Reading the News: Telling Supply from Demand in Commodity Markets

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This paper

We build **indexes** of commodity **supply** and **demand** using a **computer-based narrative approach**.

- Starting from a **general framework** that captures a **market-wide commodity sentiment**, we tailor our approach to cover **different commodity categories** such as energy, industrial and precious metals, agricultural commodities etc.

Contribution

- Our approach is **flexible**, **unified**, and can span the **global** commodity market.
- Our indexes can be used **independently** or enrich and improve structural model-based predictions.
- They track commodity price developments and are available at **higher frequencies** than standard macro variables.
  - Mitigation of the **temporal aggregation bias** in prediction.
- Relying on narrative measures helps relax the **orthogonality assumption** between supply and demand shocks often employed in quantitative and structural approaches.

Motivation

Understanding commodity-price fluctuations is **important**.

- **Implications** for **economic growth**, countries' **financial resources** and **income distribution**, **terms of trade** and **real exchange rates**.
- Unprecedented interest in **commodity investing** during the past decade and increased **flow of institutional funds** into futures markets of commodities: **financialization**.
  [Basak and Pavlova, 2016]
  - Implications for **portfolio allocation** and **market segmentation**.

Classifying commodity price developments into **supply** and **demand** components is **non-trivial**.

- Model-based methods
  - Conventional measures subject to **endogeneity critique**

Positioning in the Literature

- **Textual analysis** for the **measurement** of various **economic outcomes**; [Tetlock, 2007], [Gentzkow and Shapiro, 2010], [Hoberg and Phillips, 2010], [Boudoukh et al., 2013], [Alexopoulos and Cohen, 2015] **[Baker et al., 2016]**, and [Allcott and Gentzkow, 2016].
- **Identification** of **supply** and **demand** shocks in **commodity markets** (focus on oil): [Kilian, 2008; 2009], [Kilian et al., 2009], **[Wu and Cavallo, 2012]**, [Kilian and Vigfusson, 2016], [Känzig, 2018], **[Datta and Dias, 2019]**, [Loughran et al., 2019].
- **Narrative approaches** in **economics**: **[Romer and Romer, 2010]**.

Methodology. A four-layer approach

We simulate news reading in **four steps**.

- **News intensity**. Count the **number** of commodity-specific **articles**.
  - The larger the commodity price shock, the higher the news coverage of the commodity in-question.
  - Potential asymmetric relationship between positive and negative news and news coverage.
- **Content analysis**. **Identify words** and **word combinations** that can be **attributed** to **supply** and **demand** factors.
  - Identification of **words** and **word combinations** of **supply** and **demand** lemmas with standard directional words. ▸ dictionaries
- **Refinement**. Overlay the process with an additional algorithm that caters to **exceptions** and **negations**. Creation of **thematic indexes** that capture weather, financial developments, trade war, COVID-19 (ongoing).
- Extensive **Human Auditing**. ▸ human auditing

Data description

- **Market-wide news outlets** for the construction of the global commodity index; and for the individual commodity indexes.
  - **Reuters** (May 2000 to date, 1,035,286 articles)
  - **Dow Jones** (Jan 2000 to date, 2,760,967 articles)

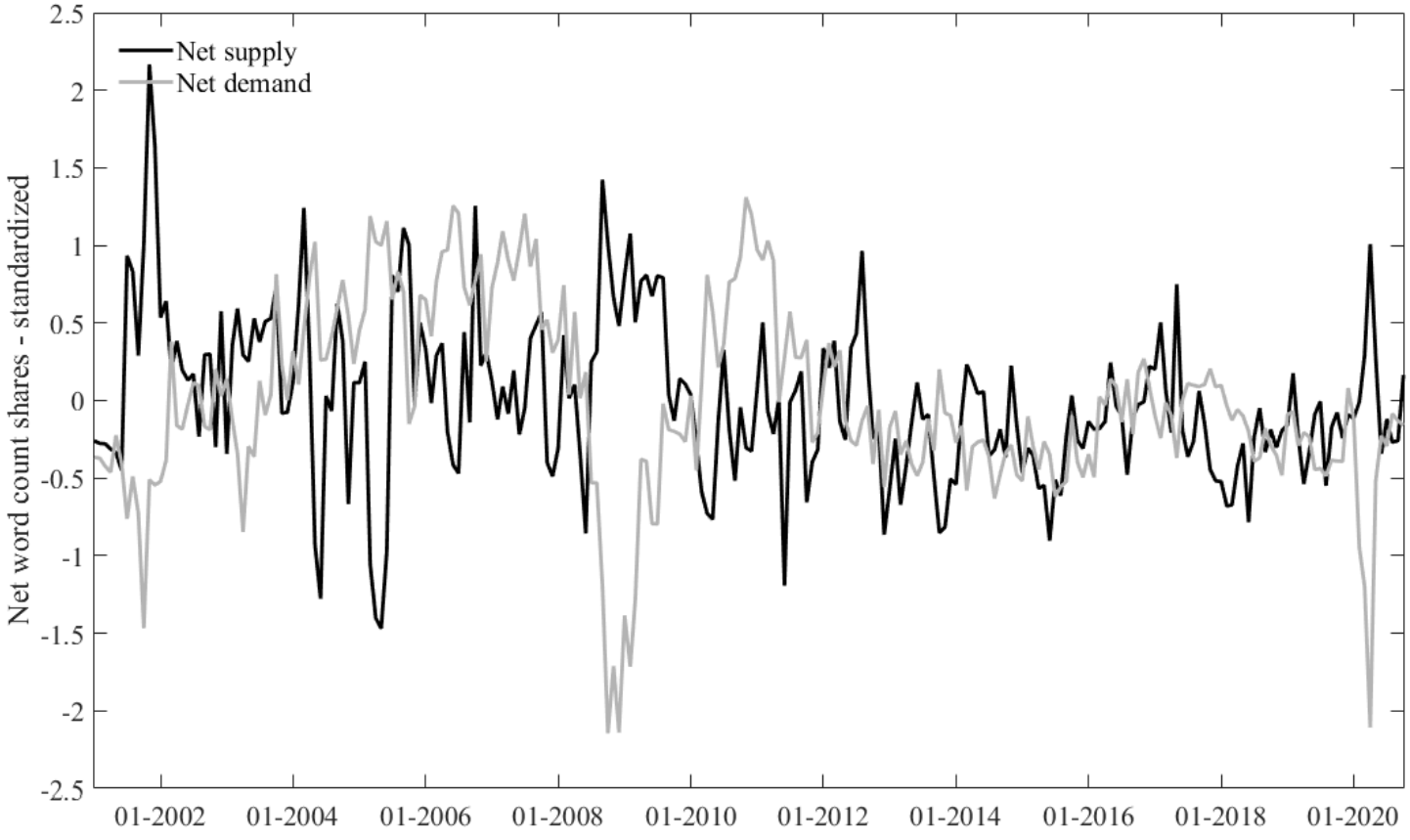
- We complement our market-wide news providers with **commodity specific publications** such as Oil Daily (Dec 1996 to date, 110,333 articles); Platts Gas Daily (Nov 2001 to date, 89,146 articles); Metal Bulletin News Alert Service (Jan 2010 to date) etc.

- Outlets accessed through **Factiva - Dow Jones**.

- **Standard article handling** (selection, sentence-splitting, lemmatization, stop-words and punctuation removal).

Standardized net supply and demand

Global commodity indexes



Net supply = supply decrease - supply increase
Net demand = demand increase - demand decrease

Relationship with commodity returns

Regression of S&P GSCI composite daily returns on news coverage, supply & demand indicators

	Net supply only	**Net demand only**	**Net supply & net demand**
No Articles	0.000001	-0.00001***	-0.000014***
	(0.21)	(-3.71)	(-4.81)
Net supply	0.00088***		0.00135***
	(3.84)		(6.10)
Net demand		0.00267***	0.00291***
		(8.15)	(8.98)
N	4117	4117	4117
R2	0.01	0.04	0.05

Commodity-specific results

Regression of S&P GSCI commodity-specific daily returns on net supply & demand indicators

	Crude Oil	**Natural Gas**	**Copper**	**Wheat**
Net supply	-0.00538	0.0321***	0.00881***	0.0139***
	(-1.32)	(10.23)	(3.56)	(5.12)
Net demand	0.0424***	0.0747***	0.0342***	0.0479***
	(7.28)	(16.00)	(11.91)	(17.86))
N	5529	4154	2427	4810
R2	0.034	0.05	0.06	0.06

Application I. Impact on stock market volatility

Structural decompositions point to the **significance** of demand shocks, while the impact of **supply** shocks appears to be **negligible** for stock market volatility [Bastianin and Manera, 2015]: Test using **disaggregated** indexes.

The impact of disaggregated crude-oil supply & demand indexes on stock market volatility

	Supply only	Demand only	Supply and Demand
Supply Increase	-1.927***		-1.543***
	(-15.14)		(-12.89)
Supply Decrease	0.391**		-0.0198
	(2.34)		(-0.13)
Demand Increase		-1.620***	-1.317***
		(-12.14)	(10.09)
Demand Decrease		2.482***	2.330***
		(12.38)	(11.98)
N	4911	4911	4911
Adj. R2	0.041	0.067	0.096

Application II. Diversification & market segmentation

Across commodity sub-categories

Hypothesis: Upon the arrival of a large **supply shock**, **prices of risk** in the directly affected asset class become **disconnected** from those in others [Greenwood et al., 2018], [Passari and Topaloglou, 2020].

Correlations of Daily Returns Following a Crude Oil Supply Shock

	S&P GSCI Agricultural	*S&P GSCI Energy*	*S&P GSCI Precious Metals*	*S&P GSCI Industrial Metals*	*S&P GSCI Livestock*
S&P GSCI Agricultural	1,00				
S&P GSCI Energy	0,33	1,00			
S&P GSCI Precious Metals	0,15	0,13	1,00		
S&P GSCI Industrial Metals	0,43	0,57	0,18	1,00	
S&P GSCI Livestock	0,14	0,13	-0,15	0,18	1,00

Correlations of Daily Returns Following a Crude Oil Demand Shock

	S&P GSCI Agricultural	*S&P GSCI Energy*	*S&P GSCI Precious Metals*	*S&P GSCI Industrial Metals*	*S&P GSCI Livestock*
S&P GSCI Agricultural	1,00				
S&P GSCI Energy	0,42	1,00			
S&P GSCI Precious Metals	0,46	0,41	1,00		
S&P GSCI Industrial Metals	0,33	0,40	0,52	1,00	
S&P GSCI Livestock	0,18	0,19	-0,06	0,24	1,00

Difference in Correlations of Daily Returns: (Demand - Supply)

	S&P GSCI Agricultural	*S&P GSCI Energy*	*S&P GSCI Precious Metals*	*S&P GSCI Industrial Metals*	*S&P GSCI Livestock*
S&P GSCI Agricultural	0,00				
S&P GSCI Energy	0,09	0,00			
S&P GSCI Precious Metals	0,31	0,28	0,00		
S&P GSCI Industrial Metals	-0,10	-0,17	0,35	0,00	
S&P GSCI Livestock	0,04	0,06	0,09	0,06	0,00

Application II: Diversification & market segmentation

Across asset classes

Correlations of Daily Returns Following a Crude Oil Supply Shock

Full Sample

	S&P 500	*Moody's Aaa CB*	*S&P GSCI*	*10-Y Treasury*
S&P 500	1,00			
Moody's Aaa CB	0,41	1,00		
S&P GSCI	-0,02	0,30	1,00	
10-Y Treasury	0,34	0,23	-0,06	1,00

Correlations of Daily Returns Following a Crude Oil Demand Shock

Full Sample

	S&P 500	*Moody's Aaa CB*	*S&P GSCI*	*10-Y Treasury*
S&P 500	1,00			
Moody's Aaa CB	0,70	1,00		
S&P GSCI	0,15	0,42	1,00	
10-Y Treasury	0,44	0,44	-0,14	1,00

Difference in Correlations of Daily Returns: (Demand - Supply)

Full Sample

	S&P 500	*Moody's Aaa CB*	*S&P GSCI*	*10-Y Treasury*
S&P 500	0,00			
Moody's Aaa CB	0,29	0,00		
S&P GSCI	0,17	0,12	0,00	
10-Y Treasury	0,10	0,21	-0,08	0,00

Conclusion

- We build **indexes** of commodity price **supply** and **demand** developments using **textual analysis**.
- Our indexes measure the **coverage**, **direction** and **intensity** of commodity news and **track** the major **developments** in commodity markets.
- **Useful** tool in the light of the recent **COVID-19 crisis** when supply and demand **shocks** are **frequent**, **large**, and **not necessarily orthogonal**.
- Supply and demand developments appear to have **different implications** for the **volatility** and **correlation dynamics** across **asset markets**. Implications for diversification and market segmentation.

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– Appendix –

Methodology

Dictionary examples

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Commodity-Wide Common Dictionary

Supply

suppl*	produc*	output*	export*

Demand

demand*	consum*	buy*	import*

Natural Gas

Supply

suppl*	produc*	output*	export*	inject*
explor*	extract*	rig*	drill*	capacity*

Demand

demand*	consum*	buy*	import*	util*
emission*	costumer*	electric*	heating*	plant*

Wheat

Supply

suppl*	produc*	output*	export*	crop*
planting*	farm*	harvest*		

Demand

demand*	consum*	buy*	import*	purchas*
flour*	feed*	miller*		

Human and computer standardized net supply and demand

Global commodity indexes

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