

The Impact of the COVID-19 Crisis on Energy Prices in Comparison to the 2008 Financial Crisis

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Introduction and Motivation

The COVID-19 pandemic has forced governments around the world to impose strict social-distancing measures among the population to ease the burden on health care systems and slow down the spread of the virus. European countries have seen an abrupt shut-down of their economies; except for basic necessities all other sectors of the economy have been affected by an unprecedented demand contraction and a declined supply of goods. The energy sector is no exemption, historical consumption profiles have changed as people's and industries' routines have been drastically shuffled, transportation is kept to minimum levels and cycling and walking have risen in importance as a result of curfews.

This contribution analyzes the impact of COVID-19 on price developments of the main five energy commodities, oil and coal globally, gas and CO2 certificates in Europe as well as electricity in Germany, with that observed during the world financial crisis of 2008. In particular, we address the following questions:

- What is the behavior of electricity, oil, gas, coal and carbon prices during COVID-19?
- Are there any similarities (or differences) in price behavior with the same period in 2018, 2019 and 2008?
- Besides the COVID-19 crisis, are there additional drivers for commodity prices at the moment?

The energy markets have never experienced a crisis on the scale of COVID-19, and comparisons with other crises may seem at first misplaced; however, the financial crisis—albeit different in causes and progression—is the worst latest reference the sector has and it is insightful to understand where we stand and what lessons could be drawn for current market developments.

The following sections address the methodology, criteria and assumptions for the selected comparison time frames, the general and crisis-specific drivers for each commodity, and the final discussion and conclusions, highlighting reasons behind price movements in both crises.

Methodology

To depict the current price trends of the chosen energy commodities and compare them with the 2008-crisis, price time series in 2020 up to April 9 are analyzed. All months of 2020 were characterized by news regarding COVID-19 with various degrees of severity. Hence, three points in time are selected as “events” which likely affected markets (cf. also The Berlin Spectator, 2020):

- Monday, 27.01.2020: First European cases in France on January 25 and the first German case on January 27 (ZDF, 2020).
- Monday, 24.02.2020: Germany's Federal Minister of Health, Jens Spahn, states that COVID-19, as an epidemic, has reached Europe and its spread in Germany is anticipated (Federal Ministry of Health, 2020). EURO STOXX 50 and DAX started plummeting the Friday before and strongly continued on this Monday (WSJ, 2020).
- Monday, 23.03.2020: Schools and daycares closed in all German states and ban for social meetings is imposed (Merkur, 2020; Federal Ministry of Health, 2020).

Although some impacts have been observed before, March 23, 2020 is the appointed date (AD) for the setting in of the COVID-19 crisis within this analysis. The trends in commodities before and after this date will be juxtaposed with the trends before and after the AD of 2008's financial crisis, which is set to September 15, corresponding to the announcement of Lehman Brothers' bankruptcy. Hence, March 23, 2020 and September 15, 2008 will serve as ADs, whose values are the basis, from which percentage deviations will be presented.¹ The trends from 2018 and 2019 are also shown for a comparison of recent developments in commodities. March 26, 2018 and March 25, 2019 serve as ADs, so Mondays are used in all years.

Impact of the COVID-19 pandemic in energy commodities with focus on Germany

Overview on energy commodity price curves

The current COVID-19 pandemic affects energy commodities in different ways. Figure 1 shows normalized price curves for electricity, coal, carbon, gas and oil in relation to the appointed date of each year. Detailed analyses of each commodity as well

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as discussions on causes and effects follow in the corresponding sections below.

Oil

The COVID-19 pandemic is an unprecedented shock to the global oil industry: the sharp drop in oil demand, mostly driven by a worldwide standstill transport sector, has collapsed oil prices; an oversupply—due to lifted restrictions for OPEC+ producers and a price war between Russia and Saudi Arabia—is, in turn, seizing up available storage capacities and lowering price even further.

Day-ahead prices of the domestic West Texas Intermediate (WTI) and international Brent crude oil are strongly fluctuating: in March/April 2020 prices reached absolute levels lower than those seen during the financial crisis in 2008, although the absolute price delta remains below 2008's. The price decline during the financial crisis started at approx. 145 USD/bbl (Jul 08) and turned down to 30 USD/bbl (Dec 08), which is a 80% fall and a delta of 115 USD/bbl; the price plummet in 2020—started even before COVID-19 due to the oil price war—went from 63 USD/bbl (WTI) and 72 USD/bbl (Brent) in January to its lowest level in history, 17 USD/bbl (WTI, 26/03/20) and 11 USD/bbl (Brent, 01/04/20), which is a 73% (WTI) and 84% (Brent) decline and a price delta of 46 USD/bbl (WTI) and 61 USD/bbl (Brent), respectively.

The standard deviation of the price fluctuations in both crises seems to be similar for the given timeframe: 14-16 USD/bbl (COVID-19) and 16-18 USD/bbl (financial crisis). The International Energy Agency forecasts a price stabilization for the end of the second quarter of 2020, (IEA 2020). This would follow a path, similar to the financial crisis, where the lowest oil price level was reached three months (Dec 08) after the starting point of the crisis (Sept 08). Figure 1: Price curves in oil, gas, coal, carbon and electricity markets of calendar week (CW) 3 to CW 22 in 2018, 2019 and 2020 compared with the financial crisis in 2008 (Source: Thomson Reuters Datastream (2020), EEA (2012), ENTSO-E (2020), OPSD (2019)).

Fuel efficiency measures had already lowered oil demand from the transport sector—especially road and maritime—, but the major shock comes from the sharp cut in passenger mobility especially in flight and road modes. As an example, as of March 29th, mobility in transit stations in Germany had declined around 70% compared to the baseline (Google, 2020) and the demand shock grows as countries enforce more lock down measures. In contrast, during the financial crisis, passenger mobility—driven by the disposable income—was only slightly affected, decreased 5% worldwide (Moschovou & Tyrinopoulos, 2018), but international trade was severely reduced and the freight sector of major exporting countries saw declines of over 20% (Rothengatter, 2011).

Natural gas

For the past years, gas prices have continuously decreased due to milder winters, increased shares of LNG imports—mainly driven by US gas—and consequent greater volumes of stored gas. Figure 1 shows the gas prices in the NetConnect Germany market area. Due to price convergence, this series can be seen as a proxy for European gas prices. This declining price trend also holds for January and February of 2020—just before the COVID-19 crisis hit Europe—as the gas price at the AD was on a much lower level (8.25 EUR/MWhth) compared to 2019 (15.20 EUR/MWhth) and 2018 (18.02 EUR/MWhth).

However, from the week before the AD to the following, the price dropped 20% compared with a decline of 6% in 2019 and 2% in 2018 over the same weeks. This would mean that the COVID-19 crisis led to a larger relative decrease in the seasonal price of natural gas compared with the two previous years without a crisis. In contrast, during the Lehman Brothers bankruptcy in 2008 prices remained stable, possibly due to a stronger interlinkage between oil and gas prices in long-term gas supply contracts; while in 2020, gas prices are increasingly affected by liquid spot markets and gas-to-gas trading.

When the COVID-19 crisis hit, there was no sudden gas price collapse within a couple of days but the underlying economic crisis is affecting gas price drivers. Hauser et al. (2016) discuss gas price determinants in detail.

On the supply side, increased competition within gas markets has already led to an overall price decline and fuller storages: by the end of March 2020, German suppliers were storing 164 TWhth (72% of total capacity) compared to 122 TWhth in 2019 and 33 TWhth in 2018. As storage levels depend on the coldness of the previous winter, a COVID-19-induced demand contraction over the coming months will further pressure gas suppliers.

Current gas price movements are driven by remaining high supply capacities and decreasing demand. Demand for gas in Germany comes from the heating, power, and industry sector and they are affected by the COVID-19 crisis in varying degrees. Due to previous mild winters, the already low gas demand from the heating sector is not expected to further change with the crisis. The gas demand from the power sector relies not only on the electricity demand, but also on the share of renewable energy sources (RES), which is also discussed in the electricity section. Finally, as gas is used in many industries, which have a share of approx. 30% in total gas demand in Germany (e.g. chemical processing and metal industry) and are likely affected by the crisis, a longer-term reduction of industrial demand is also probable.

Coal

During the COVID-19 crisis, a clear decline in coal prices cannot be identified. As Figure 1 shows, prices

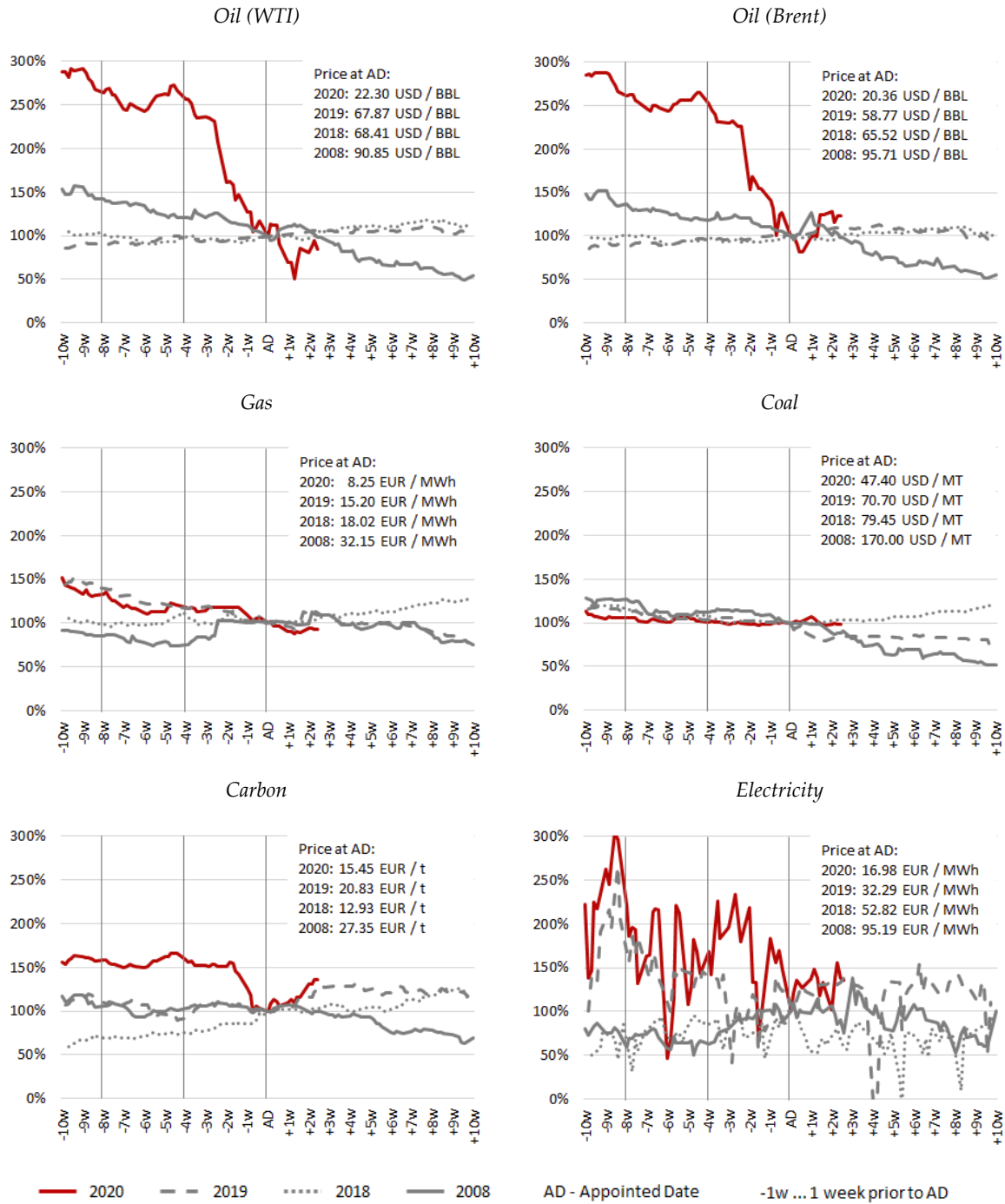


Figure 1: Price curves in oil, gas, coal, carbon and electricity markets of calendar week (CW) 3 to CW 22 in 2018, 2019 and 2020 compared with the financial crisis in 2008
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were already comparably low before New Year 2020. There was a clear drop at the end of March 2019 from price levels that were continuously higher than 70 USD/t to prices of about 60 USD/t. Since then, an overall declining trend continued, so that prices were at about 50 USD/t at the end of March 2020. It can be concluded that the effect of the COVID-19 crisis on coal prices is comparably low and that influencing factors that put coal prices under pressure already existed before the crisis (e.g. falling gas prices, prices of ETS certificates) and are still the main drivers (IEA, 2019).

During the financial crisis, by contrast, a clear effect of global hard coal demand on prices can be observed. Before this crisis, coal producing companies increased their investments significantly. When global hard coal demand dropped sharply due to the crisis, companies addressed the drastic decline in cash flow with a reduction of prices. There was an overall, steep decrease in coal price to 2006 levels, starting in July 2008 until the beginning of 2009 (IEA, 2009).

Carbon

Like fuel prices, prices of European Union Allowances (EUA) decreased due to the COVID-19 crisis, from 25 to 17 EUR/t (-30%). This direct and sharp market reaction was not observed in the financial crisis of 2008. In 2009, market reacted much slower, with first price declines six weeks after Lehmann Brothers' bankruptcy, although ultimately the price decreased by up to 60%. The financial crisis and the related lower industry production contributed to low carbon prices for almost a decade (Bel & Joseph 2015). These low prices allowed policy makers to tighten the regulation of EU ETS (Emissions Trading System) and hence to reduce its cap, e.g. with the instruments of back loading, market stability reserve (MSR) as well as a higher reduction factor in phase 4. However, all this was possible because the EU ETS was oversupplied and it lost its capability to provide sufficient price signals for the mitigation of carbon emissions.

Looking at today's EU ETS, a reduction in carbon emissions is observed due to COVID-19. Currently, it is unclear if this short-term reduction will lead to an overall long-term reduction in emissions in the EU ETS. This depends on the fundamental situation of the EU ETS that can either stay scarce or the market turns long and is oversupplied with EUAs. In the latter case, the MSR will reduce the number of available EUAs, which allows policy makers to tighten the regulation again. However, it is highly questionable if this is a focus of policy makers due to the upcoming economic crisis. Otherwise, if the market remains scarce, short-term industry production declines and emission reduction will only decrease the EUA price, which can already be observed. But overall emissions in the ETS sector will not decrease since the European emission cap is constant. Therefore, emissions in the ETS sector will occur later or in a different area. This so-called

“waterbed effect” is widely discussed in association with the coal phase-out (Rosendahl 2019).

Electricity²

Figure 1 suggests that day-ahead electricity prices have fallen since the start of lock-down measures in Germany (CW 13) and are also lower compared with the same time frame in reference years (2018 and 2019). While in the CW 13 of 2020, average price was 20.93 EUR/MWhel, on the same days of this calendar week, average price was 38.33 EUR/MWhel in 2019 and 40.52 EUR/MWhel in 2018. In contrast, the Lehman Brothers' bankruptcy does not exhibit a clear impact on day-ahead prices.

The current effect on prices is unambiguous when comparing the first two weeks of the lock-down with similar weeks in terms of aggregated weekly generation fuel type in 2020: comparable weeks 13 and 6 show a difference of 12.22 EUR/MWhel—absolute values in week 6 are higher only for five of the 120 hours in the time-frame; weeks 14 and 12 exhibit 22.97 and 23.92 EUR/MWhel, respectively, which is a minor difference. Possibly the crisis had an impact in week 12 already, though prices in week 12 exceed week 14 for 32 hours only.

Three main factors influenced these price developments during the COVID-19 crisis: lower power demand—due to reduced industrial production and activities in the service sector—, lower prices of energy carriers and emission certificates, and higher feed-in from variable renewable generation (vRES).

1. Power demand. During the first two weeks of lock-down, demand was 420 GWhel lower than in the same weeks of 2019 and 161 GWhel lower in the same weeks of 2018; the latter gap is not as large because Good Friday and Easter Monday in the considered time span of that year lowered demand. Likewise, comparing the 15th week, demand dropped 1,090 GWhel (2019) and 903 GWhel (2018). Such a large decrease may not be solely explained by the public holiday on the 10th of April but may also respond to the generalized demand contraction triggered by the crisis.

2. Prices of energy carriers and ETS certificates. As discussed above, prices of gas and ETS certificates are following a sharper declining trend since the beginning of the crisis. Figure 2 shows decreasing variable unit costs for gas plants and slightly increasing ones for coal plants, suggesting that combined cycle gas turbines are progressively undercutting marginal costs of hard coal and lignite.

3. Renewables feed-in (vRES). During the first three weeks of the lock-down, low power demand has also faced a higher vRES feed-in (7.9 TWh_{el}) compared with the same time frame in 2019 (6.0 TWh_{el}) and 2018 (7.6 TWh_{el}). This higher feed-in, although independent from the COVID-19 crisis, has put downward pressure on power prices and production from fossil plants.

With respect to the two previous weeks, power

demand in week 13 and week 14 decreased by 6.9% in Germany, 9.2% in France, 10.3% in the United Kingdom, 10.5% in Spain and 17.1% in Italy. Italy and Spain have shut-down all non-essential factories and had a more stringent curfew, while some (more) industries in Germany remained open, which could explain its comparatively small drop in power demand in Germany.

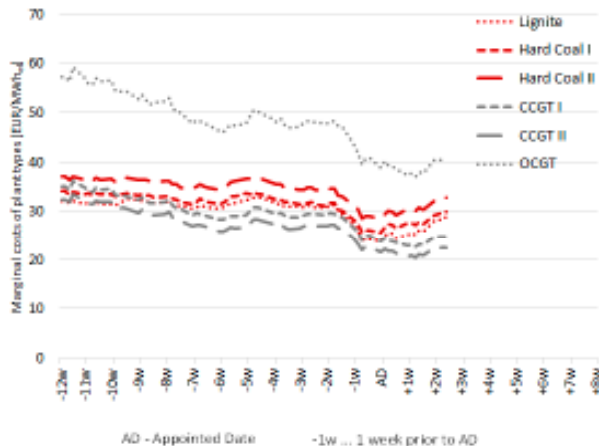


Figure 2: Variable item costs for different unit types. Properties of Lignite, OCGT, Hard Coal I and CCGT I are derived from Panos & Konstantin (2017, p. 154), and roman-II-plants are derived from JRC (2014). Fuel and carbon prices are from Datastream (2020). Own illustration.

Conclusion

The COVID-19 pandemic's impact on energy commodities is largely heterogeneous. The effect of COVID-19 on coal prices can be deemed indirect at most. The observed decline in European gas prices is a general trend due to mild winters, filled storages and increasing competition of pipeline gas and LNG. The COVID-19 crisis may affect fundamental drivers in the form of a decrease in gas demand in the power and industry sector due to a general decline of economic growth. Currently, significantly lower CO₂ emissions are observed in the transport and industry sector. It is questionable whether a long-term effect for emissions covered by the emission trading system can be observed, especially if the overall carbon emission cap (EU ETS) remains constant. Long-term effects in the emission trading system will depend on stabilization mechanisms and outcomes of the Green Deal. The oil market is affected to a great degree as prices have reached historically low levels driven by both, a supply shock from the Saudi-Russian price war as well as a demand shock from the COVID-19 pandemic. The impact might be temporary, but long-term challenges foresee a highly unstable global financial situation.

In general, the COVID-19 shut-down results in a lower power demand, leading to an overall expected reduction in power output of conventional units. Shifts in the merit order of power plants in Germany can already be observed due to a change in the coal-to-gas

price ratio. Hard coal is pushed out of the market, due to low gas prices, and lignite production is reduced to lower levels, an effect not compensated by low carbon prices. When determining the merit order with commodity prices from March 2, 2020, 5 GW of highly efficient CCGTs precede lignite in the merit order. This amount doubles when using prices from March 31, 2020. However, the weeks past the COVID-19 measures are also characterized by high amounts of renewable energy feed-in, which impedes parsing the effect of COVID-19 on electricity prices.

This analysis is a snapshot of short-term trends in energy commodity prices in 2020 and attests to the complexity of factors affecting energy markets. General trends and conditions, which exist independent of COVID-19, determine prices, but the pandemic-based demand shock further affects the commodities. An observable "COVID-19 energy price effect" is observed for all considered commodities with exception of coal. However, the COVID-19 crisis is still in its infancy and the long-run effects depend on the further developments and on the occurrence and severity of a persistent recession. Low prices for conventional energy sources in combination with a constant carbon cap (and consequent lower emission allowance prices) result in a weaker business case for renewable energies and will most likely make the clean energy transition more difficult.

Footnotes

¹ Some commodity prices show seasonal patterns. Consequently, the selected appointed dates of the two crises (spring vs autumn) also have an impact on price trends, but data is not adjusted by seasonal filters in this analysis.

² Values are taken from ENTSO-E (2020), unless otherwise indicated. It is assumed that COVID-19 predominantly affects business days' activities

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