Carbon Tracker Initiative

U.S. Shale Oil and Gas

Going over the hedge?

May 2015

About Carbon Tracker

The Carbon Tracker Initiative is a team of financial specialists making climate risk real in today's financial markets. Our research to date on unburnable carbon and stranded assets has started a new debate on how to align the financial system with the energy transition to a low carbon future.

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The photo in the background shows extensive natural-gas operations at Jonah Field in Wyoming. Credit: EcoFlight

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Executive Summary

US shale production has prompted increased volatility in the oil markets, as exemplified by the 50% drop in prices during the second half of 2014. This has caused investors to ask whether the US shale industry can adapt to a new low price environment if it persists.

The aim of this study was to understand better the impact of a sustained reduction in commodity prices on the credit arrangements of U.S. exploration and production (E&P) companies. The study focused on five of the largest pure-play U.S. E&P shale oil and gas companies, by market capitalisation. These companies were: Continental Resources; Concho Resources; Chesapeake; Whiting Petroleum; and Energen Corp.

> These US shale operators have hedges which to some extent have given them a soft landing from the drop in oil and gas prices so far in 2015.

This group of companies so far have used a number of options and tactics to weather lower commodity prices. Some have raised substantial capital in both equity and bond markets. All have implemented cuts in costs and capital expenditure. And these US shale operators have hedges which to some extent have given them a soft landing from the drop in oil and gas prices so far in 2015. This study analyses the impact of lower commodity prices in relation to the covenants these companies have agreed with their creditors under their senior credit facilities. Covenants are financial limits imposed by creditors, which typically include a threshold ratio of debt to earnings before interest, tax and depreciation and amortisation (EBITDA).

The covenant ratio is an indicator of financial prudence, and in addition, the prospect of crossing the covenant might require certain actions by the company. Both debt levels and EBITDA are impacted by lower commodity prices.

Covenants might apply to the company's performance over the previous quarter, as in the case of Chesapeake,[1] or as long as the previous four quarters, as with Whiting Petroleum, annual company reports show.[2]

1 Chesapeake Energy Corporation, 2015. Annual Report for the Fiscal Year Ended December 31 2014. Available at: http://www.chk.com/investors/annual-report

2 Whiting Petroleum Corporation, 2015. Annual Report for the Fiscal Year Ended December 31 2014. Available at: http://www.whiting.com/investor-relations/annual-reports/

Technically, exceeding a covenant can lead to a default. However, companies have many options to head this off, ranging from capital raisings, to negotiating with creditors for a waiver or to renegotiate their covenant terms, or to agree a debt restructuring. In practice many companies would generally take such actions and successfully avoid exceeding a covenant.

We analysed the impact of a range of oil and gas prices on the defined covenant ratios, to determine how vulnerable companies were to exceeding these, for illustrative purposes. Additionally, we investigated how far hedges contributed to 2015 EBITDA. Calculations of EBITDA were based on financial projections and hedging positions, as published by the companies. Net debt was taken from consensus forecasts as reported on Bloomberg. Where financial projections for 2015 were unavailable from the company, we used individual analyst forecasts or unchanged data from 2014.

This study found that all companies would stay within their covenants in 2015, if commodity prices remained at present levels or higher.

However, our illustrative analysis showed that Chesapeake might exceed its net debt/ EBITDA covenant, if quarterly average oil and gas prices were sustained below $50 per barrel and $2.25 per million cubic feet (mcf).

> Hedging is a vital ingredient in the financial performance this year of Chesapeake and Energen in particular.

That compares with the market prices of $58 and $2.5, which were prices noted at the time of writing this report. According to the analysis, Whiting Petroleum would exceed its debt/EBITDA covenant if oil prices were sustained for four quarters below $50 a barrel. Concho Resources and Energen appeared comfortably within their covenants for a wide range of commodity prices far below present levels. Continental Resources does not have an EBITDA covenant ratio. If such a covenant were applied, for illustrative purposes, the company was found to stay within a typical threshold level at average oil prices above $40.

All these companies therefore appear likely to stay within their covenant ratios in 2015, barring a further step down in oil prices. As we noted above, companies have options to take evasive action even if oil and gas prices fell, to avoid exceeding their covenants, or to renegotiate these. However, hedging is a vital ingredient in the financial performance this year of Chesapeake and Energen in particular. If our assumed market oil and gas prices were sustained ($58 and $2.5 respectively), cash hedging gains of nearly $1.2 billion would account for an estimated 46 percent of Chesapeake's adjusted EBITDA in 2015, as projected in our analysis. Similarly, hedging gains are equivalent to 42 percent of adjusted EBITDA at Energen Corp; 28 percent at Concho Resources;

7 percent at Whiting Petroleum; and 4 percent at Continental Resources.

These figures underline the scale of adjustment that companies may have to make in 2016, to compensate for losing such hedging gains. Some companies may have to use a range of options, including capital raisings and asset sales, lower capital expenditure, or even debt restructuring, depending on the commodity price outlook. This analysis shows that the debt arrangements of some of the biggest U.S. shale oil and gas independents are vulnerable to downside from current commodity price levels. They have limited protection from oil prices falling further, especially as their hedging positions decline or expire altogether in 2016, with the same level of hedging cover no longer available.

"This analysis shows that the debt arrangements of some of the biggest U.S. shale oil and gas independents are vulnerable to downside from current commodity price levels."

Investors need to be aware of their exposure to high yield bonds, given on-going price volatility. However, far from carefully reappraising the sector, investors in 2015 are backing the U.S. energy E&P sector with record amounts of capital. March saw record monthly equity raisings by US E&P companies, worth $3.8 billion, according to Bloomberg data. And E&P companies have already issued this year to April some $18 billion of new junk bonds, which is equivalent to half the amount still outstanding for all 2014.

1 Introduction

Over the past eight years, the U.S. shale oil and gas industry has exploited high oil prices; record low interest rates; and advanced horizontal drilling technology to transform hydrocarbon production in the United States.
The industry risks falling victim to its own success, however. Oil prices have fallen abruptly since Saudi Arabia's decision to maintain production despite higher U.S. oil output. Lower oil and gas prices have already started to reduce the revenues, profitability and asset values of U.S. shale exploration and production (E&P) companies.

> The industry risks falling victim of its own success.

Creditors typically align lending to a company's asset values, earnings and debt. As a result, lower commodity prices may also reduce their credit access. If lower oil and gas prices are sustained through this year and next, the shale industry risks losing two of its three original growth drivers: high commodity prices and cheap debt.
This report focuses on five of the largest pure-play U.S. E&P shale oil and gas companies, by market capitalisation.

These companies are: Continental Resources; Concho Resources; Chesapeake; Whiting Petroleum; and Energen Corp.

Until now, these companies have been partly shielded from the effects of lower oil and gas prices by robust hedging. These hedges guarantee oil and gas prices far above present market values. The companies will be critically dependent on these hedges in 2015. Hedging gains will account for a half or more of company earnings.
These lucrative, higher-priced hedges largely expire next year. A sustainable outlook therefore critically depends on sustained higher oil and gas prices in 2016. Companies have also maintained cash flow through capital raisings as market appetite remains for U.S. E&P for equity and bonds.

The report analyses the impact of a range of oil and gas prices on profitability and net debt, and in turn on the relationship to their senior credit agreement limits.
It is divided into sections as follows.

Section 2 provides a brief overview of shale oil and gas production.
Section 3 introduces the five companies which form the focus of the study, and **Section 4** describes their potential responses to the drop in commodity prices. **Section 5** introduces the credit analysis which is the focus of the study, and **Section 6** describes the results. Finally, **Section 7** discusses the findings.

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2

An overview of shale oil and gas production

Conventional natural gas reservoirs form when gas travels from organic-rich rock and becomes trapped by a layer of impermeable rock above it. Producers can access the gas by drilling vertical wells into the area where the gas is present, allowing it to flow to the surface.

Shale gas resources, by contrast, are contained within relatively impermeable source rock, meaning that the gas does not migrate out of the source rock and into a reservoir where drillers can easily access it. Instead this gas and oil is accessed using the techniques of vertical and horizontal drilling, coupled with hydraulic fracturing to open fissures in the rock, allowing the hydrocarbons to flow to the surface.

Onshore hydraulic fracturing is a relatively rapid process, taking a matter of months from initial site development to production. Producers are therefore nimble: they can ramp up production quickly, compared with conventional production. That allows them to be more responsive to oil and gas prices. For example, some companies have scaled back the development of sites this year, aiming to capitalise on higher commodity prices, if and when these return.

However, production requires capital to maintain output, especially in the case of shale oil and gas as a result of their high decline rates. That creates the usual competition for cash flows, between servicing debt and maintaining production.

The main production stages in shale oil and gas production are as follows.

Initial construction includes development of access roads and a well pad, and takes about four weeks.

Vertical drilling can take up to two weeks per vertical well; there may be several vertical wells on each well pad.

Horizontal drilling involves the transport and assembly of a larger, horizontal drilling rig on site; this is followed by drilling, and the insertion of cement casing around the well, which can take up to six weeks per well.

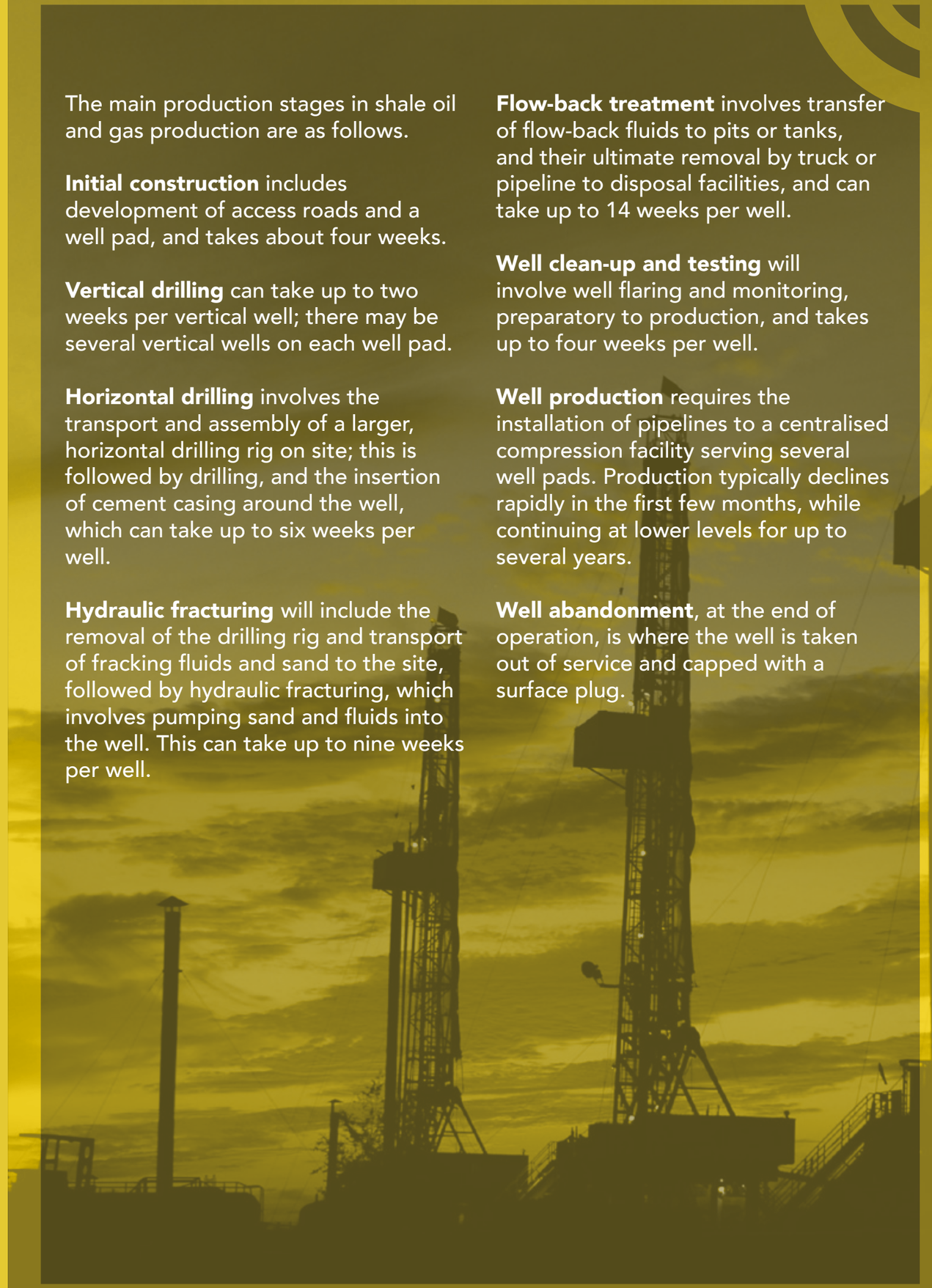
Hydraulic fracturing will include the removal of the drilling rig and transport of fracking fluids and sand to the site, followed by hydraulic fracturing, which involves pumping sand and fluids into the well. This can take up to nine weeks per well.

Flow-back treatment involves transfer of flow-back fluids to pits or tanks, and their ultimate removal by truck or pipeline to disposal facilities, and can take up to 14 weeks per well.

Well clean-up and testing will involve well flaring and monitoring, preparatory to production, and takes up to four weeks per well.

Well production requires the installation of pipelines to a centralised compression facility serving several well pads. Production typically declines rapidly in the first few months, while continuing at lower levels for up to several years.

Well abandonment, at the end of operation, is where the well is taken out of service and capped with a surface plug.



3

Five focus companies

This report focuses on five companies, selected by size, according to market capitalisation, and a pure-play focus on U.S. onshore shale gas and oil.

Continental Resources

Continental Resources (NYSE: CLR) was founded in 1967 and is a top-10 independent oil producer in the United States, based in Oklahoma City. It is the largest leaseholder and one of the largest producers in the biggest shale oil basin, the Bakken play of North Dakota and Montana. Continental expects around 18 percent production growth this year, to 75 million barrels of oil equivalent. The company's output is about 70 percent oil. It has chosen to defer some well completions awaiting higher prices. Continental has no hedged position in either 2015 or 2016 in oil, but increases its volume of hedged gas in 2016 compared with 2015, the company's 2014 annual report indicates.[1]

Concho Resources

Concho Resources is headquartered in Midland, Texas. The company is an independent oil and natural gas company with assets concentrated in the Permian Basin of Texas and New Mexico. Concho Resources expects production growth in 2015 of about 18 percent, to around 48 million barrels of which 64 percent is oil. Concho has hedged about a half and a quarter of its oil and gas production in 2015 respectively, and has a shrinking volume of hedged oil output in 2016, the company said in March this year.[2]

1 *Continental Resources Inc., 2015. Annual Report for the fiscal year ended December 31 2014. Available at: http://investors.clr.com/phoenix.zhtml?c=197380&p=irol-reportsannual*

2 *Concho, 2015. Investor Presentation: March 2015. Available at: http://ir.concho.com/files/doc_presentations/2015/Howard-Weil-vFinal.pdf*

Chesapeake

Chesapeake was founded in 1989, is based in Oklahoma, and has assets throughout the United States. The company's output is about 76 percent natural gas. Chesapeake has forecast around 4% growth in 2015, to 236 million barrels of oil equivalent, after adjusting for the sale of assets in the Southern Marcellus play, its fourth quarter results state.[3] That divestment has left the company with more than $1 billion in cash at the end of 2014. The company has stated that it plans to hold back completion of undeveloped assets this year, to cut costs and as it awaits a rise in commodity prices. Chesapeake has hedged about 42% of its projected oil and gas output this year, but has zero oil and negligible gas hedges in 2016.

Whiting Petroleum

Whiting's primary assets are in the Permian Basin and Rockies. It has a large net acre position in the core of the Bakken resource play, bolstered by last year's acquisition of Kodiak Oil and Gas. Whiting Petroleum expects 42 percent growth in 2015, after accounting for that purchase, to about 59 million barrels of oil equivalent.[4] Its output is around 80 percent oil. At the end of March 2015, the company raised $3 billion cash, from a public equity offering and private offerings of convertible and senior, unsecured notes.[5] The proceeds would be used to repay borrowings under its credit facility and fund its 2015 capital programme, improving the company's net debt and capitalisation. Whiting has hedged nearly 9 percent of its oil output in 2015, at more attractive prices with downside protection above $58, and has no gas hedges.

Energen Corp.

Energen is an almost pure play Permian company, following the sale of its San Juan gas assets in 2014. The company forecasts a near 20 percent rise in oil production in 2015. This year oil will account for about two thirds of total production of 22 million barrels of oil equivalent. Energen is well hedged in 2015, at nearly 60 percent of its projected oil output and 36 percent of gas. The company is unhedged in 2016, its 2014 annual report shows.[6]

3 *Chesapeake Energy Corporation, 2015. Financial and operational results for the 2014 full year and fourth quarter. Available at: http://www.chk.com/Documents/investors/Press-Releases/PR-20152502.pdf*

4 *Whiting Petroleum Corporation, 2015. A stronger company set to prosper at current prices. April 2015. Available at: http://www.whiting.com/investor-relations/presentations-and-media-events/*

5 *Barclays, 2015. Whiting Petroleum: Estimate housekeeping. Barclays Capital Inc., New York.*

6 *Energen Corporation, 2015. Annual Report for the Year Ended December 31 2014. Available at: http://ir.energen.com/phoenix.zhtml?c=94826&p=irol-reportsannual*

4

A new commodity price environment

Lower commodity prices

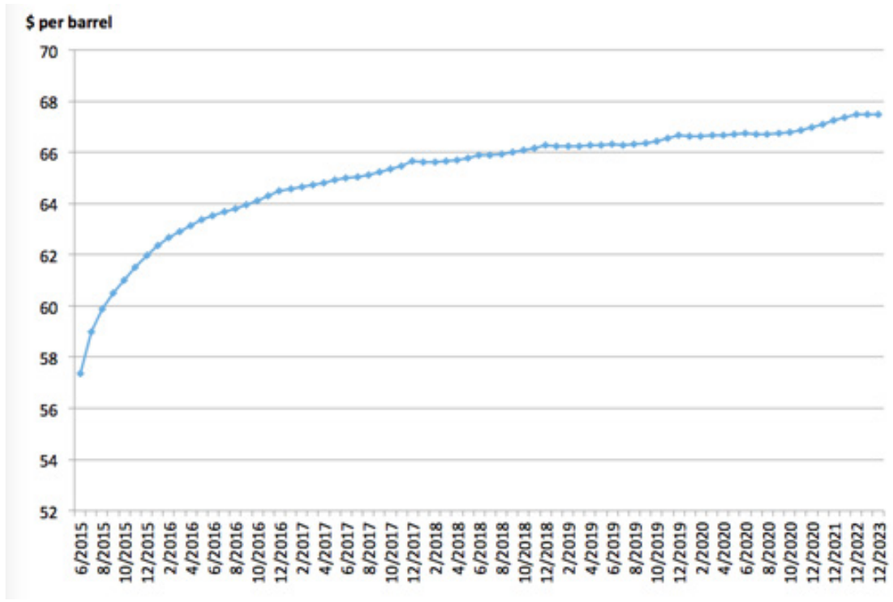
Since mid-2014, U.S. market oil prices have as much as halved. The U.S. natural gas price benchmark, Henry Hub, has fallen by 30 percent or more.

West Texas Intermediate (WTI) oil prices are forecast to rise to an average of $70 in 2016, from a forecast average of $52 in 2015, and $93 last year, according to the Short-Term Energy Outlook (STEO) of the U.S. Energy Information Administration, published in early April.[1] The STEO report forecast that Henry Hub natural gas prices would average $3.45 per mmBTU in 2016, from a forecast average of $3.07 in 2015, and $4.39 last year.

However the recent price volatility has demonstrated the difficulty of predicting future oil prices for any forecast institution or market. Following are forward curves for WTI and Henry Hub, showing that market participants are trading for future delivery at prices gradually rising from today's levels.

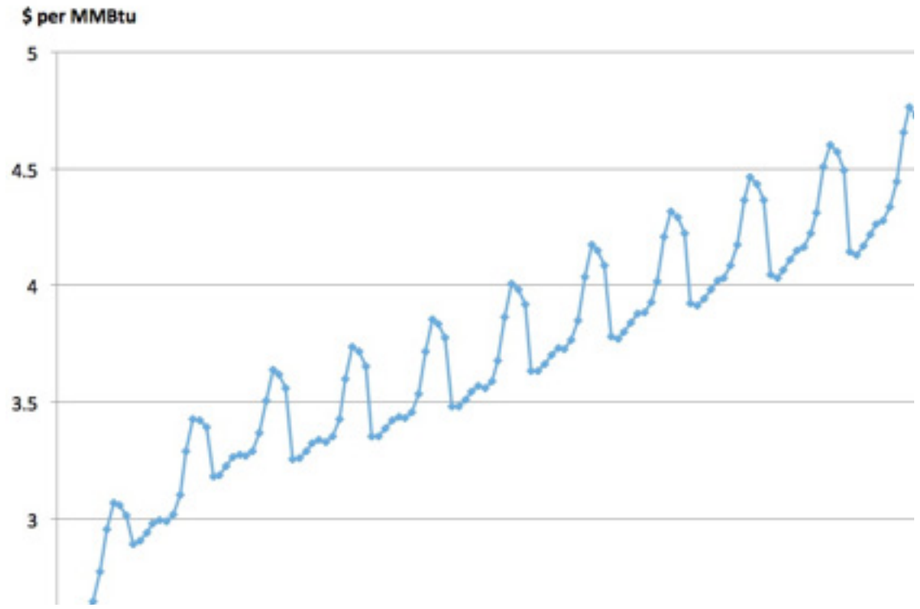
1 *Energy Information Administration, 2015. Short-Term Energy and Summer Fuels Outlook. Available at: http://www.eia.gov/forecasts/steo/pdf/steo_full.pdf*

Figure 1. Forward curve for WTI crude oil (as of April 27 2015)



Source: Bloomberg

Figure 2. Forward curve for Henry Hub natural gas, Bloomberg (as of April 27 2015)



Source: Bloomberg

Weathering the storm

[redacted]

So far, the five focus companies have used a variety of tools and options to withstand falling revenues.

Capital raising

[redacted]

First, companies have been able to continue to raise capital on public equity markets, where investors have continued appetite, perhaps in anticipation of heightened oil and gas M&A (see below, Investor Risk).[1]

Second, companies have increasingly returned to the bond market in 2015. For example, Whiting Petroleum raised $2 billion in junk bond offerings in March.[2] At the same time, Whiting raised $1 billion in a public equity offering. In bond issuances, oil and gas companies have benefited from a continuing lack of yield elsewhere, given record low interest rates.

Such equity and bond issuance has shored up cash flows and reduced vulnerability to stricter lending terms, including a lower borrowing base as a result of prospective asset impairments.

Cost reductions, production deferral and lower capital expenditure

[redacted]

Several of the selected companies have chosen to defer completion of wells, awaiting higher commodity prices and expected service cost reductions. This will also allow them to cut capital expenditure.

Hedging

[redacted]

Many companies had already hedged their 2015 output, a standard, protective measure, before the oil price collapse last year. These hedges have now become extraordinarily important, locking in commodity prices far above market levels. However, the vast majority of more lucrative hedges expire this year.

1 *Wade, T. 2015. U.S. shale oil firms raise enough equity to avoid loan reset squeeze. Reuters News. Available at: http://www.reuters.com/article/2015/03/24/oil-prices-credit-idUSL2N0WQ1FK20150324*

2 *Natarajan, S., Eddings, C. and Loder, A., 2015. Oil companies are getting a second chance in the bond market. Bloomberg. April 22, 2015. Available at: http://www.bloomberg.com/news/articles/2015-04-21/oil-firms-find-debt-reprieve-in-u-s-as-buyers-binge-on-bargains*

Shale companies have principally used three types of hedges. Swap contracts fix the selling price of a certain share of future output, through the purchase of a put option. The swap fixes a floor price below which they are protected. Some companies have additionally used "collar" contracts. By selling a higher priced call option, they have limited their upside potential, establishing a price ceiling, but earned a premium which offset the cost of the put option. Some companies have gone a stage further and used three-way collars, which also limit their downside protection by selling a further put option.
The aim from selling this lower-priced, out-of-the-money put option was to limit further the overall hedging cost. However, commodity prices have now fallen so far that these put options have come into the money, thus eliminating any further protection as prices continued to fall.

Table 1 shows that the five companies studied in this report have hedged 0-59% of their projected oil production in 2015, at a WTI oil price of $76-95 per barrel, compared with a spot price of $58 at the time of writing. They have hedged gas at $4.1-4.3 per mmBTU, compared with a spot price of about $2.5. Most of the five focus companies have little or zero hedging in 2016, as disclosed in their recent reports and presentations.

Whiting Petroleum is the least hedged, of the five companies, as a proportion of its projected production.

Table 1. Hedging volumes, including oil collars and swaps above $58 WTI floor, 2015 vs 2016

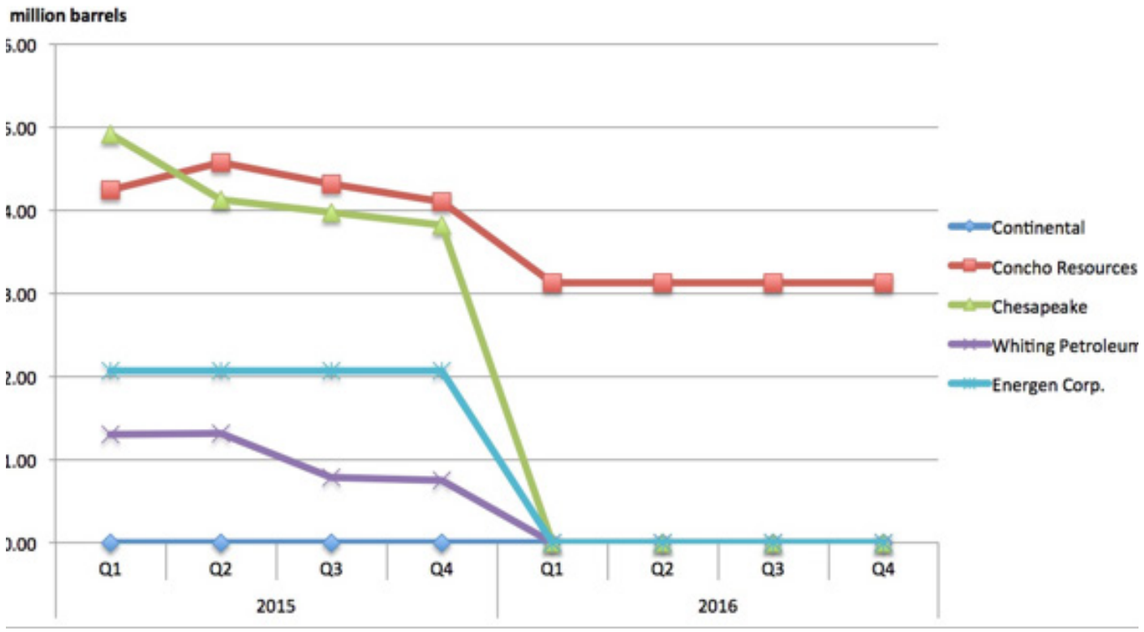
Company	2015 production, % hedged			Hedged price, 2015 swaps		2016 production, volume hedged	
	Oil	Natural gas	All, mboe	Oil, $/bbl	Natural gas, $/mcf	Oil, mln bbl	Natural gas, bcf
Continental Resources	0.00%	38.42%	12.31%	0.0	3.82-4.43	0.0	60.9
Concho Resources	55.52%	22.21%	44.21%	84.2	4.3	12.5	0.0
Chesapeake	42.63%	42.58%	40.74%	94.6	4.1	0.0	5.3
Whiting Petroleum	8.73%	0.00%	6.99%	76-93	0.0	0.0	0.0
Energen Corp.	59.14%	33.95%	44.32%	89.3	4.3	0.0	0.0

Source: Company annual reports and presentations; CTI analysis

Figure 3 below shows how hedged volumes fall steadily over 2015, generally to zero. For example, Energen is the most hedged company in 2015 as a proportion of its output, but has zero hedges in 2016. Concho is the only one of the five companies which has attractively priced oil hedges in 2016. Where quarterly data were unavailable, volumes were assumed to be equally spread across each quarter. Regarding natural gas, only Continental Resources is substantially hedged in 2016 (see Figure 4).

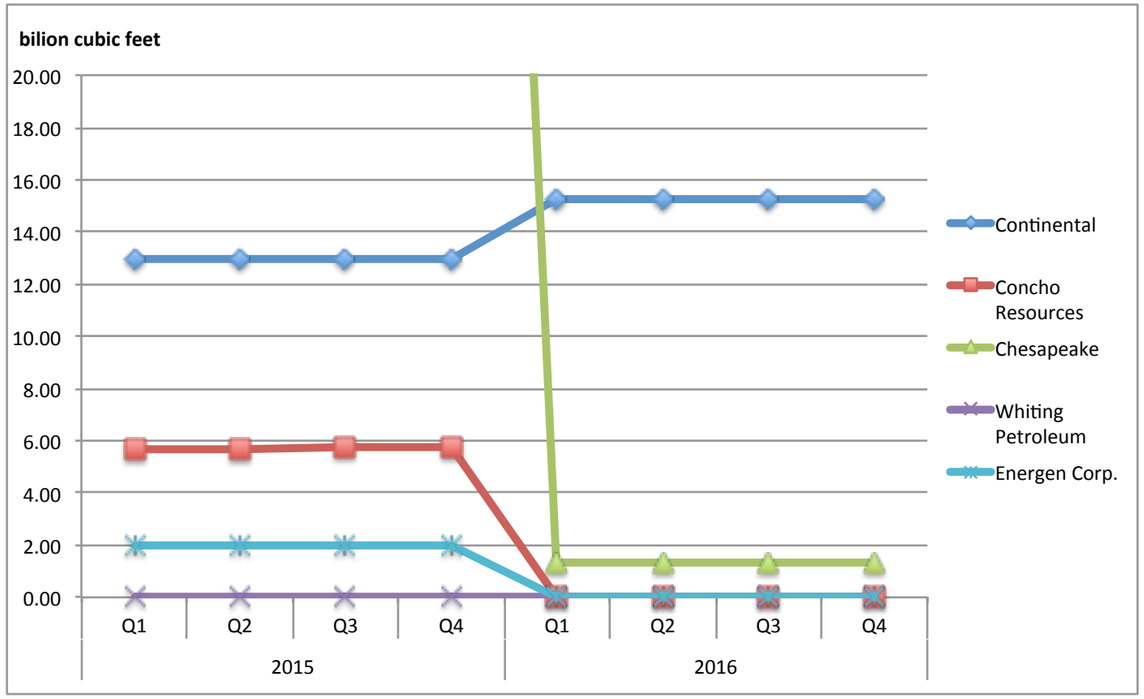
Companies can continue to purchase new hedges, but these will be at less attractive rates, reflecting the low-priced environment. For example, since October 1 last year, Whiting Petroleum has acquired three-way crude oil collars with a floor price of $58 a barrel, to hedge production in the third quarter of 2015. That compares with a floor price of $85, for previously purchased, equivalent collars.

Figure 3. Crude oil hedges above $58 WTI floor, quarterly volumes, 2015-2016



Source: Company reports and presentations; CTI analysis

Figure 4. Natural gas hedges, quarterly volumes, 2015-2016



Chesapeake had hedged 181 bcf natural gas in Q1 2015, and so far exceeds the scale of the other companies
Source: Company reports and presentations; CTI analysis

Investor risk

Investors have substantial exposure to debt and equity in upstream U.S. oil and gas exploration and production.

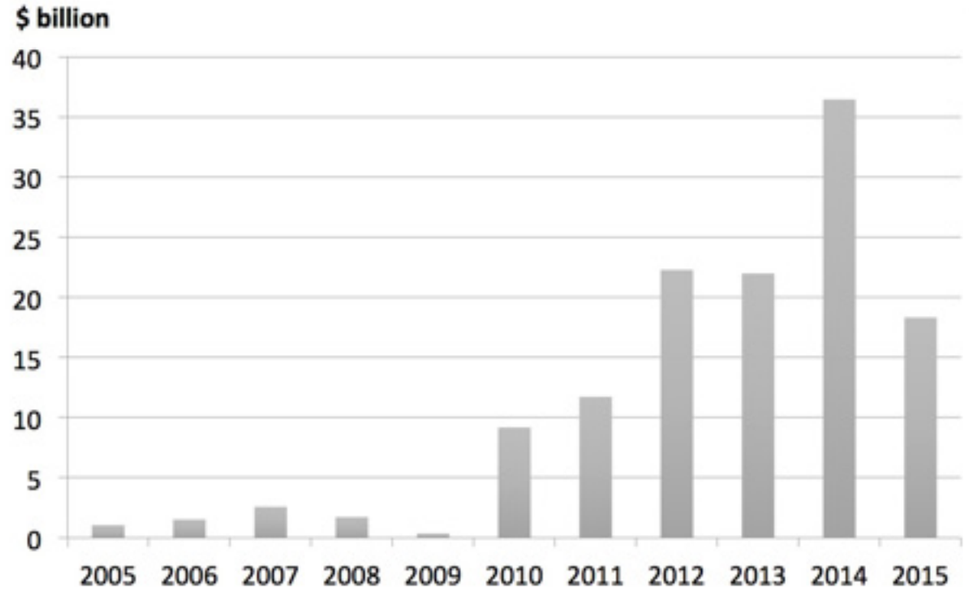
Bond investments

U.S.-domiciled companies in the energy sector have outstanding high yield, or junk, bond debt worth $238 billion, according to Bloomberg data. That is equivalent to 14 percent of the $1.7 trillion U.S. high-yield market, making energy the fourth biggest sector overall.

Narrowing down the energy sector further, specifically exploration and production (E&P) companies have outstanding some $127 billion of high-yield bond debt, Bloomberg data shows. As of the end of April 2015, these upstream energy companies had already issued half as much junk bond debt ($18 billion) as is still

outstanding from the whole of 2014, at $36 billion (see Figure 5).

Figure 5. Total outstanding high-yield bond debt, by year of issuance, U.S. E&P companies (from Bloomberg, as of April 30, 2015)



Source: Bloomberg

Upstream shale oil and gas companies in general have exploited an ultra-low interest rate environment, and the appetite of investors seeking higher bond yields. The question is whether these investors will be left holding stranded assets in a sustained, low oil price environment.

The Economist newspaper reported in April a McKinsey analysis of 300 independent American oil and gas companies in the first quarter of this year, which found that the debt of one-third of midsized firms was trading at below 80% of face value.[3]

Data from the U.S. Financial Industry Regulatory Authority (FINRA) show the traded price and yields of active issued bonds.[4] FINRA data indicate that bonds issued by the five focus companies were generally trading below mid-2014 levels, at yields of up to 6 percent, as of late April 2015. The bonds were all trading at far above distressed levels.

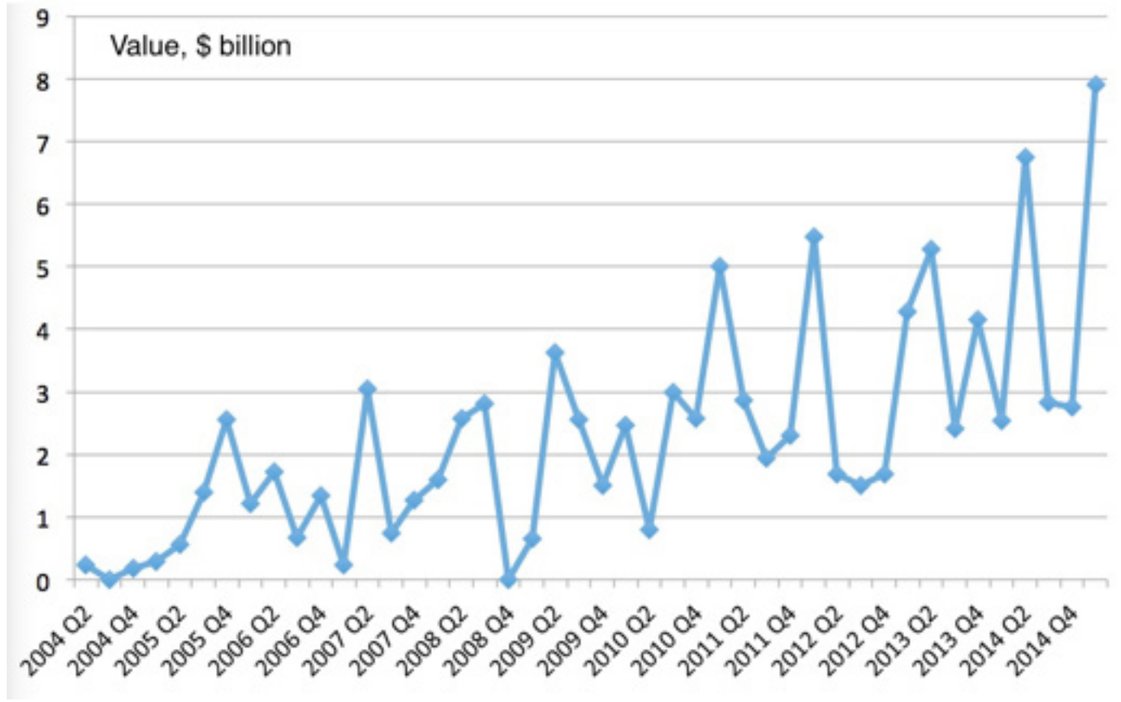
3 *The Economist, 2015. Unconventional but normal. Available at: http://www.economist.com/news/finance-and-economics/21648622-fall-oil-price-has-not-curbed-fracking-nearly-much*

4 *Financial Industry Regulatory Authority (FINRA), n.d. Market Data. Available at: http://finra-markets.morningstar.com/MarketData/Default.jsp*

Equity investments

The total equity value of U.S. energy exploration and production companies, including shale oil and gas, was $650 billion, as of April 30, Bloomberg data show. Figure 6 below shows that equity offerings by U.S. oil and gas exploration and production companies reached a new record in the first quarter of this year. The month of March was also a monthly record, with equity offerings worth $3.8 billion in that month alone.

Figure 6. Public equity offerings by quarter, U.S. energy E&P companies, 2004-2015

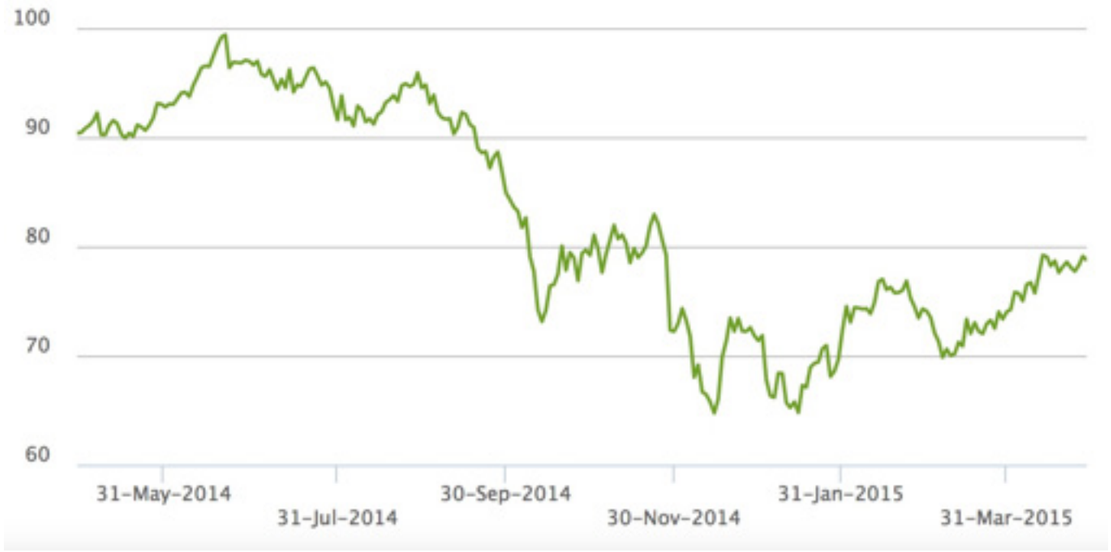


Source: Bloomberg

The iShares U.S. Oil and Gas Exploration and Production ETF tracks energy E&P companies (Figure 1).[5] The index is presently trading at $78.75 (as of April 30, 2015), or 19 percent below mid-2014 levels, (see Figure 7) indicating a notional cost of equity capital from investing in these firms over the past 10 months.

5 *Blackrock, n.d. iShares U.S. Oil and Gas Exploration and Production ETF. Available at: https://www.ishares.com/us/products/239517/ishares-us-oil-gas-exploration-production-etf*

Figure 7. iShares U.S. Oil and Gas E&P ETF, historical prices, 30/06/14 – 28/04/15



Source: iShares U.S. Oil and Gas Exploration and Production ETF

5

Credit impacts of lower oil and gas prices

How lower commodity prices can impact credit quality

This report focuses on the sensitivity of debt arrangements to oil and gas price volatility. Lower prices could impact the financial health of the companies studied in this report principally in two ways.

First, a company may have to write-down its reserve values, resulting in asset impairments, according to a 12-month rolling average of oil and gas prices. Notable asset impairments in 2014 included Whiting Petroleum. Whiting reported in December that as a result of lower oil and gas prices, it would postpone development of non-core proved oil and gas properties, which were not already being developed, in Colorado, Louisiana, North Dakota and Utah. That resulted in a $587 million write-down of these assets. Chesapeake, another of the five focus companies in this report, warned that they expected a "material" write-down in the first quarter of 2015, based on oil and gas prices through February.[1]

Asset impairments may impact a company's borrowing base. This is the amount of total debt that a company can call upon under its senior credit facility. Creditors will determine the borrowing base according to a range of factors which can include the collateral value of proved reserves mortgaged to such lenders (as stated by Whiting Petroleum), and the commodity price outlook (as stated by Energen). The borrowing base is typically reviewed semi-annually, for example in April and October.

1 *Chesapeake Energy Corporation, 2015. Annual Report.*

A lowering of the borrowing base could trigger further events, such as asset disposals, if it placed the company in excess of its new, lower borrowing limit. Energen stated in its 2014 annual report that it expected a further reduction in its borrowing base, in the light of commodity prices.[2]

Second, companies could exceed certain credit covenants under their senior credit facility. These covenants typically specify financial ratios that the company must stay within. Ratios include metrics such as earnings before interest, tax, depreciation and amortization (EBITDA), EBITDAX[3], or debt. EBITDA is impacted directly by lower commodity prices. Exceeding a covenant technically could result in a default.

As Chesapeake says, in its 2014 annual report[4]:

> "Our failure to comply with the financial and other restrictive covenants relating to our indebtedness could result in a default and acceleration of such indebtedness and lead to cross defaults under our other indebtedness."

In fact, while the covenants are not meant to be crossed, in practice companies have many options for evasive action.

First, they can help themselves, in advance of exceeding a covenant. For example, they could raise capital by issuing new junk bonds, offering new equity or selling assets. Depending on the terms of the covenant, such capital could count towards EBITDA, or else be used to pay down debt. Second, companies could negotiate a waiver or new covenant terms. Sometimes, creditors may set covenant ratios at levels that they are subsequently prepared to negotiate. Third, in more serious cases, creditors and company might agree a debt restructuring, such as a debt-for-equity swap. All these actions would avoid a default. In addition, in some cases companies may not have drawn down any borrowing under their senior creditor facility, in which case creditors may be unable to act, where the covenant was exceeded.

This report focuses on senior credit facility covenants. The annual reports of the companies studied here show that they have typically agreed covenants which include ratios of debt and EBITDA.

Table 2 below shows that the five companies were all operating more or less comfortably within their senior credit facility covenants, as of December 31 2014.

2 *Energen Corporation, 2015. Annual Report.*

3 *Earnings Before Interest, Taxes, Depreciation, Depletion, Amortization and Exploration Expenses*

4 *Chesapeake Energy Corporation, 2015. Annual Report.*

Table 2. Performance against credit covenants, target companies, end of 2014

Company	Debt/asset covenant ratio		Debt/ EBITDA covenant ratio		Applicable time period of Debt/ EBITDA covenant
	Description	Value, actual vs threshold	Description	Value, actual vs threshold	
Continental Resources	Net debt/ total capitalisation	0.55 vs 0.65	N/A	N/A	N/A
Concho Resources	Current liabilities/ current assets	0.46 vs 1.00	Total debt/ EBITDAX	1.73 vs 4.25	Quarterly
Chesapeake	Net debt/ total capitalisation	0.31 vs 0.65	Net debt/ consolidated EBITD	1.55 vs 4.00	Quarterly
Whiting Petroleum	Current liabilities/ current assets	0.31 vs 1.00	Total debt/ EBITDAX	2.49 vs 4.00	Last four quarters
Energen Corp.	Current liabilities/ current assets	0.26 vs 1.00	Total debt/ EBITDAX	1.20 vs 4.00	N/A

Source: Company 2014 annual reports; Bloomberg; CTI analysis

A focus on senior credit facility covenants

This report uses the covenants that companies have to stay within, as published in their 2014 annual reports. The aim was to conduct a sensitivity analysis to identify oil and gas prices which might lead to a company exceeding its covenant. As noted above, in the real world companies would have options to head off such an event.
We focused on EBITDA/ Net Debt ratios. Four of the five companies had covenants which included an EBITDA component. A scenario analysis was run on the fifth, Continental Resources, for illustrative purposes.

Net debt was taken from Bloomberg consensus forecasts, at of the end of April, and were therefore a snapshot, which was fixed regardless of the oil and gas price. EBITDA in 2015 was calculated using the company's own financial guidance and published price hedges. The value of EBITDA varied according to the assumed oil and gas price. This allowed a sensitivity analysis of a debt/ EBITDA ratio, according to a range of oil and gas prices.
Where 2015 data were unavailable, we used estimates from analysts,[1] or 2014 figures, making this analysis necessarily an approximation, for illustrative purposes.

1 *Analyst firms used for this study included Barclays and Wells Fargo*

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Scenario analysis

Following are results of the scenario analysis, by company. Ratios are highlighted in red where they exceed the senior credit facility covenant. As discussed above, a company could take action to avoid exceeding limits in those covenants, either directly or through discussion with its creditors.
The findings are illustrated in Tables 3-7 below.

Table 3. Scenario analysis of Continental Resources, Total Debt/ EBITDAX Ratio

TOTAL DEBT/ EBITDAX RATIO – Hypothetical covenant default threshold value of 4.00								
2014 value: N/A	**gas price, Henry Hub, $/mcf**							
oil price, Nymex WTI, $/ bbl		**2**	**2.25**	**2.5**	**2.75**	**3**	**3.25**	**3.5**
	30	**8.2**	**8.1**	**7.9**	**7.8**	**7.6**	**7.5**	**7.3**
	40	**5.3**	**5.3**	**5.2**	**5.1**	**5.1**	**5.0**	**4.9**
	50	3.9	3.9	3.9	3.8	3.8	3.8	3.7
	60	3.1	3.1	3.1	3.1	3.0	3.0	3.0
	70	2.6	2.6	2.6	2.5	2.5	2.5	2.5

Sources: Company reports and presentations; Bloomberg; CTI analysis

Table 4. Scenario analysis of Concho Resources, Total Debt/ EBITDAX Ratio

TOTAL DEBT/ EBITDAX RATIO - Concho Resources covenant default threshold value of 4.25								
2014 value: 1.73		gas price, Henry Hub, $/mcf						
oil price, Nymex WTI, $/ bbl		2	2.25	2.5	2.75	3	3.25	3.5
	30	2.4	2.4	2.3	2.3	2.3	2.3	2.2
	40	2.3	2.2	2.2	2.2	2.2	2.1	2.1
	50	2.2	2.1	2.1	2.1	2.1	2.0	2.0
	60	2.0	2.0	2.0	2.0	2.0	1.9	1.9
	70	1.9	1.9	1.9	1.9	1.9	1.8	1.8

Source: Company 2014 annual reports; Bloomberg; CTI analysis

Table 5. Scenario analysis of Chesapeake, Net debt/ consolidated EBITDA Ratio

NET DEBT/ EBITDA RATIO - Chesapeake covenant default threshold value of 4.00								
2014 value: 1.55		gas price, Henry Hub, $/mcf						
oil price, Nymex WTI, $/ bbl		2	2.25	2.5	2.75	3	3.25	3.5
	30	6.5	5.7	5.0	4.5	4.1	3.8	3.5
	40	5.4	4.8	4.4	4.0	3.7	3.4	3.1
	50	4.7	4.2	3.9	3.6	3.3	3.1	2.9
	60	4.1	3.8	3.5	3.2	3.0	2.8	2.6
	70	3.7	3.4	3.1	2.9	2.8	2.6	2.5

Source: Company 2014 annual reports; Bloomberg; CTI analysis

Table 6. Scenario analysis of Whiting, Total Debt/ EBITDAX Ratio

TOTAL DEBT/ EBITDAX RATIO - Whiting covenant default threshold value of 4.00								
2014 value: 2.49		gas price, Henry Hub, $/mcf						
oil price, Nymex WTI, $/ bbl		2	2.25	2.5	2.75	3	3.25	3.5
	30	12.2	11.9	11.7	11.5	11.2	11.0	10.8
	40	6.5	6.4	6.4	6.3	6.2	6.1	6.1
	50	4.4	4.4	4.4	4.3	4.3	4.3	4.2
	60	3.4	3.3	3.3	3.3	3.3	3.3	3.2
	70	2.7	2.7	2.7	2.7	2.7	2.6	2.6

Source: Company 2014 annual reports; Bloomberg; CTI analysis

Table 7. Scenario analysis of Energen, Total Debt/ EBITDAX Ratio

TOTAL DEBT/ EBITDAX RATIO - Energen covenant default threshold value of 4.00								
2014 value: 1.20		gas price, Henry Hub, $/mcf						
oil price, Nymex WTI, $/ bbl		2	2.25	2.5	2.75	3	3.25	3.5
	30	1.7	1.7	1.7	1.7	1.7	1.7	1.7
	40	1.6	1.6	1.6	1.6	1.6	1.6	1.6
	50	1.5	1.5	1.5	1.5	1.5	1.4	1.4
	60	1.4	1.4	1.4	1.4	1.4	1.4	1.3
	70	1.3	1.3	1.3	1.3	1.3	1.3	1.3

Source: Company 2014 annual reports; Bloomberg; CTI analysis

Key findings

These findings are a based on a calculation of EBITDA in 2015, according to a range of oil and gas prices. Net debt was based on a single estimate according to a Bloomberg consensus analyst forecast for 2015.

The findings record the debt/EBITDA ratio for any given oil and gas price. This ratio would apply to a company's covenant over different timescales. For example, 2014 annual reports indicate that the covenant would have to be exceeded for four quarters in the case of Whiting Petroleum, and just for the latest quarter for Chesapeake.

The sensitivity analysis shows that these companies are all within their covenant thresholds at recent WTI and Henry Hub prices of $58 and $2.5 respectively. They would stay within their covenants in 2015, if commodity prices remained at present levels or higher.

In this illustrative analysis, Chesapeake and Whiting appeared vulnerable to exceeding their covenants in 2015, if commodity prices fell from present levels, for a sustained period (one quarter in the case of Chesapeake, and four quarters in the case of Whiting).

Our analysis suggests that Chesapeake may exceed its covenant if average oil and gas prices were sustained below $50 per barrel and $2.25 per thousand cubic feet (mcf) respectively. WTI crude oil prices have only briefly dipped below $50 in the recent past, and natural gas prices have exceeded $2.5. Our analysis suggests that Whiting Petroleum is vulnerable to exceeding its covenant at oil prices sustained below $50 a barrel.

Concho Resources and Energen appeared comfortably within their covenants for a wide range of commodity prices as analysed here.

The position of Chesapeake reflects the combination of lower sales and rising net debt in 2015 compared with 2014. We calculate a halving in oil, gas and natural gas liquid revenues in 2015, if recent WTI and Henry Hub prices were sustained ($58 and $2.5 respectively). These falling revenues are despite the effect of hedges, which are calculated to result in gains of about $1.2 billion in 2015, at present commodity prices. Chesapeake has hedged about 41 percent of its output this year.

Whiting has hedged only 7 percent of its output in 2015, at more attractive rates with downside protection above $58. Continental Resources does not have a total debt/EBITDA covenant, and so this was used only for illustrative purposes.

The company is already entirely unhedged in 2015 as regards crude oil, and its natural gas hedging actually rises in 2016, and so the company has less adjustment next year. Energen and Concho Resources are well within their covenant thresholds for all commodity prices considered in this study.

Hedging is an important factor driving financial performance in 2015.

Regarding Chesapeake, cash gains on its 2015 hedges would be around $1.2 billion, at present commodity prices, or about 46 percent of the company calculated adjusted EBITDA; hedging gains are equivalent to 42 percent of adjusted EBITDA at Energen Corp; 28 percent at Concho Resources; 7 percent at Whiting Petroleum; and 4 percent at Continental Resources.

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Discussion

This report analysed the sensitivity to sustained low commodity prices of five large U.S. shale oil and gas E&P companies. In particular, we analysed their vulnerability to exceeding debt/earnings covenant ratios, under their senior credit facilities. We projected financial performance in 2015 using guidance and hedging data provided by the companies themselves, and Bloomberg consensus forecasts for net debt.

We note that this is a static analysis, and that in reality companies have various options for evasive action in the event that they may exceed their covenants. These options include capital raisings, asset sales and negotiations with their creditors. In addition, in some cases companies may not have drawn down any borrowing under their senior creditor facility, in which case creditors may be unable to act, even if a covenant were exceeded.

We note that covenants apply to different companies over different timescales, for example one quarter in the case of Chesapeake, and four quarters in the case of Whiting, according to their annual reports.

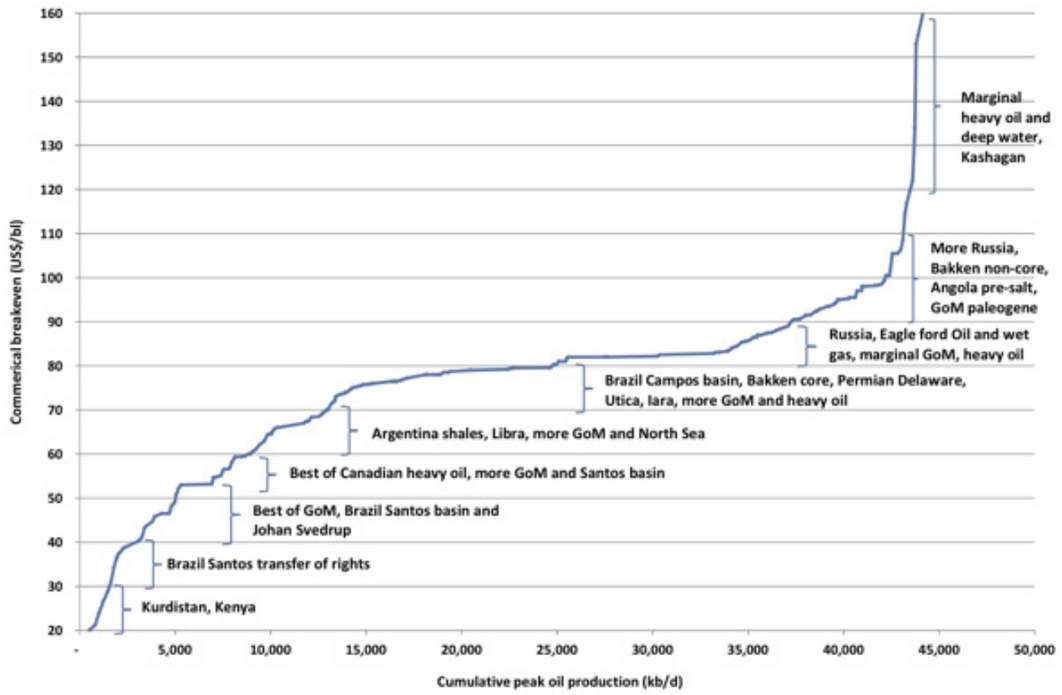
We found that two of the companies may exceed their covenant thresholds, if commodity prices fell below recent levels (oil and natural gas at $58 and $2.5 respectively). Chesapeake may exceed its debt/EBITDA covenant at quarterly average oil and gas prices sustained below $50 per barrel and $2.25 per thousand cubic feet (mcf). Whiting Petroleum may exceed its covenant at oil prices below $50 a barrel. Energen and Concho Resources would appear resilient to all commodity prices considered here.

Two of the five companies were especially well hedged in 2015, Chesapeake and Energen, but much less so if at all in 2016. They will be able to hedge their 2016 production, but likely at prices below those of their expiring hedges, and so may have to offset substantial lost hedging gains, depending on the commodity price outlook.

This analysis shows that some of the biggest independents may be vulnerable to commodity prices falling below current levels. The new dynamic in the oil market created by extra U.S. shale production, with other producers not backing down, has changed the market context for US shale oil and gas producers. This has weakened prices to a point where any further downward movement could prompt significant restructuring of the financial arrangements of the sector.. Investors need to be aware of the exposure of US shale high yield bonds to on-going price volatility.

U.S. shale oil and gas illustrate the higher marginal cost of development of the world's remaining oil and gas reserves. Shale break-even prices have been falling, but are still higher than many conventional sources of oil and gas, and may therefore be more vulnerable to stranding (see Figure 8).

Figure 8. Goldman Sachs: Cost curve indicating future marginal US shale projects require US$80/bbl Brent oil price



Source: Goldman Sachs Equity Research[1]

1 *Goldman Sachs Equity Research, 2014. From revolution to dominance: Shale drives deflation, M&A, capital efficiency. May 16 2014.*

Debt exposure of US shale sector has been cushioned by hedging, but that is about to run out. For companies that will see expiry of substantial hedges in 2016, revenues may suffer in a lower price environment. These findings highlight the relevance to financial performance of these five companies of continued rises in commodity prices, and the impact of a decline or loss of hedging in 2016.

Companies have options to offset for their lost hedging gains in several ways. They could achieve deeper cost cutting or further reductions in capital expenditure. We note that in the previous shale gas collapse of 2009, companies achieved deep cost cuts, and have continued to survive at much lower sustained gas prices than previously, partly due to high prices for co-produced oil.

One of the principal approaches companies have employed to date, to counter falling oil and gas prices, has been through capital raisings. In 2015 to date, investors have backed the industry with a record flow of capital. However, this study has shown that some U.S. major shale oil and gas companies have limited protection from oil prices falling further, as their hedges decline. We are yet to see the full impact on cash flows of OPEC trying to shore up its market share.

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