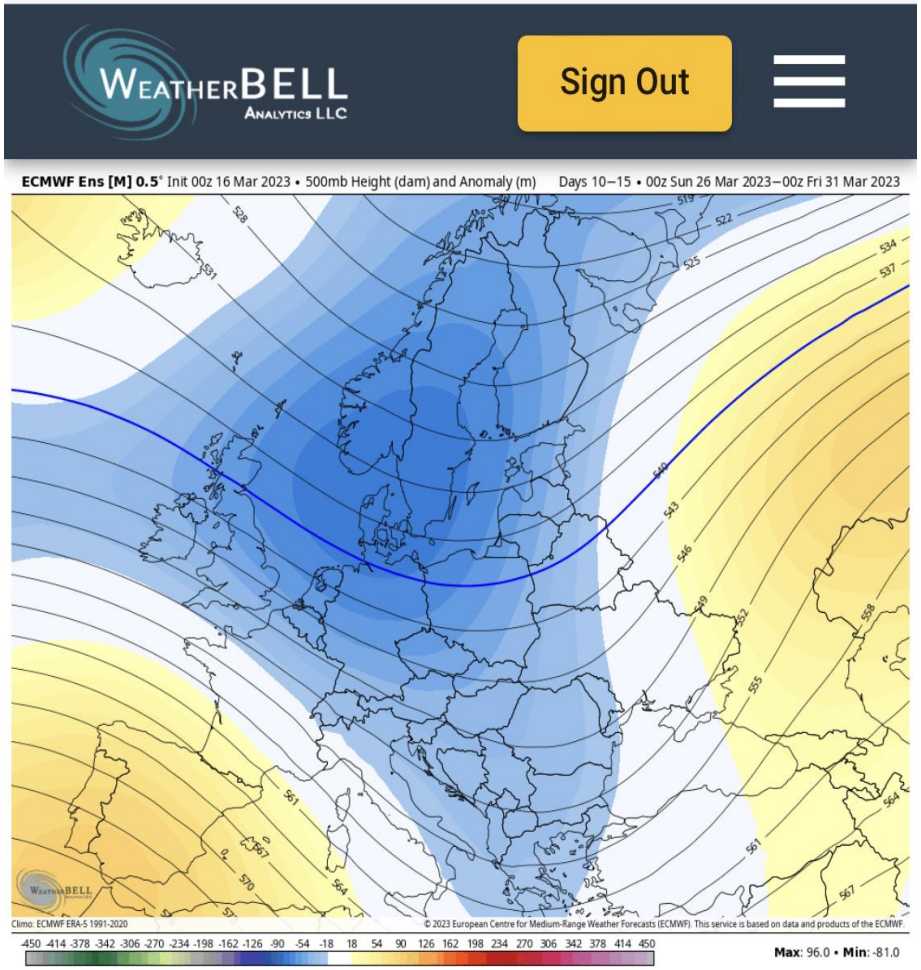
EU Weather





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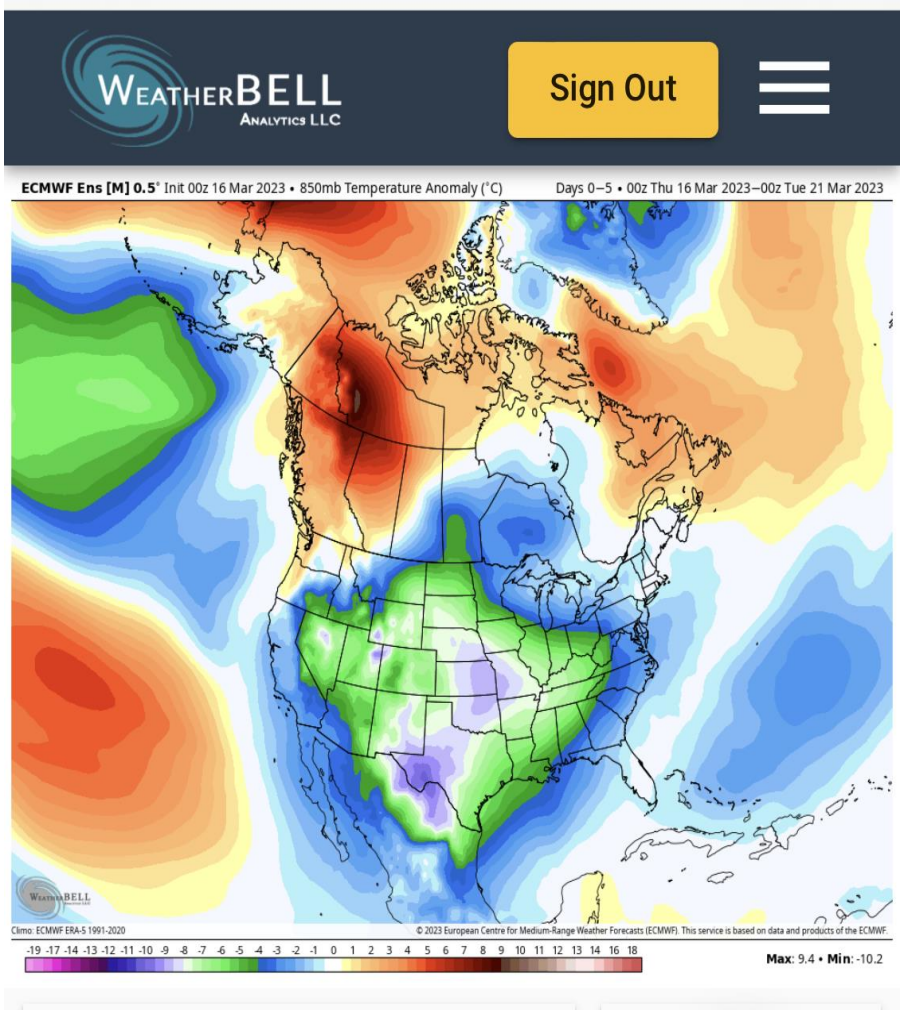
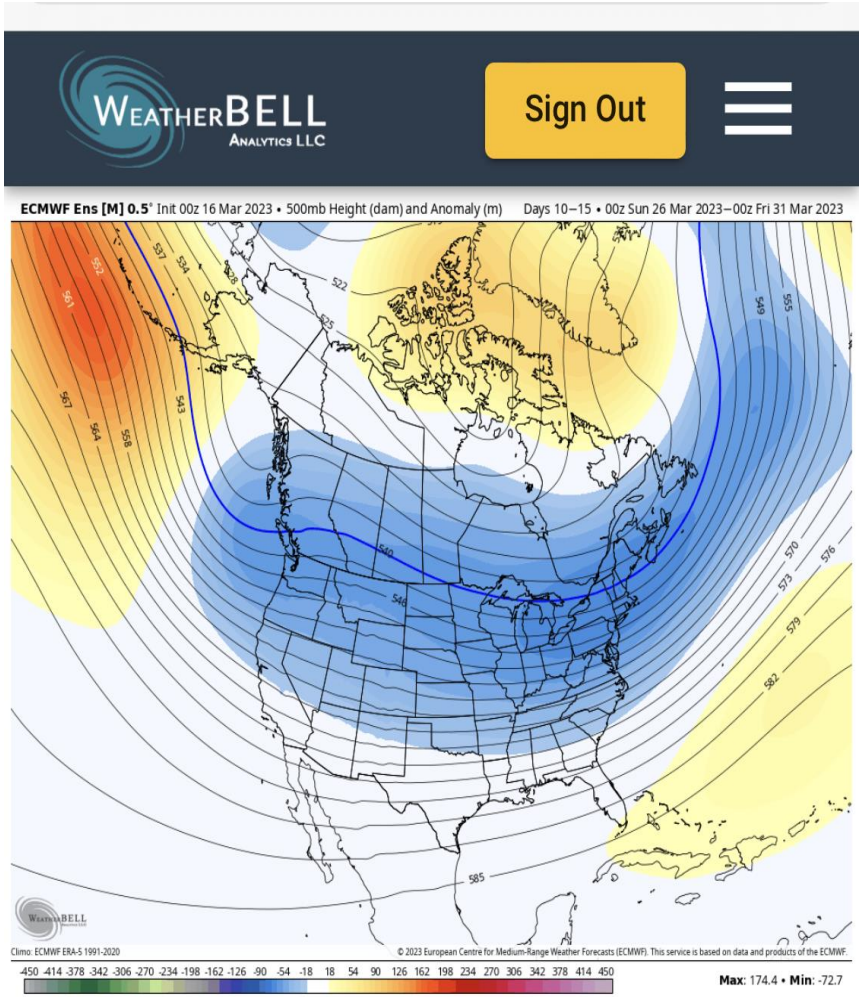
US Weather





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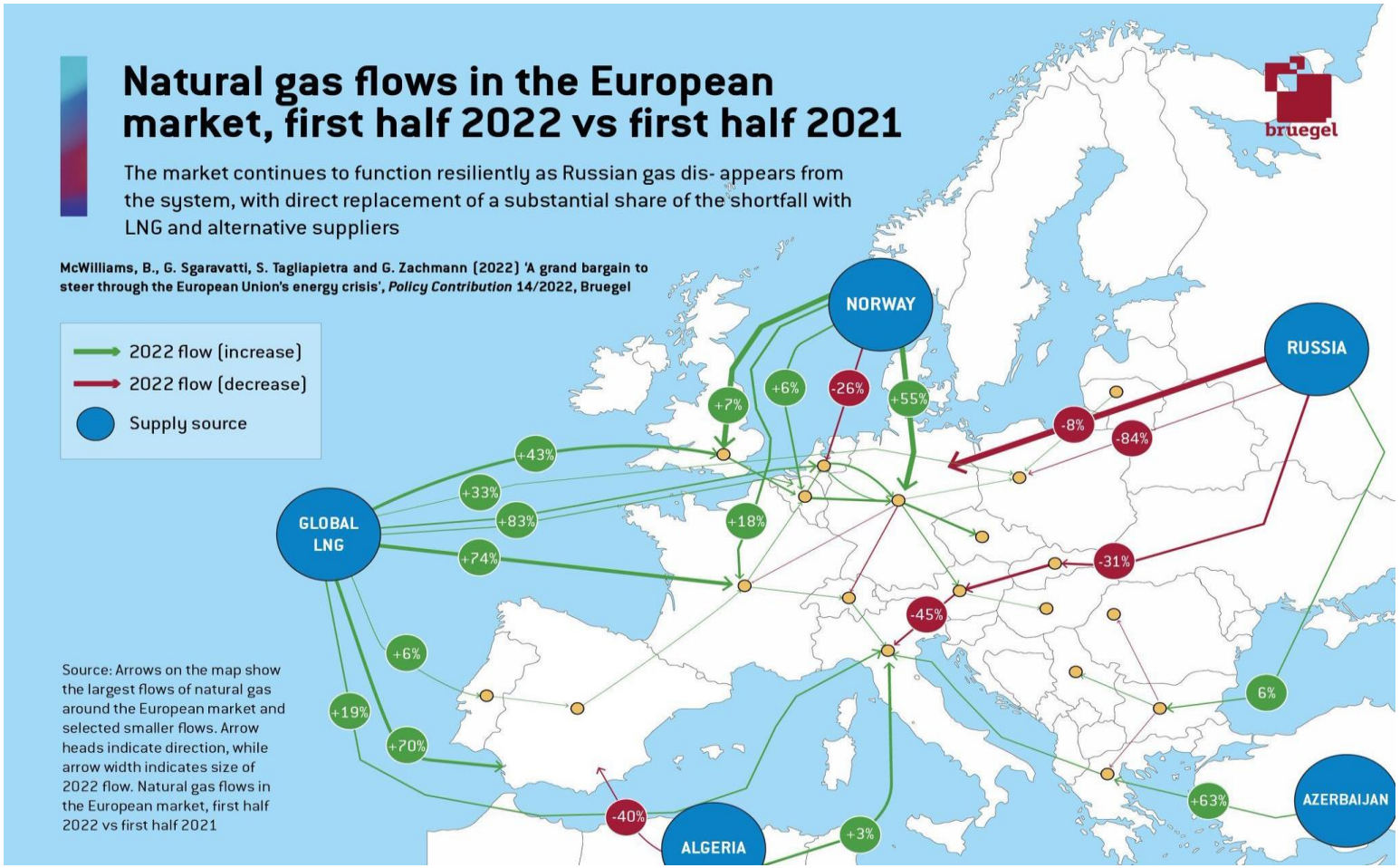
Flows 2022 vs 2021



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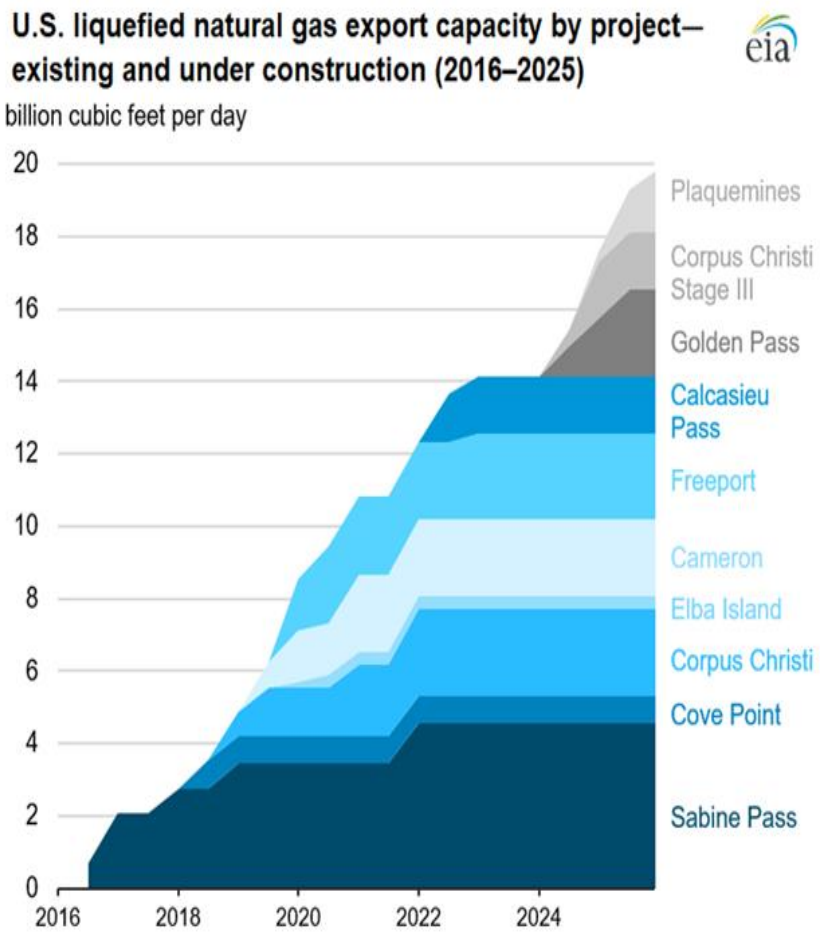
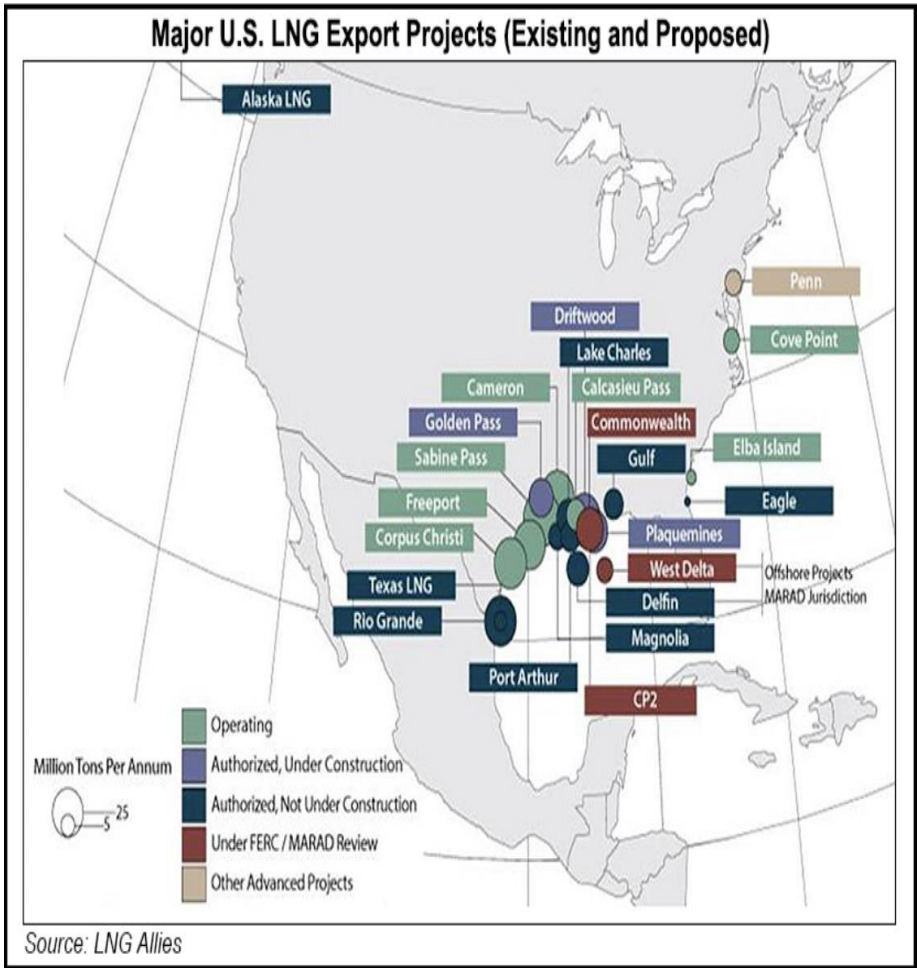
USA LNG exports





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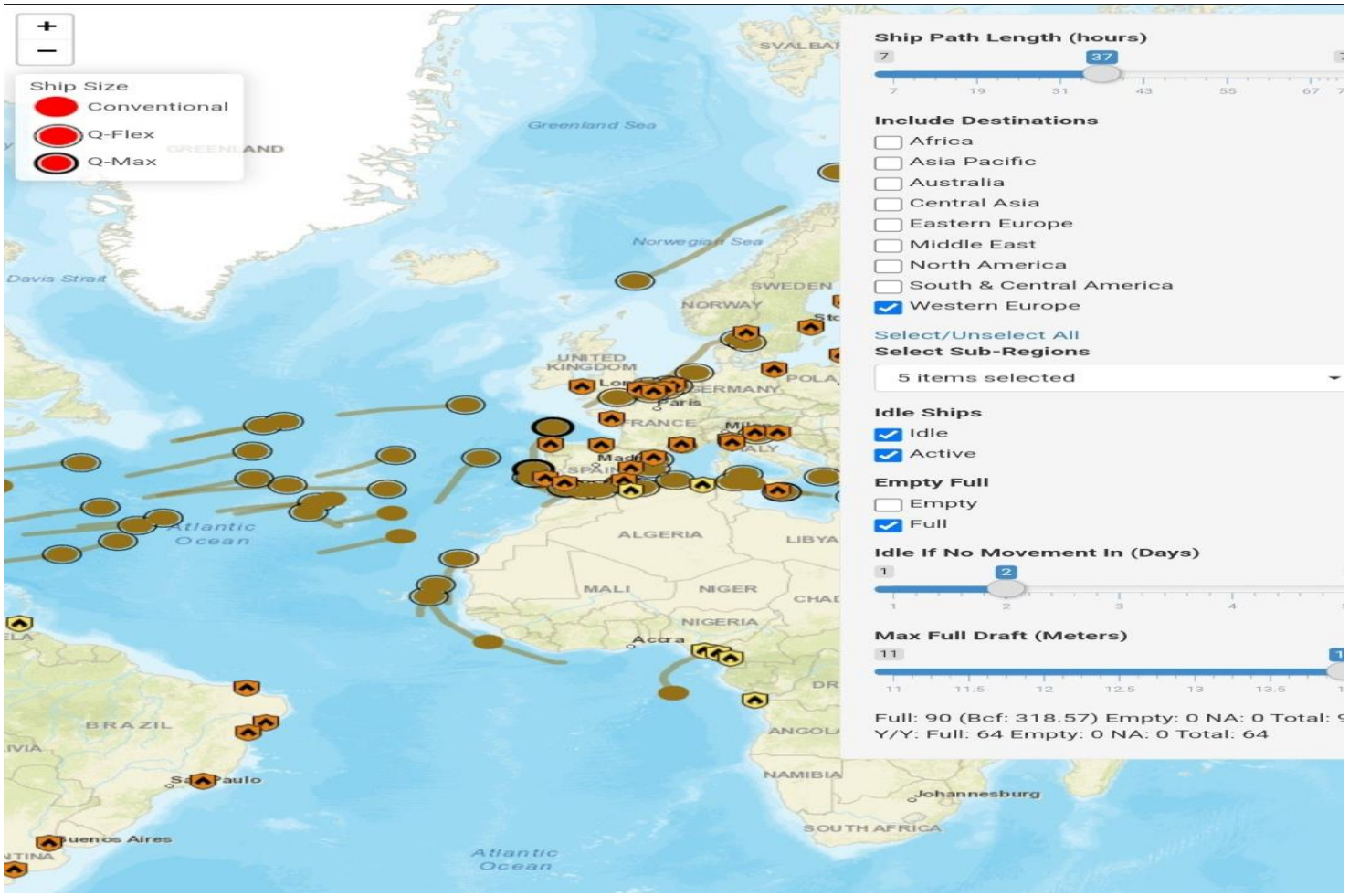
LNG flotilla…natural gas cap



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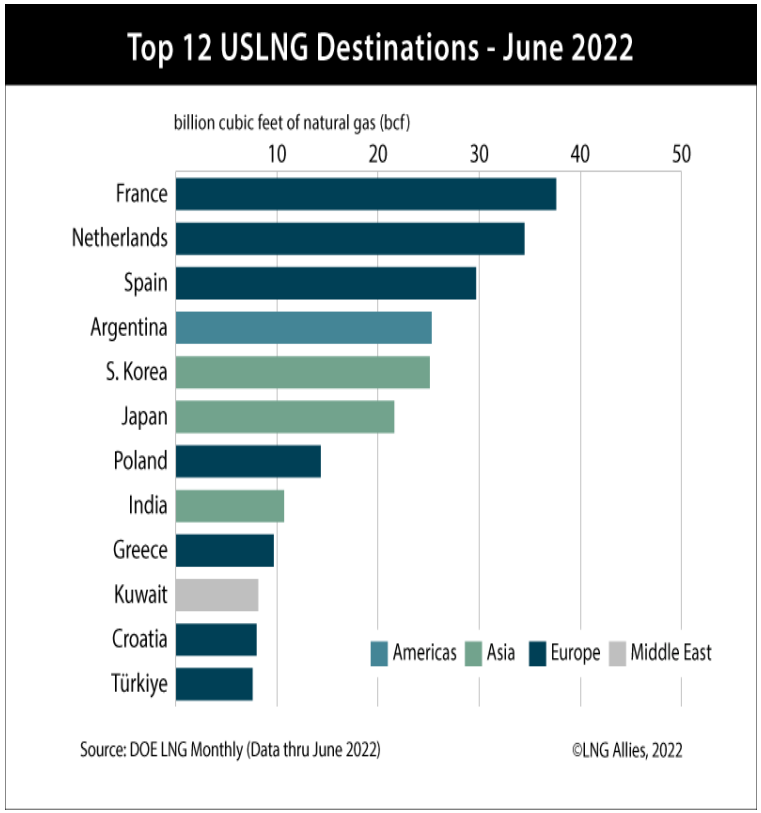
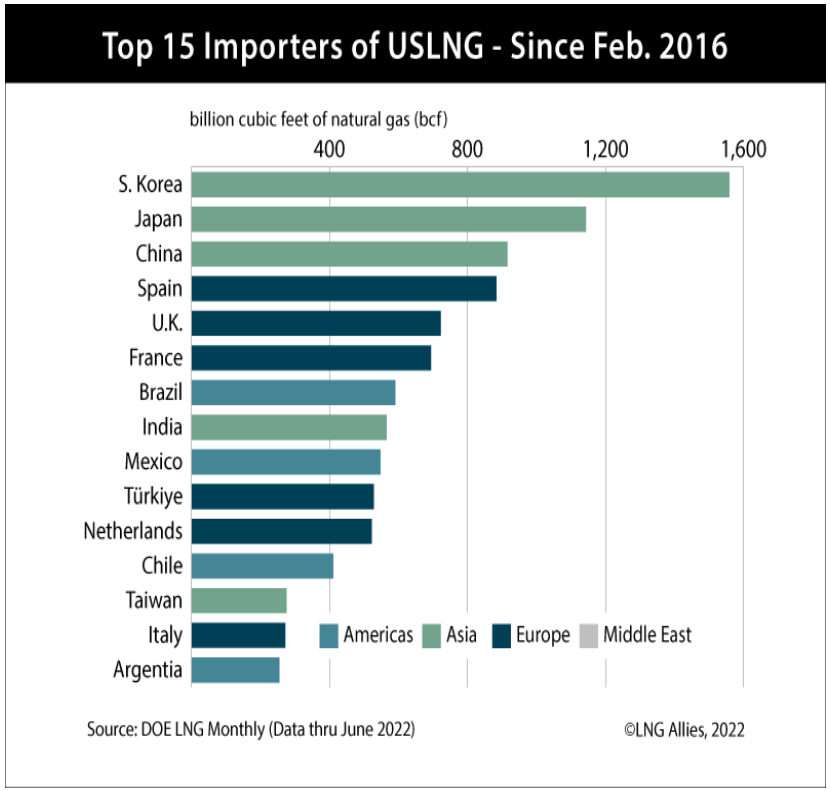
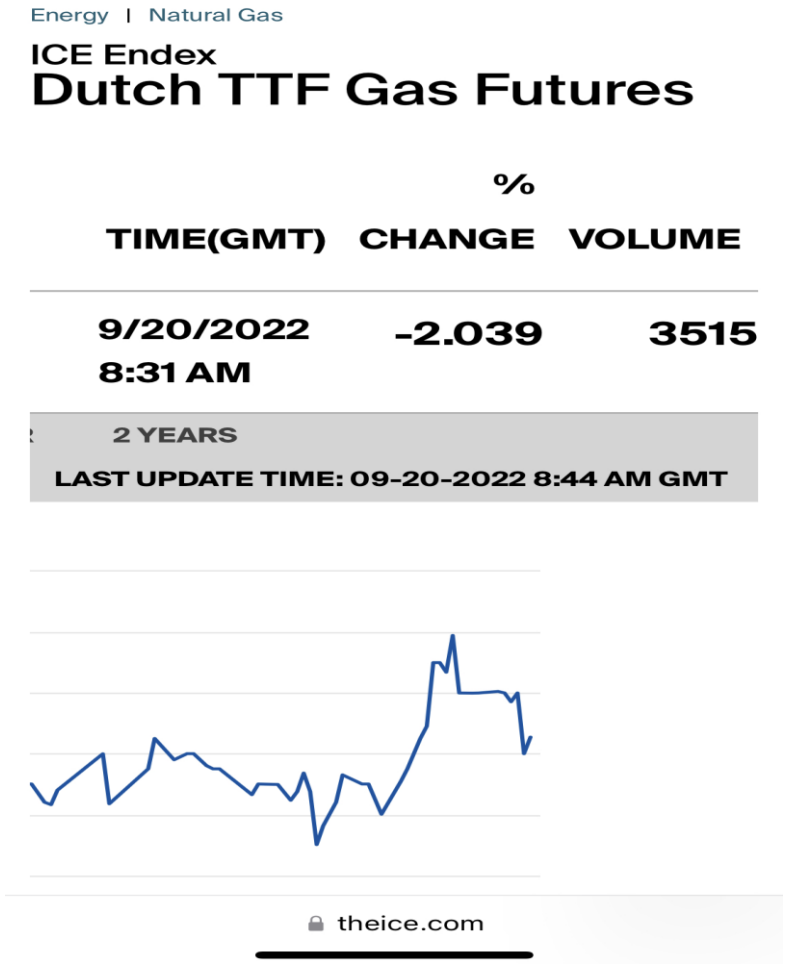
Import EU LNG cap





Speculation on TTF?

- **Mercato regolamentato non over the counter**
- Curva forward
- Volumi
- Quantità
- Risk management
- Liquidità lungo la curva
- Intercontinental Exchange, ICE



Speculation on TTF? Rivista Energia

MERCATO DEL GAS

di Andrea Paltrinieri* e Domenicantonio De Giorgio**

ASPETTI TECNICO-FINANZIARI DI TTF E HENRY HUB

Wholesale natural gas pricing for European benchmark TTF futures contract takes place within the domain of a fully-structured commodity futures market. The notion according to which TTF futures prices reflect inherent technical inefficiencies of that market is ill-established. Far more valid reasons behind TTF futures prices wild run up are to be found in the massive contraction of natural gas physical supply flows from Russia from as far as spring 2021. The need to attract large quantities of LNG from international routes to replace lost Russian piped supplies makes the case for TTF prices to «compete via signal» against international buyers in direct competition with European ones. As such, the relevance of the TTF price formation mechanism has grown dramatically as Europe evolves from a (nearly) stand-alone regional hub to a regional hub in direct international competition.

La formazione del prezzo del contratto futures TTF, benchmark per il gas metano all'ingrosso per l'area europea, avviene entro quello che a tutti gli effetti è un vero e proprio mercato di commodity futures. La nozione secondo cui i meccanismi di formazione di tale prezzo rifletterebbero insite inefficienze tecniche di tale mercato è malposta. Motivazioni ben più valide dietro le sue drammatiche variazioni vanno ricercate nella massiccia contrazione dell'offerta fisica — eminentemente russa — delle molecole di gas metano già a partire dalla primavera 2021. Inoltre, il bisogno di attrarre ingenti quantità di GNL dalle rotte internazionali in sostituzione delle perdute forniture terrestri russe fa gravare sul TTF anche un inedito valore «segnaletico» rispetto ai compratori in diretta concorrenza con la geografia europea. Ciò ulteriormente aggrava ruolo e rilevanza del meccanismo di formazione del prezzo TTF stesso, nella complessa transizione da hub regionale a sé stante ad hub regionale in regime di competizione internazionale.

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** *Professore a contratto, Università Cattolica del Sacro Cuore, Energy Working*

Con riferimento al recente articolo di Salvatore Carollo pubblicato su «RivistaEnergia.it» (1), abbiamo ritenuto opportuno focalizzarci su alcuni meccanismi di microstruttura e funzionamento del mercato Title Transfer Facility (TTF) e Henry Hub (HH). In particolare, vorremmo far luce su alcuni aspetti citati dall'Autore quali (1) le «gigantesche speculazioni» sul mercato TTF, «borsa di Amsterdam» e «mercatino di paese», (2) la natura di borsa regionale di TTF rispetto a quella ritenuta maggiormente globale di Henry Hub, «terminale di esportazione in Florida», (3) «il valore di Henry Hub come tetto massimo del prezzo del gas».

A tal riguardo, pare opportuno partire da una premessa. Prezzo *spot*, prezzo *future*, consegna fisica, *cash settlement*: purtroppo o per fortuna in Unione Europa si è deciso di instaurare un mercato – in cui si intrecciano dinamiche fisiche tipiche delle commodity e dinamiche finanziare – che ora «deve sopportare» il peggior shock energetico da cinquant'anni a questa parte. La crisi del gas in Europa, sul cui incombente arrivo ammonivamo già ad agosto 2021 (2), vede nel metano il proprio massimo simbolo: quantità, frequenza e durata della sua disponibilità sono al centro di un vortice frenetico che ne ha fatto decollare le quotazioni. Già: le quotazioni. E una quotazione è cosa complessa.

In prima approssimazione rappresenta il meccanismo attraverso cui si forma il prezzo rispetto al quale un compratore e un venditore convengono di scambiarsi un certo bene o servizio. Se la negoziazione è privata e bilaterale, il prezzo che «chiude» la trattativa

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WTI oil 2020 settlement

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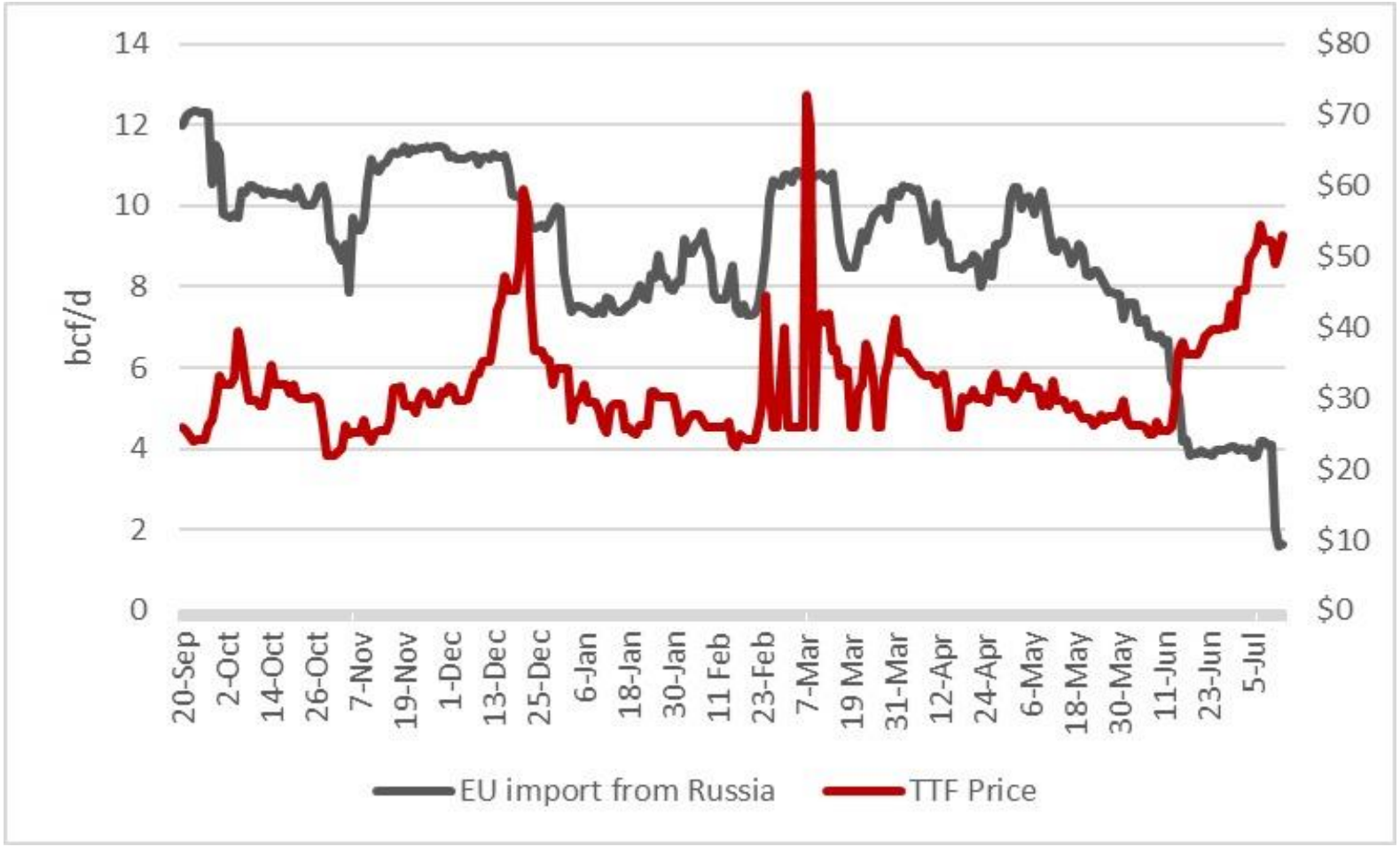
Import flows from Russia and TTF price



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Churn ratio TTF

Table 6: Global Gas Benchmarks Churn Ratios - 2020

Global Benchmark churn rates 2020 (HH, TTF, NBP: trading/consumption; JKM: trading/LNG imports)			
	Country/Region	**Hub**	**Churn**
VERY LIQUID	United States	HH	57.0
	US + Mexico	HH	54.2
	US + Mexico + Canada	HH	47.2
LIQUID	FR-DE-AT-CZ-Benelux	TTF	21.4
MATURE	Britain	NBP	12.6
	UK-IE	NBP	11.8
ILLIQUID	Asia	No hubs yet but increasing spot trading	
	CN-JP-KR-TW	JKM	0.79

Sources: JODI, S+P Global Platts, CME, LEBA, ICIS, ICE, ICE-Endex, PEGAS; P. Heather

NBP, when compared to the consumption across the United Kingdom and the Republic of Ireland

Agenda

- Oil market: Supply/Demand Balance
- Natural gas market: Supply/Demand Balance
- Financial implications: macroeconomics, portfolio

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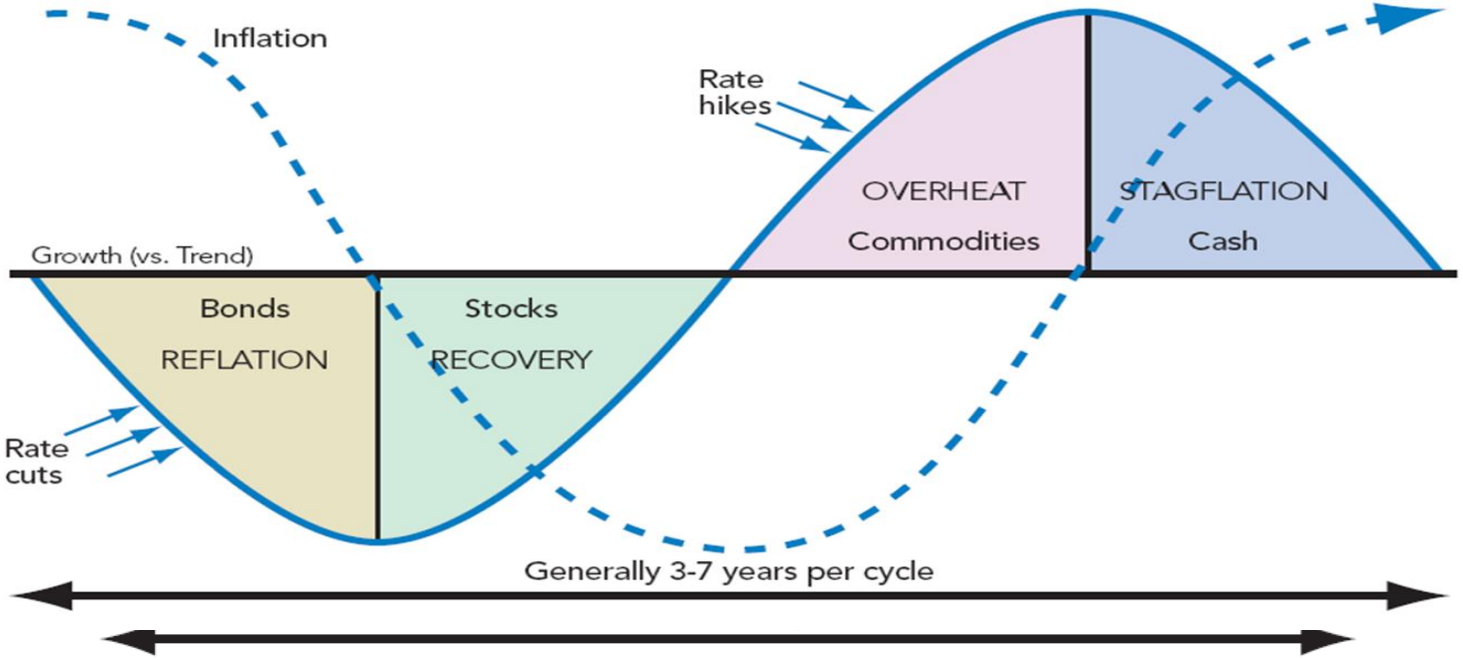
Economic cycle



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Global central banks policy rate

Global Central Bank Policy Rates						
Country	Rate	Central Bank Rate (Today)	CPI YoY	Real Central Bank Rate	Last Move	Last Move Month
Japan	Policy Rate Bal	-0.10%	4.0%	-4.1%	Cut	Jan-16
Switzerland	Target Rate	1.00%	3.3%	-2.3%	Hike	Dec-22
Thailand	Policy Rate	1.50%	5.0%	-3.5%	Hike	Jan-23
Taiwan	Discount Rate	1.75%	3.0%	-1.3%	Hike	Dec-22
Denmark	Deposit Rate	2.10%	7.7%	-5.6%	Hike	Feb-23
Eurozone	Deposit Rate	2.50%	8.5%	-6.0%	Hike	Feb-23
Norway	Deposit Rate	2.75%	7.0%	-4.3%	Hike	Dec-22
Malaysia	Policy Rate	2.75%	3.8%	-1.1%	Hike	Nov-22
Sweden	Repo Rate	3.00%	11.7%	-8.7%	Hike	Feb-23
Australia	Cash Rate	3.35%	8.4%	-5.1%	Hike	Feb-23
South Korea	Repo Rate	3.50%	5.2%	-1.7%	Hike	Jan-23
China	Loan Prime Rate	3.65%	2.1%	1.6%	Cut	Aug-22
UK	Bank Rate	4.00%	10.1%	-6.1%	Hike	Feb-23
Canada	Overnight	4.50%	5.9%	-1.4%	Hike	Jan-23
US	Fed Funds	4.63%	6.4%	-1.8%	Hike	Feb-23
New Zealand	Cash Rate	4.75%	7.2%	-2.5%	Hike	Feb-23
Hong Kong	Base Rate	5.00%	2.0%	3.0%	Hike	Feb-23
Saudi Arabia	Repo Rate	5.25%	3.4%	1.9%	Hike	Feb-23
Indonesia	Repo Rate	5.75%	5.3%	0.5%	Hike	Jan-23
Philippines	Key Policy Rate	6.00%	8.7%	-2.7%	Hike	Feb-23
India	Repo Rate	6.50%	6.5%	0.0%	Hike	Feb-23
Poland	Repo Rate	6.75%	17.2%	-10.5%	Hike	Sep-22
Czech Republic	Repo Rate	7.00%	17.5%	-10.5%	Hike	Jun-22
South Africa	Repo Rate	7.25%	6.9%	0.3%	Hike	Jan-23
Russia	Key Policy Rate	7.50%	11.8%	-4.3%	Cut	Sep-22
Peru	Policy Rate	7.75%	8.7%	-0.9%	Hike	Jan-23
Turkey	Repo Rate	9.00%	57.7%	-48.7%	Cut	Nov-22
Mexico	Overnight Rate	11.00%	7.9%	3.1%	Hike	Feb-23
Chile	Base Rate	11.25%	12.3%	-1.1%	Hike	Oct-22
Colombia	Repo Rate	12.75%	13.3%	-0.5%	Hike	Jan-23
Brazil	Target Rate	13.75%	5.8%	8.0%	Hike	Aug-22
Argentina	Benchmark Rate	75.00%	98.8%	-23.8%	Hike	Sep-22

CREATIVE PLANNING @CharlieBilello Data as of 2/22/23

German PPI

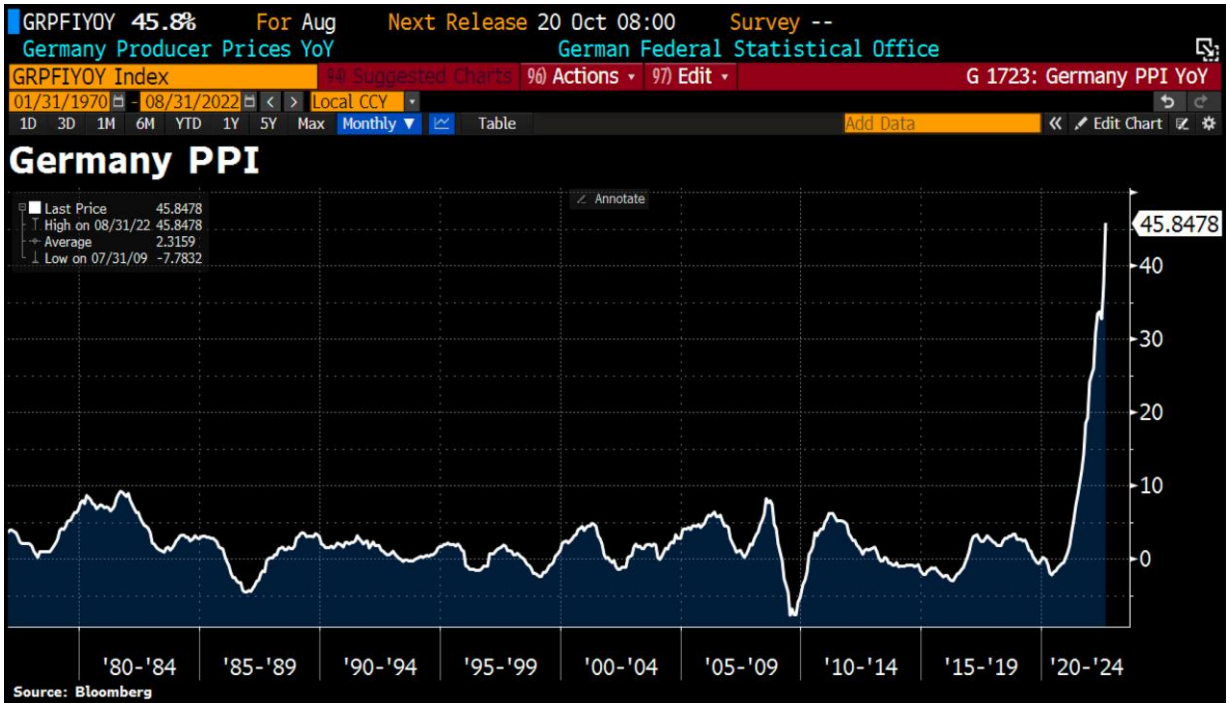
Energy prices more than doubled

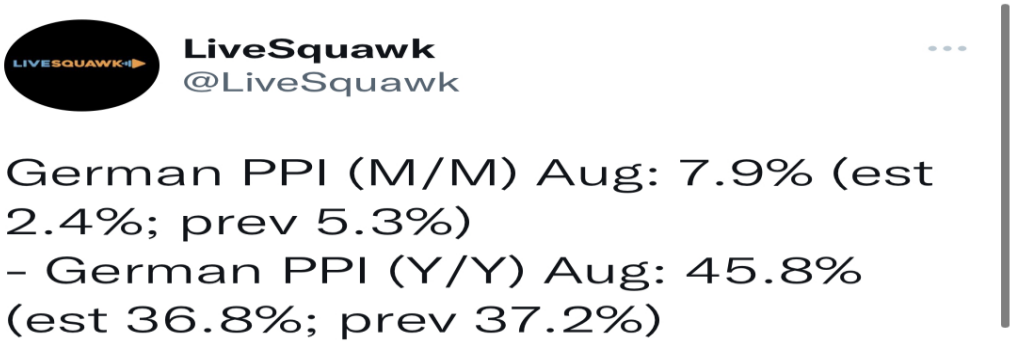
Energy prices as a whole were up 139.0% compared to August 2021 and by 20.4% compared to July 2022. Mainly responsible for the high rise of energy prices were the strong price increases of electricity (+174.9%).

Electricity redistributors had to pay 278.3% more than in August 2021, special contract customers 195.6%. Prices rose for small commercial customers who often conclude tariff-bound contracts by 12.9%. Compared with the previous month July prices for electricity rose for all customers by 26.4%.

Prices of natural gas (distribution) were up 209.4% on August 2021. Power plants had to pay 269.1% more for natural gas than one year before. Industrial consumers' prices were up 264.9%, those of resellers 236.8%. Across all customer groups, natural gas became 24.6% more expensive compared to July 2022.

Prices of mineral oil products were up 37.0% from August 2021 and fell by 3.2% from July 2022. Prices of light heating oil doubled compared to August 2021 (+104.0%), those of motor fuels were up 27.3%.





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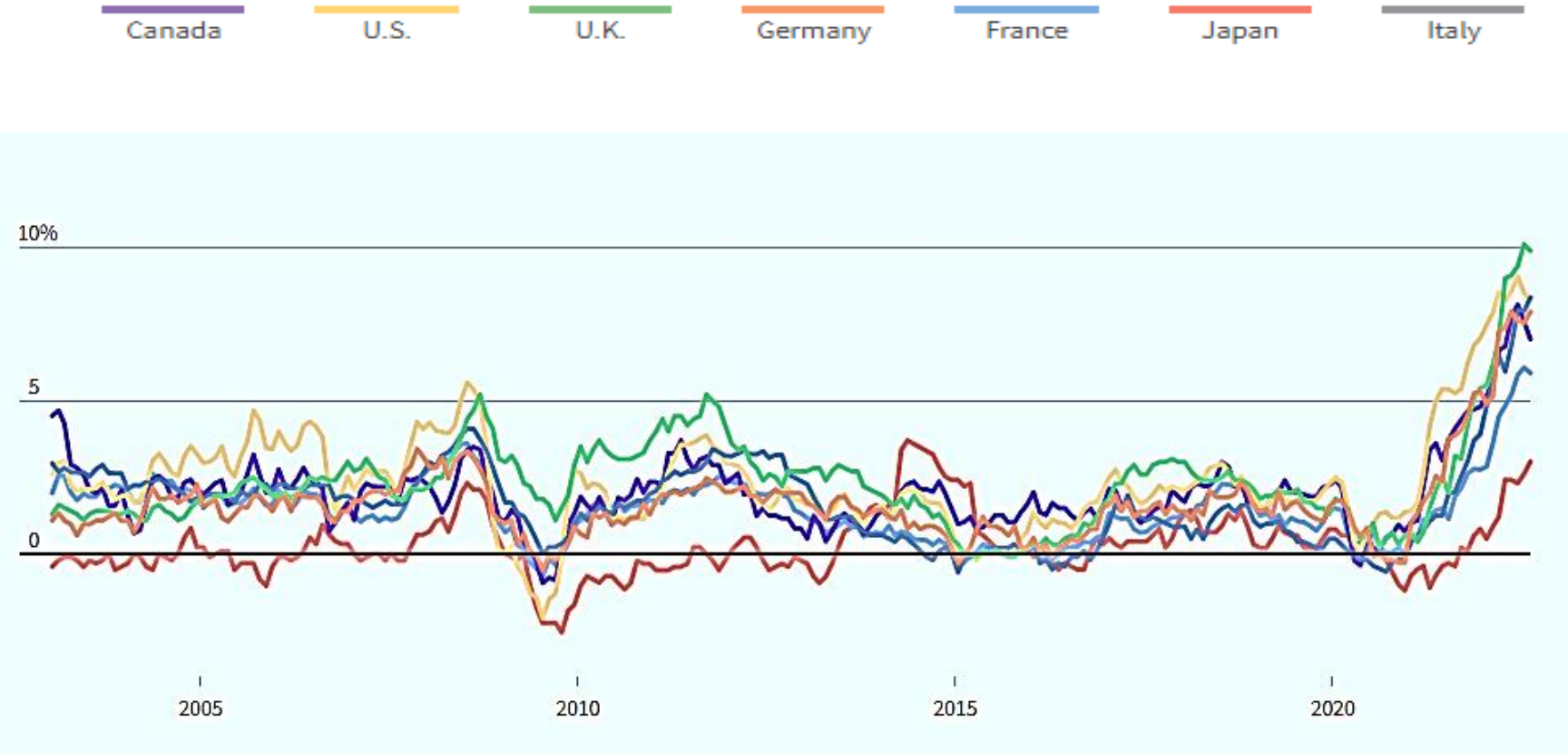
Inflation



Fonte: Reuters, Q1-2023

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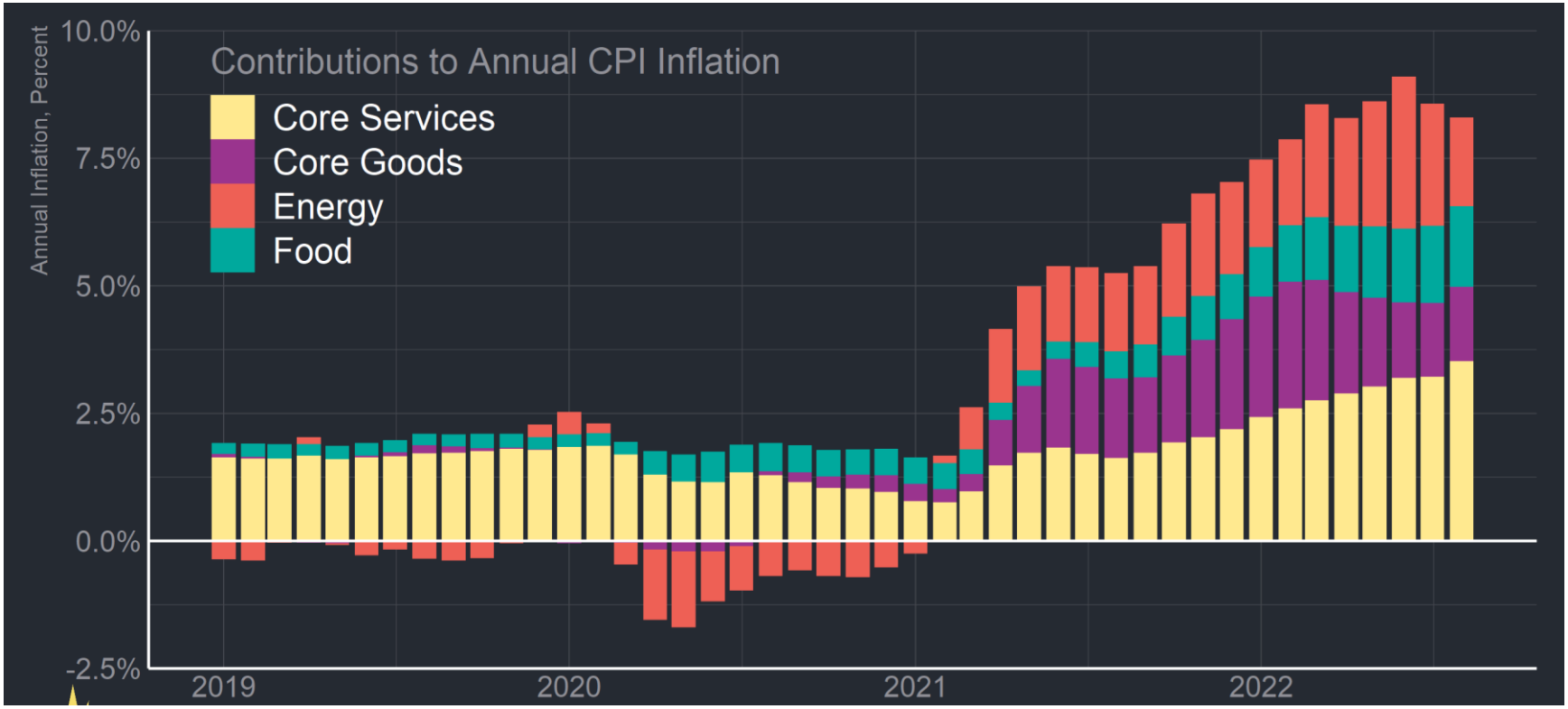
CPI US: contributors



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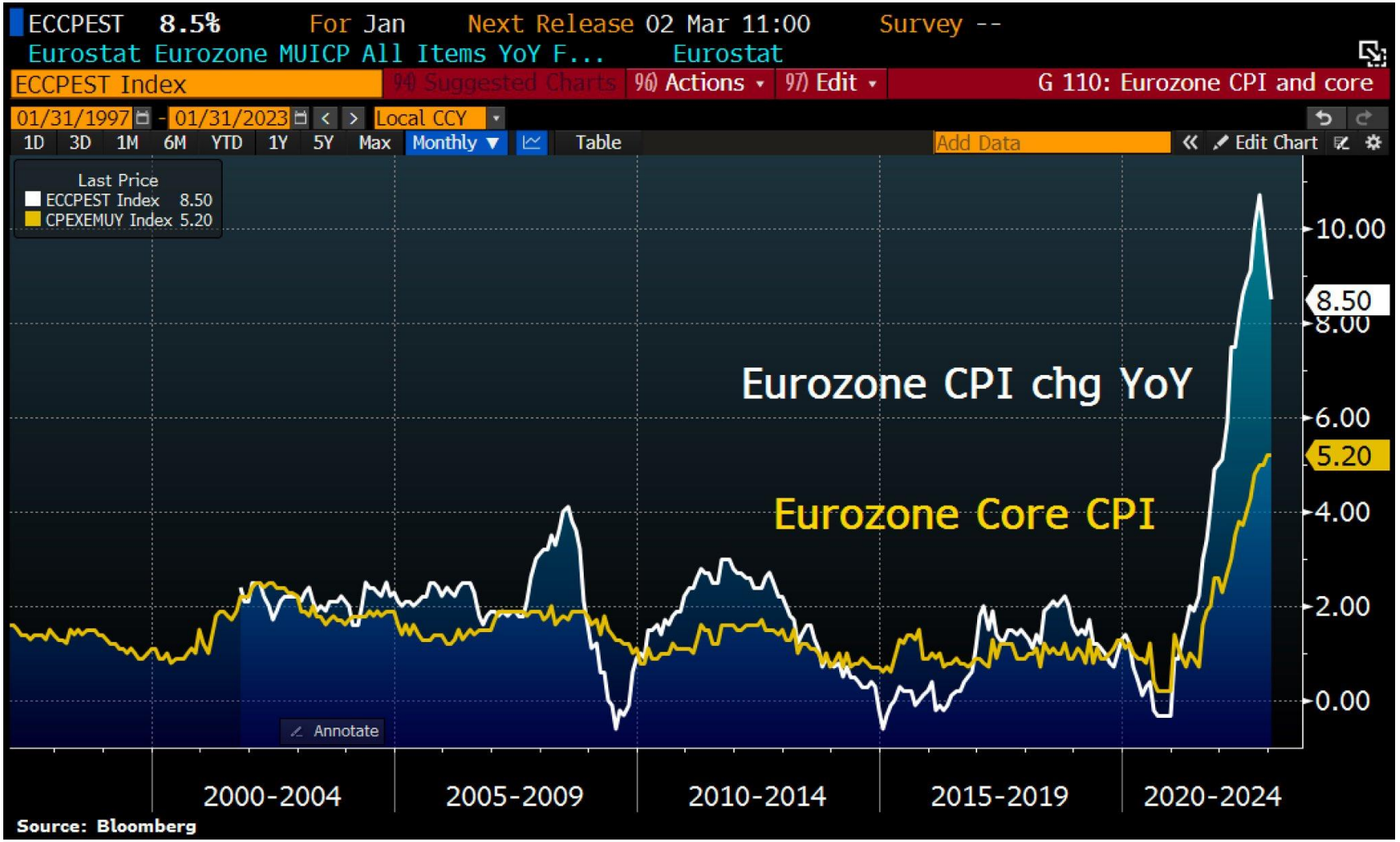
Eurozone CPI



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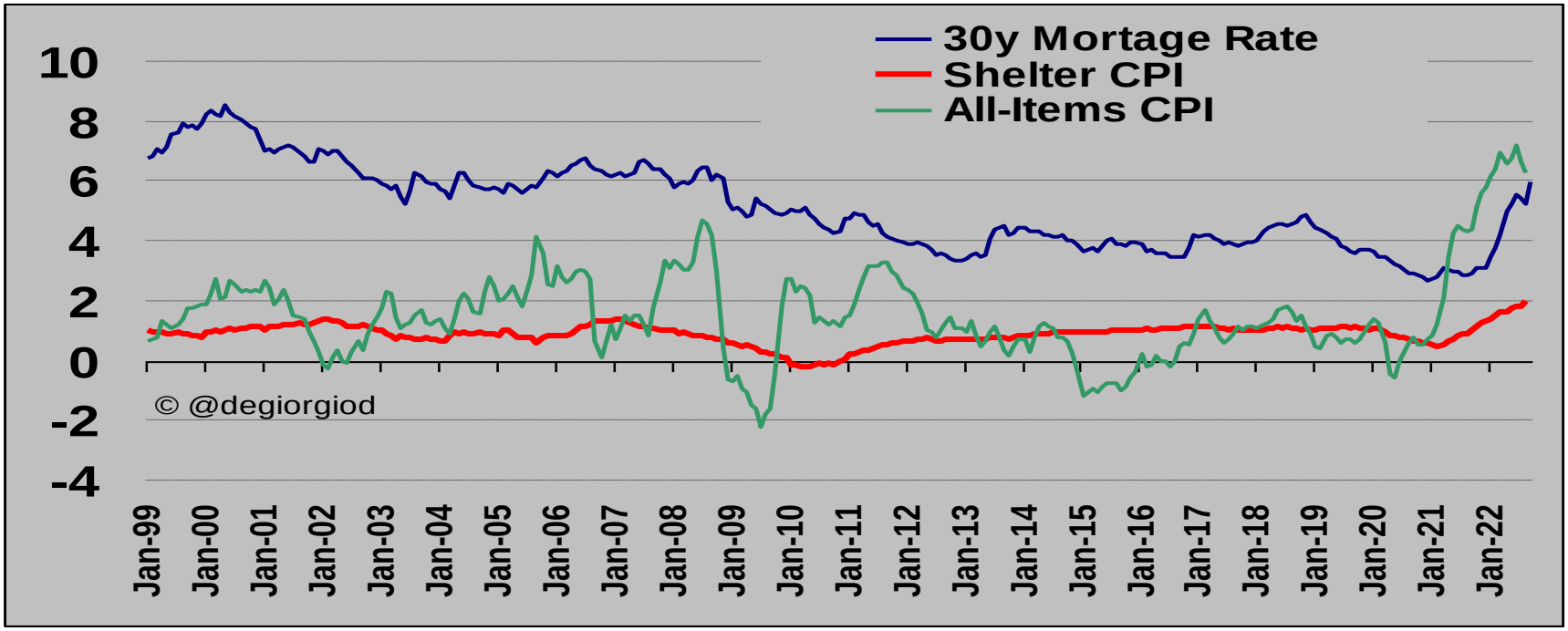
CPI US: shelter inflation



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Commodity returns

YOY commodity returns
Bloomberg
Feb' 2023

Sugar: +18%
Corn: +10%
US CPI: +6.5%
Gold: +4%
Wheat: +1%
Silver: +1%
Soybeans: -1%
Heating Oil: -2%
Copper: -9%
Gasoline: -12%
Zinc: -12%
Brent Crude: -12%
WTI Crude: -19%
Coffee: -29%
Cotton: -33%
Natural Gas: -51%
Lumber: -51%

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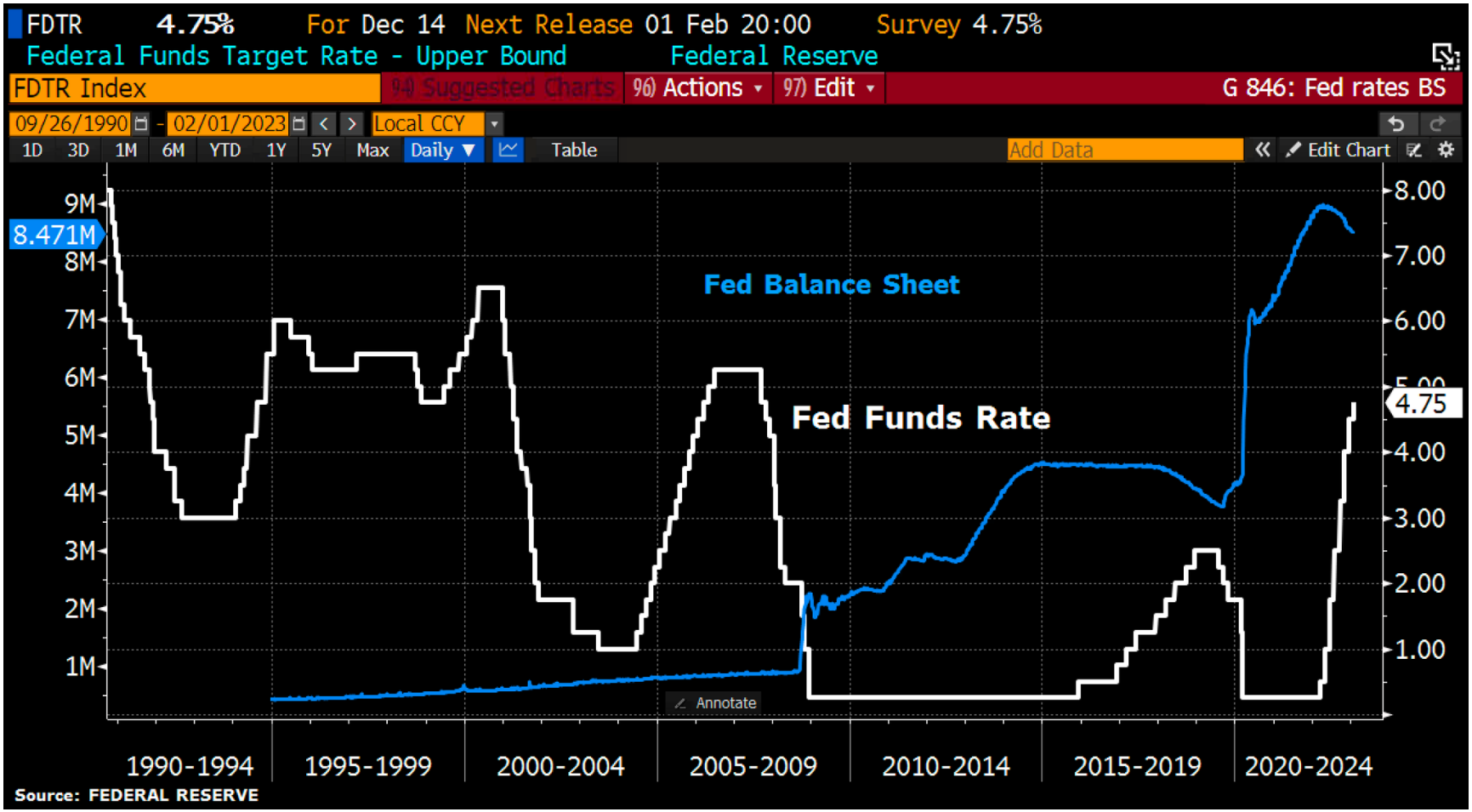
Fed fund rate



Thank you for your attention

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