The effect of crude oil prices on the valuation of energy companies

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Overview

Companies operating in the energy sector have a considerable stake in future energy prices. Because of the high volatility in crude oil and natural gas prices, company valuation is difficult. Recent years have confirmed this, as crude oil price has experienced significant shifts and high level of volatility. This provides an opportunity to test the relationship between the valuation of energy companies and crude oil prices at different market conditions and business cycles. To study this, we apply a rolling co-integration test for 80 energy companies listed on the S&P 500 and the Oslo Stock Exchange (OSE). The companies include integrated oil companies, as well as drillers, producers and suppliers to the energy industry. We use GICS-code to differentiate between company types. In addition, to test for vulnerability from changes in prices levels, we apply the test to price volatility in order to assess the impact on volatility in stock prices from varying volatility levels in commodity prices.

Methods

The data considered is daily prices for a set of 80 energy companies in S&P 500 and the Oslo Stock Exchange (OSE) prices from May 1996 until March 2017, providing 4 820 observations per price series. In addition, we include both Brent and WTI crude oil prices for the same period. We differentiate the companies using GICS-code and aggregate the stock series into a value-weighted category series. For our first analysis, we use descriptive statistics of the relationship between energy stock prices and crude oil prices. We continue by applying a vector error correction model to help identify long-run and short-run relationship between the series We create a rolling co-integration matrix by rolling the analysis with a time incremented observation window of 250 observations. This allow us to identify time-variations in the co-integration between energy stocks and crude oil prices.

Results

Table 1 summarizes the data for the aggregated series. For each variable presented, the first column concerns S&P 500 companies, and the second column concerns OSE companies. First, we note differences in company sizes, as S&P companies consists of the biggest companies. Second, there is substantial differences in company types between the selections. Finally, while average annualized returns are similar, there is considerable differences in volatility between S&P 500 and OSE.

Table 1. Summary of aggregated data per GICS category for both S&P 500 and OSE. Note that the first column per variable concerns S&P 500 and the second column concerns OSE. Mean log-return and volatility is annualized. Average value is in billion USD.

Category	GICS-code	Number of series		Mean log-return		Volatility		Average value	
Oil & Gas Drilling	10101010	2	8	-0.013	-0.043	0.404	0.656	6.0	0.28
Oil & Gas Equipment & Services	10101020	5	24	0.044	-0.028	0.366	0.360	39.4	0.58
Integrated Oil & Gas	10102010	4	1	0.065	0.059	0.254	0.325	142.2	54.2
Oil & Gas Exploration & Production	10102020	21	7	0.041	-0.005	0.285	0.588	22.7	0.75
Oil & Gas Storage & Transportation	10102040	3	5	-0.018	-0.031	0.187	0.558	27.8	0.57

Figure 1 provides a time-series for the indexed value of companies considered in the S&P 500 per GICS category. Comparing the levels and development with the WTI crude oil price in Figure 2, it is evident that some of the categories follow the WTI crude oil price. In particular, integrated oil and gas companies together with companies in oil and gas exploration and production, as well as oil and gas equipment and services have a strong relationship. For oil and gas drilling, and storage and transportation, the relationship is weaker.

While the results for the long-run relationship seems strong, the results for the rolling co-integration indicates a time-varying link between the valuation of energy stocks and crude oil prices. Further, OSE stocks seems more prone to negative changes in oil prices than positive news, indicating an asymmetric relationship.
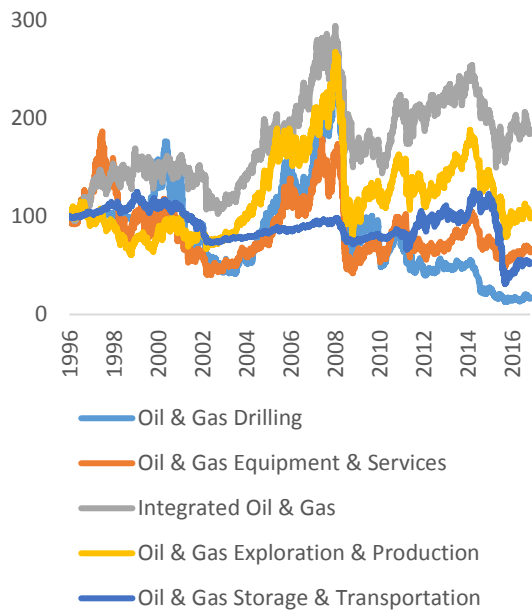
Figure 1. Indexed value (1996 = 100) per GICS-category for S&P500 companies between 1996 - 2017
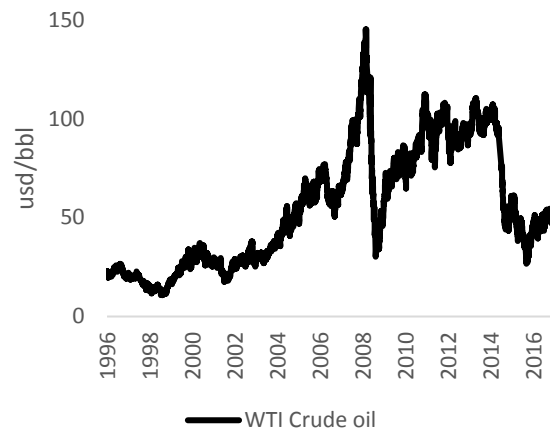
Figure 2. WTI crude oil prices in $/bbl between 1996 – 2017

Conclusion

In this paper, we explore the relationship between crude oil prices and energy stocks listed in the S&P 500 and at the Oslo Stock Exchange. We find that the long-run relations are strong for most energy companies, although companies in oil and gas storage and transportation have a weaker association. Using a rolling co-integration, we find time-varying results, and identify an asymmetric integration for stocks at OSE, where energy companies respond more to negative news compared to positive news. This may be a consequence to small companies, having fewer on-going operations and thus making them more vulnerable to changes in energy prices.

References

Hamilton, J.D. (2009). Understanding crude oil prices. The Energy Journal, 30, 179-206.

Henriques, I., and Sadorsky, P. (2011). The effect of oil price volatility on strategic investment. Energy Economics, 33(1), 79-87.

Kilian, L. (2009). Not all oil price shocks are alike: Disentangling demand and supply shocks in the crude oil market. American Economic Review, 99(3), 1053–1069.

Kilian, L. (2014), Oil Price Shocks: Causes and Consequences. Annual Review of Resource Economics, 6, 133-154.

Mohn, K., and Misund, B. (2009). Investment and uncertainty in the international oil and gas industry. Energy Economics, 31(2), 240-248.

Osmundsen, P., Asche, F., Misund, B., and Mohn, K. (2006). Valuation of international oil companies. The Energy Journal, 49-64.