

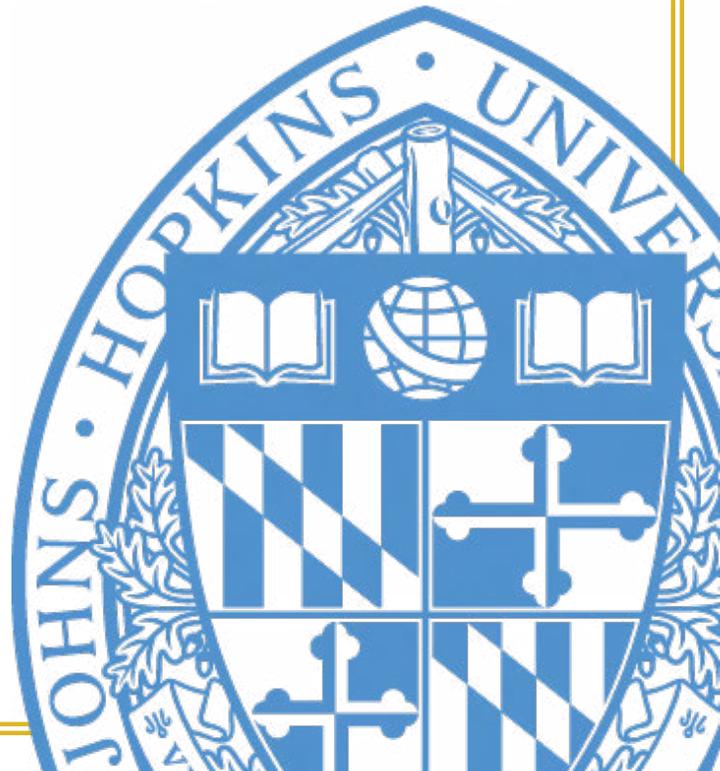
SAF/No.15/March 2017

Studies in Applied Finance

**INVESTMENT THESIS FOR
POLSKIE GÓRNICHTWO
NAFTOWE I GAZOWNICTWO
(WSE: PGN)**

***Steve H. Hanke, Hesam Motlagh,
and Anshul Subramanya***

Johns Hopkins Institute for Applied Economics,
Global Health, and the Study of Business Enterprise



Investment Thesis for Polskie Górnictwo Naftowe I Gazownictwo **(WSE: PGN)**

By Steve H. Hanke, Hesam Motlagh, and Anshul Subramanya

Disclaimer: These research reports are primarily student reports for academic purposes and are not specific recommendations to buy or sell a stock. Potential investors should consult a qualified investment advisor before making any investment. This study was completed on March 7, 2017.

About the Series

The Studies in Applied Finance series is under the general direction of Professor Steve H. Hanke, Co-Director of The Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise (hanke@jhu.edu) and Dr. Hesam Motlagh (hnekoor1@jhu.edu), a Fellow at The Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise.

This working paper is one in a series on applied financial economics, which focuses on company valuations. The authors are mainly students at the Johns Hopkins University in Baltimore who have conducted their work at the Institute as undergraduate researchers.

About the Author

Steve H. Hanke is a Professor of Applied Economics and Co-Director of the Institute for Applied Economics, Global Health, and the Study of Business Enterprise at The Johns Hopkins University in Baltimore. He is a Senior Fellow and Director of the Troubled Currencies Project at the Cato Institute in Washington, D.C., a Senior Advisor at the Renmin University of China's International Monetary Research Institute in Beijing, a Special Counselor to the Center for Financial Stability in New York, a contributing editor at Central Banking in London, and a contributor at Forbes. Prof. Hanke is also a member of the Charter Council of the Society of Economic Measurement and of Euromoney Country Risk's Experts Panel.

In the past, Prof. Hanke taught economics at the Colorado School of Mines and at the University of California, Berkeley. He served as a Member of the Governor's Council of Economic Advisers in Maryland in 1976-77, as a Senior Economist on President Reagan's Council of Economic Advisers in 1981-82, and as a Senior Advisor to the Joint Economic Committee of the U.S. Congress in 1984-88. Prof. Hanke served as a State Counselor to both the Republic of Lithuania in 1994-96 and the Republic of Montenegro in 1999-2003. He was also an Advisor to the Presidents of Bulgaria in 1997-2002, Venezuela in 1995-96, and Indonesia in 1998. He played an important role in establishing new currency regimes in Argentina, Estonia, Bulgaria, Bosnia-Herzegovina, Ecuador, Lithuania, and Montenegro. Prof. Hanke has also advised the governments of many other countries, including Albania, Kazakhstan, and Yugoslavia.

Prof. Hanke has been awarded honorary doctorate degrees by the Bulgarian Academy of Sciences, the Universidad San Francisco de Quito, the Free University of Tbilisi, Istanbul Kültür University, and Varna Free University in honor of his scholarship on exchange rate regimes. He is a Distinguished Associate of the International Atlantic Economic Society, a Distinguished Professor at the Universitas Pelita Harapan in Jakarta, Indonesia, a Professor Asociado (the highest honor awarded to international experts of acknowledged competence) at the Universidad del Azuay in Cuenca, Ecuador, and a Profesor Visitante at the Universidad Peruana

de Ciencias Aplicadas (the UPC's highest academic honor). In 1998, he was named one of the twenty-five most influential people in the world by World Trade Magazine.

Prof. Hanke is a well-known currency and commodity trader. Currently, he serves as a member of the Supervisory Board of Advanced Metallurgical Group N.V. in Amsterdam and Chairman Emeritus of the Friedberg Mercantile Group, Inc. in Toronto. During the 1990s, he served as President of Toronto Trust Argentina in Buenos Aires, the world's best-performing emerging market mutual fund in 1995.

Prof. Hanke's most recent books are Zimbabwe: Hyperinflation to Growth (2008) and A Blueprint for a Safe, Sound Georgian Lari (2010), Juntas Monetarias para Paises en Desarrollo (2015), and Currency Boards for Developing Countries: A Handbook (2015).

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Summary

This working paper is an in-depth financial analysis of Polskie Górnictwo Naftowe i Gazownictwo (PGNiG), a Polish state-controlled oil and natural gas company. Our analysis examines the economic trends and commodity movements that affect PGNiG and how the firm adjusts to these changing factors. This analysis is combined with our proprietary Discounted Cash Flow (P-DCF) model and a Monte-Carlo simulation. This results in distributions of probable free cash flows and future earnings. Our goal is to provide the necessary financial and background information along with in-depth analysis to allow the reader to make an informed investment decision.

Acknowledgements

Many thanks to Charlie Bushnell and Henry Carpenter for draft comments.

Keywords: Financial Modeling, PGNiG, Polskie Górnictwo Naftowe I Gazownictwo, Discounted Cash Flow, Free Cash Flow, Monte Carlo Simulation, Investment Thesis, Sensitivity Analysis

JEL codes: G11, C63



Polskie Górnictwo Naftowe I Gazownictwo
PGNiG, WSE: PGN

Expected FCF / Share: PLN (Polish Zloty) 6.91 (13.46% Gain)
Investment Decision: **HOLD**

Polskie Górnictwo Naftowe I Gazownictwo	
Company Name	Polskie Górnictwo Naftowe I Gazownictwo
Date	03/07/17
Fiscal year ends (current period)	12/31/2016 (Q1)
Current Price	6.09 PLN
52 week high (date)	6.43 PLN (03/02/17)
52 week low (date)	4.55 PLN (11/18/16)
Market Cap	PLN 35,190M
Shares Outstanding	5,778M
Current P/E	16.38
Cash	5,553M PLN
Price / Book	1.05
2013 EPS	0.350 PLN
2014 EPS	0.480 PLN
2015 EPS	0.390 PLN
2016 EPS (Estimated)	0.370 PLN
Total Debt (Short Term + Long Term)	6,404M PLN

Table of Contents

Executive Summary	4
Catalysts and Risks	5
Company Description and Historical Performance	7
Model of Company	13
Results and Discussion of Model	17
Sensitivity Analysis	20
Management Compensation	24
Conclusion and Investment Decision	24

Executive Summary

Polskie Górnictwo Naftowe i Gazownictwo (PGNiG, WSE: PGN) is a Polish state-controlled oil and natural gas company which deals with the exploration, production, import, storage, distribution, and sales of natural gas and crude oil. PGNiG is one of the largest companies in Poland and is listed on the Warsaw Stock Exchange. The company is part of the WIG20 Index, a capitalization-weighted stock market index of the twenty largest companies on the Warsaw Stock Exchange. The market currently prices PGNiG at 6.09 Polish Zloty (PLN) per share (as of 03/07/19). To assess the value of PGNiG, we have implemented a Probabilistic Discounted Cash Flow Model (PDCF) to determine a fundamental value of approximately **6.91 PLN/share**. This is an estimated gain of approximately **13.46%**. The valuation is driven by the anticipated growth of PGNiG's Exploration & Production (E&P) and Trade & Storage (T&S) business segments, both of which showed high growth in 2010-2015. To determine the certainty of our value estimate, we performed Monte Carlo simulations on our PDCF. Our initial Monte Carlo simulation has high uncertainty, primarily due to high variance in historical revenue growth. This high variance in turn is due to a high dependence of PGNiG's business segment revenue on crude oil, the price of which fluctuated heavily in early 2016. Crude oil prices have rallied since early 2016, but remain low relative to pre-2014 levels. Thus, it comes as no surprise that the fundamental value of the business is dependent on the price of oil and we recommend a cautious investment rating of **HOLD** until there is more certainty in the directionality of oil prices.



Figure 1: PGNiG (WSE: PGN) stock performance over the last five years
 Source: Bloomberg Terminal, Command <GP>

Catalysts and Risks

Catalysts

- Negotiations for Électricité de France S.A. (EDF) assets in Poland;
 - EDF is a French electric utility company and owns four power plants in Poland;
- Poland consumes the 4th most natural gas in Europe, behind Germany, Spain, and Belgium;
- Natural Gas demand has grown worldwide (Fig. 2);
- Increase in heat and electricity prices;
- Poland is looking to “re-Polonize” industries “at a low cost” according to Deputy Prime Minister and Finance Minister Mateusz Morawiecki;
 - “Perhaps [the] power utilities industry is one of them” –Mateusz Morawiecki;
- A 3-year contract with ArcelorMittal to deliver quantity of natural gas valued at PLN 1.4bn;
 - The contract is signed from 01/01/2017 through 01/01/2020 but has an option to be extended through 2023;
- PGNiG saw improved operating results in 2016 indicative of a recovering oil market;
 - Official Q4 or FY2016 results have not been released.

Risks

- Business performance is highly dependent on prices of (crude) oil;
 - 9-month average of crude oil prices are down 36% year-over year (as of Q3 2016);
- Natural Gas demand has remained constant in Eurasia (Fig. 2);
- Decreasing tariff price of gas fuel (Fig. 3);
- Foreign Exchange Risks;
- Impact of global warming on national temperatures;
 - Sale of gas for heat and electricity is cyclical with seasons – revenue from sale of natural gas and heat in the winter is substantially higher than in the summer.

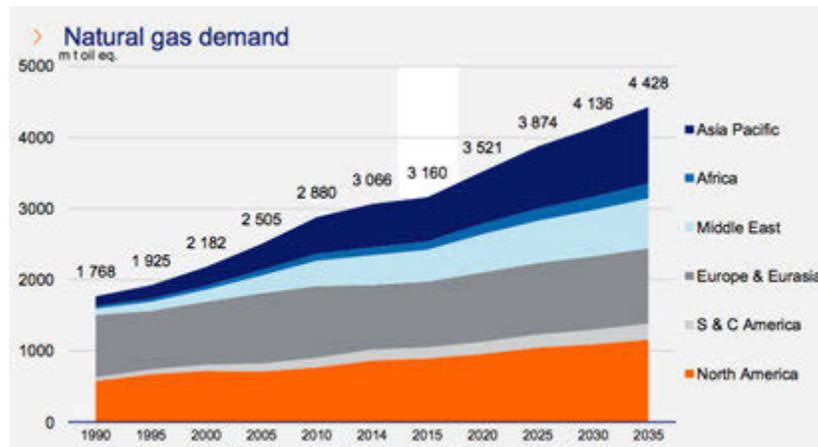


Figure 2: Demand for natural gas by geographic region
 Source: PGNiG Investor Presentation, December 2016

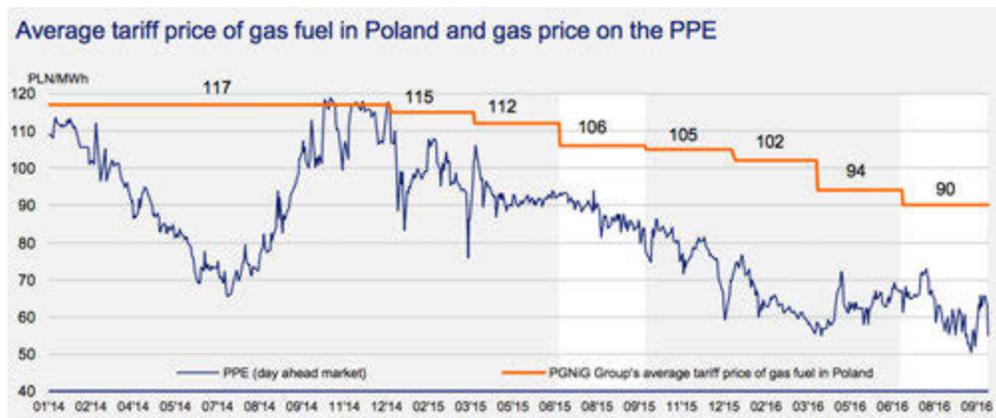


Figure 3: Tariff price of gas fuel and gas price on the PPE
 Source: PGNiG Investor Presentation, December 2016

Company Description and Historical Performance

Company Overview

PGNiG operates in the energy and natural gas sector and deals with the exploration, production, storage, import, distribution, and sales of natural gas. The company is state-controlled, and the Poland State Treasury currently owns 70.83% of shares outstanding. PGNiG is also part of the WIG20, an index of the largest 20 companies in Poland, and comprises 4.43% of the index, representing the 8th largest share.

The oil and gas industry as a whole has struggled recently due to the deregulation of the natural gas market and the low price of crude oil. Deregulation forces PGNiG to decrease their gas fuel tariffs (see above, Fig. 3), and low crude oil prices significantly affect PGNiG's E&P and T&S segment, which together generate over 90% of the company's revenue.

Business Segments and Q1-Q3 2016 Financial Summary

PGNiG divides its business into 5 main operating segments. For the purposes of the PDCF, revenue is estimated for each of these segments, as we believe this represents the most realistic indicator of company performance. Financial notes for all business segments below compare Q1-Q3 of 2016 to Q1-Q3 of 2015, unless stated otherwise. All data collected are from PGNiG's Q3 quarterly report for 2016.

- **Exploration and Production Segment:** Hydrocarbon extraction and preparation of products for sale. Includes processes of exploring for and extracting natural gas and crude oil from reserves. Also includes geological surveys, geophysical research, drilling and development of production from reserves.
 - Revenues down by PLN 617M (17%).
 - Poor performance driven by a 5% decline in oil sales volume and a fall in crude oil prices (average price of Brent in Q1-Q3 2016 was approx. 20% lower than in Q1-Q3 2015).
 - Higher impairment loss on non-current losses (PLN 692M in Q1-Q3 2016, 136M in Q1-Q3 2015).

- **Trade and Storage:** Sales of natural gas from either imports or from domestic sources, operation of underground gas storage facilities for trading, and electricity trading. This segment operates six underground gas storage facilities.
 - Revenues down by PLN 3,511M (15.2%).
 - Poor performance driven by increasing deregulation of the natural gas market in Poland and decreasing fuel tariffs.
 - Discount schemes introduced in an effort to improve competitiveness

- **Distribution:** Includes transmission of natural gas through distribution network.
 - Revenues up by PLN 75M (2%) and operating profit up by 11% due to an increased volume of distributed natural gas.
 - Average temperature in Poland decreased, increasing the demand for gas for heating purposes.
 - Expenses decreased due to a reduction of employee benefits.
- **Generation:** Generation of sale and electricity and heat.
 - Operating profit increased by PLN 119M to PLN 301M.
 - Higher revenues from sales of heat.
 - Lower procurement costs of coal.
- **Other:** All other activities that are not classified into the above segments.

Dependence on Crude Oil Prices

PGNiG's performance, particularly the performance of its E&P segment, is heavily dependent on the price of crude oil. The freefall of oil prices in 2015 caused total revenue from sale of oil and condensate in 2015 to drop by PLN 0.7bn (Fig 4). E&P revenue from sales to external customers dropped from PLN 4.3bn to PLN 3.1bn during that year as well.

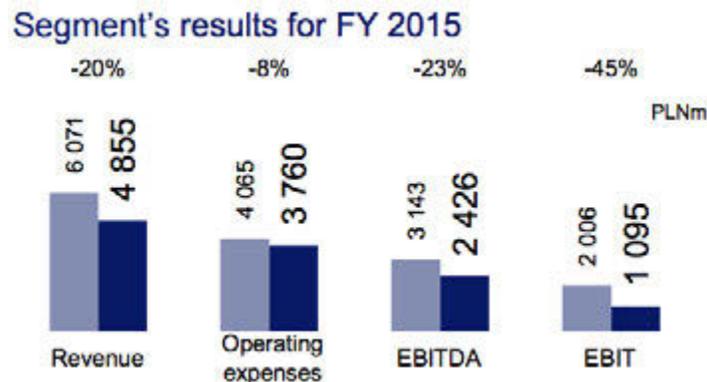


Figure 4: Decrease in Revenue during FY 2015. Revenues shown are total revenues and include inter-segment sales

Source: PGNiG Investor Presentation, December 2016

Fig. 4 makes it evident that PGNiG's operational performance is strongly influenced by the price of crude oil. Over the course of 2016, we have seen an increase in crude oil price from its low of \$29 dollars / barrel in Jan 2016 to \$53 / barrel in Jan 2017 (Fig. 5).



Figure 5: WTI Crude Oil Futures through Q1 2017
 Source: Bloomberg Terminal, Command <DES>

Additional upside for the price of oil can be found in the aftermath of the OPEC cuts and also in the economic theory of the mean reversion of the oil-gold ratio as elaborated on below. Regarding the former, in November of last year, OPEC nations agreed to trim output by a collective 1.2 million barrels per day for the first half of the year. Based on estimates in January, those nations achieved a compliance of 90% with their planned cuts, according to estimates from the producer group¹.

Regarding the oil-gold ratio, economic theory suggests that gold maintains purchasing power more than other commodities – thus, over long periods of time, the prices of other commodities adapt and adjust to the price of gold². As a result, the ratio between the price of gold and the price of another commodity reverts to a mean over a long period of time, with the price of gold remaining relatively stable and the price of the commodity adapting. Based on analysis by Prof. Steve H. Hanke of the Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise, the mean of the distribution for the oil-gold ratio is approximately 0.065 in \$ per bbl / \$ per oz. Thus, given a current gold spot price of \$1228.90 / oz. (as of 03/07/17), we find an estimated oil price of \$79.88, compared to the current spot price of \$52.83. Mean-reversion suggests that given the current spot price of gold, the price of oil is expected to return to almost \$80 / barrel barring additional shocks to the oil and gold markets.

¹ <https://www.bloomberg.com/graphics/2017-opec-production-targets/>

² Hanke, Steve "On the Price of Oil", Globe Asia May 2016, pp16-18

A 50% reversion of this ratio occurs in approximately 13.7 months, suggesting that the price of oil should reach close to \$70/bbl by the end of 2017.

This estimated price is in line with oil prices from late 2014 and early 2015. Given the heavy reliance of PGNiG's segment revenue on crude oil prices, this suggests that as oil recovers, the company's business segments should see revenues in line with that of its superb FY 2015 and moderate FY 2014. However, presently oil prices remain below 2014 levels, so some caution must be taken to ensure that our valuation of PGNiG is not fundamentally flawed.

Intersegment Sales

PGNiG has 19 direct subsidiaries and 11 indirect subsidiaries. These groups are entirely owned by PGNiG, and PGNiG's business segments often sell products to these subsidiaries. For example, the distribution segment generated revenue of PLN 654M through sales to external customers but generated PLN 3.9bn through inter-segment sales. For the purposes of this analysis, we estimate future revenue and analyze historical trends using only sales to external customers. In published financial statements, PGNiG also eliminates inter-segment sales from segment revenues as shown below (Fig. 6).

Year ended Dec 31st 2015	Exploration and Production	Trade and Storage	Distribution	Generation	Other segments	Eliminations	Total
Statement of profit or loss							
Sales to external customers	3,148	31,274	654	1,215	173	-	36,464
Inter-segment sales	1,707	468	3,931	672	152	(6,930)	-
Segment's total revenue	4,855	31,742	4,585	1,887	325	(6,930)	36,464

Figure 6: Elimination of Intersegment sales
Source: PGNiG Annual Report, 2015

Historical Performance and Looking Forward

In the previous five years, PGNiG stock has outperformed the WIG20 (Fig. 7a), with particularly strong relative performance of its share price during the fiscal years of 2013 and 2015. During a difficult 2016, the company stock performed on par with the WIG20 (Fig. 7b), but the rise and stabilization of crude oil prices suggests that PGNiG's performance will improve in the near future.

In general, the Polish oil and gas industry is beset by similar problems of gas deregulation and low crude oil prices. The key to competitiveness will be the ability of these companies to recover. In that aspect, PGNiG has secured an excellent contract with ArcelorMittal to supply PLN 1.4bn of natural gas over the next three years. Assuming a uniform distribution of this revenue over the contract period and assuming that all revenues fall under the T&S business segment, this is a 2% flat increase to segment revenue.

Additionally, PGNiG seems interested in growing value through acquisitions. They are currently negotiating with EDF for the purchase of four power plants in Poland.



Figure 7a: 5-year historical trailing return vs. WIG20
 Source: Bloomberg Terminal, Command <COMP>



Figure 7b: One-year historical trailing total return vs. WIG20
 Source: Bloomberg Terminal, Command <COMP>

Analyst Recommendations

Analysts are equally split among buy, hold, and sell recommendations for PGNiG (Fig. 8). Very recently (in Feb 2017), consensus shifted negatively compared to Q3-Q4 2016.

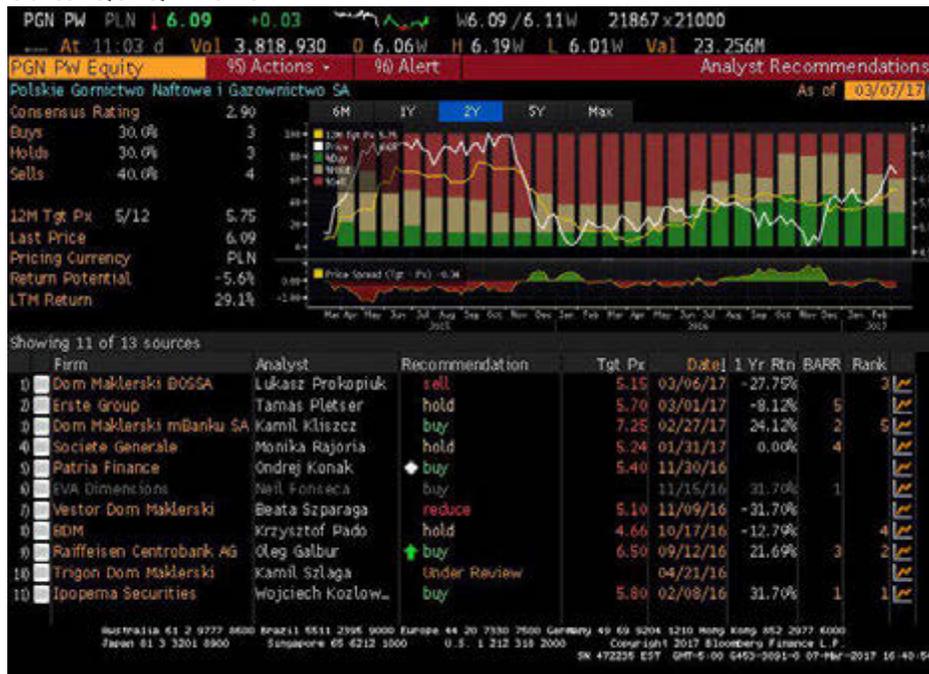


Figure 8: Analyst Recommendations
Source: Bloomberg Terminal, Command <ANR>

Ratio Performance

Inspecting the Long Term Asset Turnover Ratio (LTAT = Revenue / Long Term Assets [LTA]) and Useful Life (UL = LTA / Depreciation and Amortization [D&A]), we see that LTAT grew and UL shrunk between 2010 and 2015 (Fig. 9). Mechanistically, revenues and D&A grew faster than total LTA between 2010 and 2015, causing LTAT to grow and UL to shrink.

Using the MC simulation, we estimate an average LTAT of 1.08 over the next 10 years and an average UL of 14.17. Estimated LTAT in particular is above its historical and present values, but this simply represents PGNiG growing its revenues slightly faster than it grows its LTA indicative of a recovering crude oil price.

One likely scenario is that PGNiG continues to grow through acquisitions, such as its pursuit of EDF's Polish plants. If this is the case, total LTA may receive a boost and average LTAT over the next 10 years may fall closer to present day levels. However, acquisitions require capital expenditures (CAPEX), and our model finds that estimated FCF / share is highly sensitive to CAPEX, particularly near the end of our 10-year PDCF scope (see Sensitivity Analysis). Thus, growth entirely through acquisitions is not realistically feasible, and PGNiG must be able to grow revenue without growing their asset base in order to maintain cash flow. As a result, LTAT will increase.

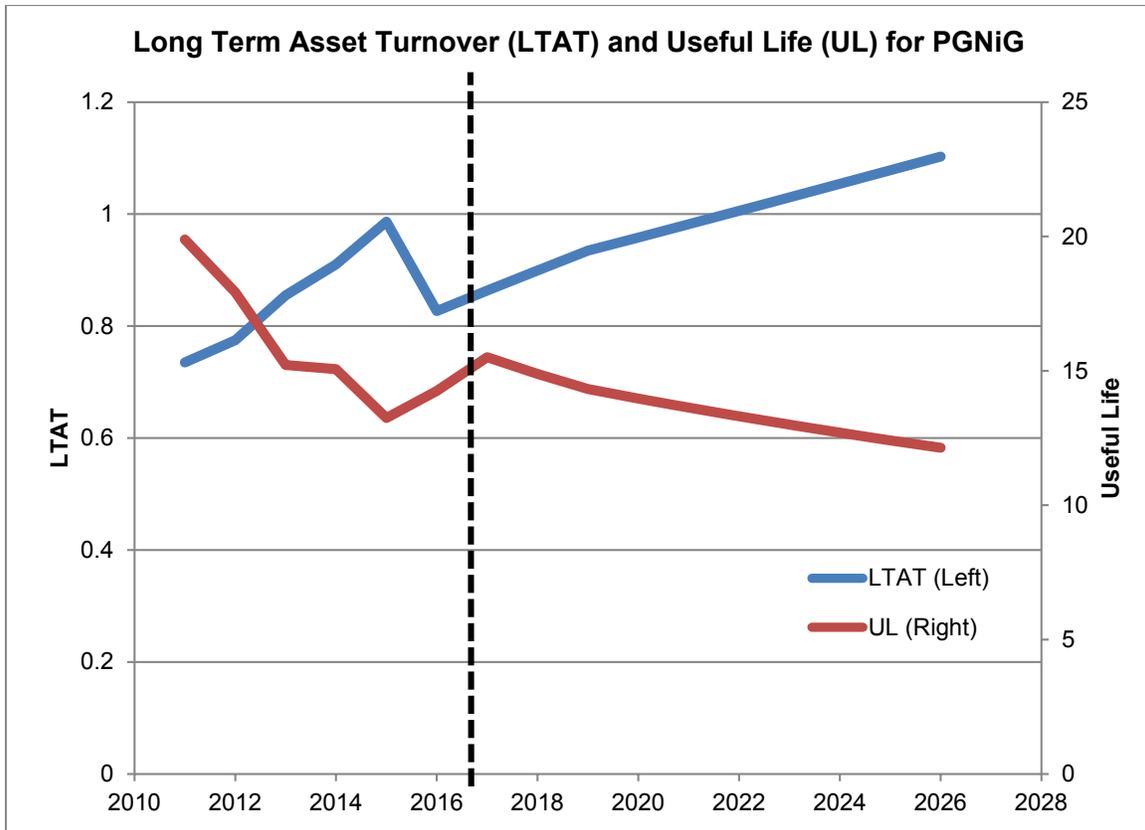


Figure 9: Historical and Estimated LTAT and UL. The black dotted line demarcates historical values (through 2016) and estimated values (2017 onwards)

PGNiG Model

The Probabilistic Discounted Cash Flow (PDCF) for PGNiG is based on primary data published directly by the company. Using these data, we established 6-year averages for the revenue growth rate of PGNiG's business segments.

Revenues for FY 2016 have not yet been published, but we estimated revenues based on Q1-Q3 performance. Intuitively, revenues for a fiscal year could and would be calculated by multiplying the revenue of Q1 through Q3 by 4/3, assuming linear extrapolation. However, PGNiG's quarterly sales tend to cyclically rise in Q1 and Q4 and shrink in Q2 and Q3, since the colder winter months see a higher usage of gas for heating. We performed an empirical analysis of the historical ratio between annual revenue and Q1 through Q3 revenues and found a ratio of 7/5 rather than 4/3.

We also calculated costs allotted to CAPEX, change in working capital, and taxes. D&A is extracted from costs of sales and is deducted as a component of CAPEX.

It is worth noting that if, for each of the next 10 years, PGNiG generates the same revenue as it did in 2015, the estimated FCF/share would be **PLN 6.35**, a **4.27% gain** over the current share price. That is, if the price of oil increases

according to the oil-gold ratio to approximately \$70/bbl - \$80/bbl and we assume that the PGNiG's revenue is directly tied to the price of oil, then the company should generate similar stellar revenues as it did in late 2014 and early 2015. If, subsequently, PGNiG generated that annual revenue for the next 10 years in our PDCF, we find an estimated share price as stated above, and we find that the company's market value would generally reflect its fundamental value.

Balance Sheet and Income Statement

Results can be found in accompanying spreadsheet, **Balance Sheet and Income Statement tabs**

PGNiG has grown its books over the last 6 years, with total assets and total liabilities + equity growing from PLN 34bn to PLN 49bn. The ongoing negotiations for EDF's Polish plants suggests that PGNiG seeks to continue growing its balance sheet over the coming years as well.

Within the balance sheet, the total value of property, plant, and equipment grew from PLN 26bn to PLN 33bn, and cash on hand grew from PLN 1.3bn to PLN 5.5bn (Appendix 2). In addition, total retained earnings have grown from PLN 16bn in 2010 to PLN 24bn in 2016. Notably, long-term debt grew from less than PLN 1bn to almost PLN 6bn between 2010 and 2015, but almost all of this was converted to short-term debt in 2016 (Appendix 3). Between 2015 and 2016, long-term debt decreased from PLN 5.8bn to PLN 1.4bn and short-term debt increased from PLN 0.6bn to PLN 5bn. This suggests that PGNiG will attempt to heavily deleverage in 2017, and we indeed find that PLN 2.5bn of debt matures in 2017 (Appendix 4).

Inspection of the income statement reveals that revenue is expected to take a hit in 2016, primarily due to poor performance from the T&S segment (Fig. 10). Earnings per share is expected to drop slightly from PLN 0.39 to PLN 0.37.



Figure 10: Historical and Estimated Revenue and EPS

Source: Bloomberg Terminal, Command <DES 4>

Value Drivers

Results can be found in accompanying spreadsheet, Value Drivers tab

We analyze the drivers of PGNiG's value and costs by determining cost margins on revenue over time.

First, we notice a strong growth of revenue over time, except for the year of 2016. On average, year-over-year (YoY) revenue growth was 11.57% between 2010 and 2015 but only 7.03% between 2010 and 2016. This reflects a decline in expected total sales of 12% in 2016 alone.

The cost margin of Raw and Other Materials Used has rapidly increased due to an increased cost of gas sold. The margin rose from 54.86% in 2010 to 66.41% in 2015. However, over this same time period, margins for employee benefits and contracted services decreased, likely reflecting the increase in input costs. Thus, EBITDA remained at approximately 18% margin on revenue for this six-year period. Margins for Raw and Other Materials, Employee Benefits, and Contracted Services are therefore set to 65.00%, 8.00%, and 7.72% margin on revenue respectively, in order to better represent PGNiG's most recent cost structure.

CAPEX was high in 2011 and 2012, at over 20% margin on revenue. This is due to an expense of approximately PLN 3bn in 2012 to acquire PGNiG Termika. Since then, however, CAPEX has decreased and remained consistently at approximately 8% margin. However, since PGNiG has grown its LTA over the last 6 years, we seek to model this growth of assets into the future as well. To do this, we set CAPEX margin at 9% margin on revenue for each of the 10 years in our PDCF. This margin sees total LTA increasing from PLN 37bn to PLN 44bn in 2026.

D&A expenses, on the other hand, have been remarkably consistent with a margin on revenue of approximately 7.5% for the last 6 years. This suggests that PGNiG is able to effectively manage the depreciation and wear of its assets.

Regarding income tax, we calculate and estimate PGNiG's income tax as a margin on their Earnings Before Taxes (EBT) in order to see through any tax shielding that may occur. We find that the income tax margin on EBT has been significantly higher between 2013 and the present than it was between 2010 and 2012. Thus, we will set the income tax margin at 26.82% margin on EBT, with standard deviation of 4.02%. This will better represent PGNiG's current tax management policies.

Finally, it is worth noting that the most recent LTAT and UL ratios are 0.99 and 13.25 respectively. The estimated average LTAT and UL are close to these values as well.

Projected Revenue Growth

Results can be found in accompanying spreadsheet, Revenue Growth Tab

The two primary sources of revenue for PGNiG are its E&P segment and T&S segment (Fig. 11). As mentioned previously, E&P revenues were hurt by low oil prices in 2015 and remained low in 2016. When oil prices were high or rising between 2010 and 2014, however, the segment saw healthy growth from revenues of PLN 2.2bn to PLN 4,3bn. PGNiG has stated in investor

presentations that they are committed to strengthening their E&P segment. To account for this, we set E&P YoY revenue growth to 7%, which is slightly lower than the historical average.

T&S segment revenues grew at an incredible rate between 2010 and 2015, with a compounded annual growth rate (CAGR) of 10.83% during that time. This segment’s revenues were hurt in 2016 due to lower unit gas purchase costs coupled with pressure on selling prices. In estimating the revenue of this segment, we admit that crude oil prices are increasing but we must remain cautiously optimistic. As a result, we set T&S YoY revenue growth to 5% -- lower than the historical average, but non-negative regardless.

Growth for PGNiG’s distribution segment is assumed to be 10% YoY, as opposed to the 44.90% average YoY growth. Because the total revenue from this segment is so low, increases in revenue from PLN 208M to PLN 654M, for example, are represented as a 133.38% growth in revenue. Clearly, this is not a realistic growth rate for the next 10 years.

PGNiG’s generation segment was formed in 2012 and has generated relatively constant revenues over that time. This segment makes up only ~4% of PGNiG’s total revenue and its YoY growth rate is held at 3%.

Finally, we incorporated revenues from the contract with ArcelorMittal into PGNiG’s revenue growth. The contract details the supply of PLN 1.4bn worth of natural gas from PGNiG to ArcelorMittal over the next three years and this revenue is uniformly distributed across the period of 2017-2020.

Total revenue growth fluctuated heavily in our historical sample and the standard deviations of YoY revenue growth is very high for all business segments. This high variance is a drawback of this model.

Year Ending	31-Dec-10	31-Dec-11	31-Dec-12	Dec 31, 2013	Dec 31, 2014	Dec 31, 2015	Expected Dec 31 2016	Mean	Assumed	Std Dev	CAGR
Segment											
Exploration and Production	2245	2879	3121	4,580	4,346	3,148	2641				
Growth Rate		28.24%	8.41%	46.75%	-5.11%	-27.57%	-16.10%	5.77%	5.77%	27.93%	1.03%
Trade and Storage	18701	19811	23253	25,341	28,367	31,274	25834				
Growth Rate		6.04%	17.76%	8.51%	11.94%	10.25%	-17.40%	6.18%	6.18%	12.21%	1.0553%
Distribution	126	141	153	165	280	654	902				
Growth Rate		11.90%	8.51%	7.84%	69.73%	133.38%	38.00%	44.90%	10.00%	49.56%	1.39%
Generation	0	0	1893	1,658	1,149	1,215	1217				
Growth Rate		NA	NA	-12.41%	-30.71%	5.78%	0.15%	-9.30%	0.00%	16.18%	0.90%
Other	208	153	210	300	162	173	137				
Growth Rate		-26.44%	37.25%	42.86%	-46.10%	6.68%	-20.58%	-1.05%	-1.05%	36.09%	0.93%

Figure 11: Historical Revenue by Business Segment

PDCF Assumptions

Results can be found in accompanying spreadsheet, PDCF tab

Margins on revenue for operating costs (Raw and other materials used, Employee Benefits, Contracted Services, Cost of Products and Services for Own Needs, Other) were generated using historical averages. The historical standard deviations of these cost margins are low, so there is little evidence to suggest that these margins would be significantly out of line with their historical values.

A summary of all other margins used in the PDCF is below. Explanations for these margins can be found in the appropriate sections above.

- Raw and Other Materials: 65% Margin on Revenue.

- Employee Benefits: 8% Margin on Revenue.
- Contracted Services: 7.72% Margin on Revenue.
- CAPEX: 9% Margin on Revenue.
- D&A: 7.47% Margin on Revenue (Hist. Avg.).
- Income Tax: 25% Margin on EBT.
- E&P segment growth: 7% YoY.
- T&S segment growth: 5% YoY.
- Distribution segment YoY growth: 10%.
- Generation Segment YoY growth: 3%.

Results and Discussion of Model

Results can be found in accompanying spreadsheet, Monte Carlo Tab

The results of the Monte Carlo Simulation can be found below. We tracked seven distinct parameters: Estimated FCF / Share, LTAT, Implied Price-to-Earnings Ratio (P/E), Free Cash Flow Return on Invested Capital (FROIC), Potential Free Cash Flow Yield (PFCFY), Percent of Invested Capital in Long Term Assets (LTA/IC), and Earnings per Share (EPS).

In our PDCF, we estimate the parameters each year for 10 years into the future. The following histograms, however, are of the *average* for each parameter over this 10-year period. Subsequently, the mean of the histogram represents an *average of averages*. We have not included the results of P/E and EPS for brevity.

FCF / Share

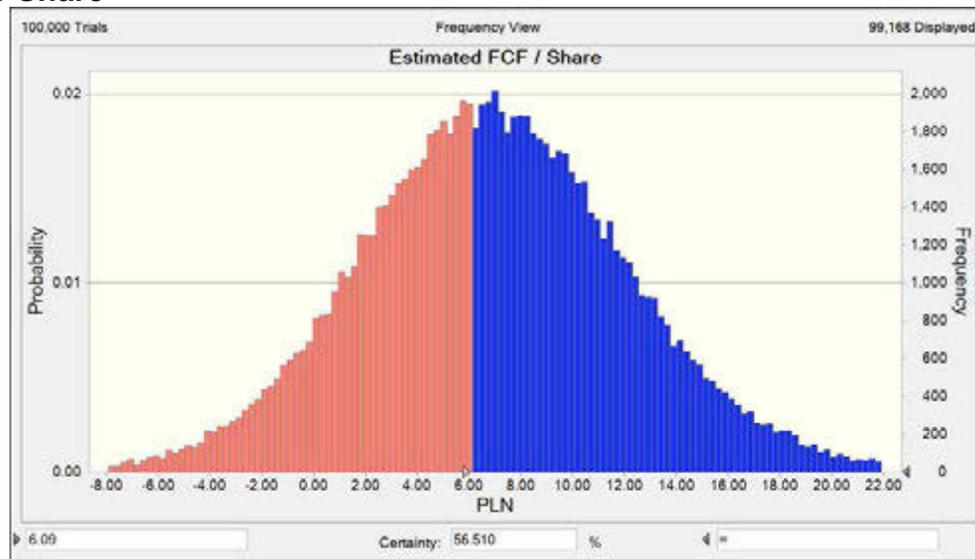


Figure 12: Distribution of expected FCF / share (PLN)

The expected FCF per share of PLN 6.91 is higher than the current share price of PLN 6.09 (Fig 12). However, the spread of FCF estimates is very high and the margin of safety is small. This high variance is likely due to extremely high variance within the revenue growth rate estimates. Currently, the 50th

percentile estimated FCF represents a gain of 13.46% over the current share price.

FROIC

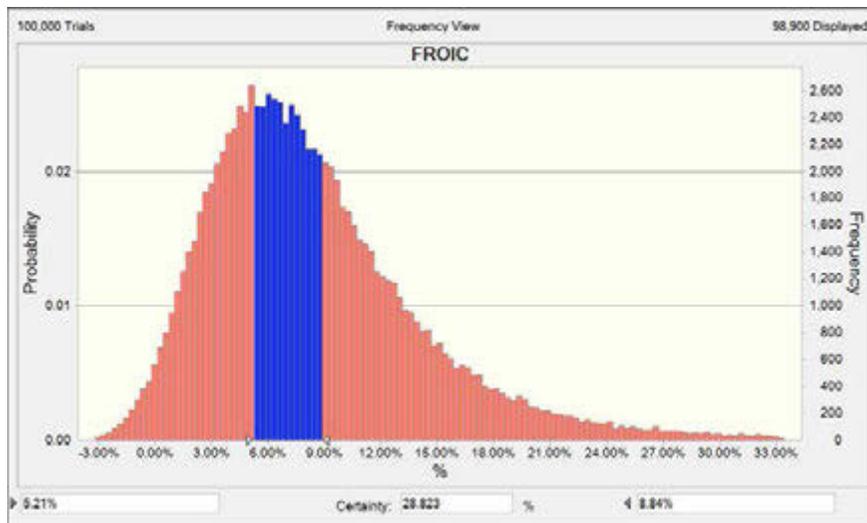


Figure 13: Distribution of average FROIC (%)

PFCFY

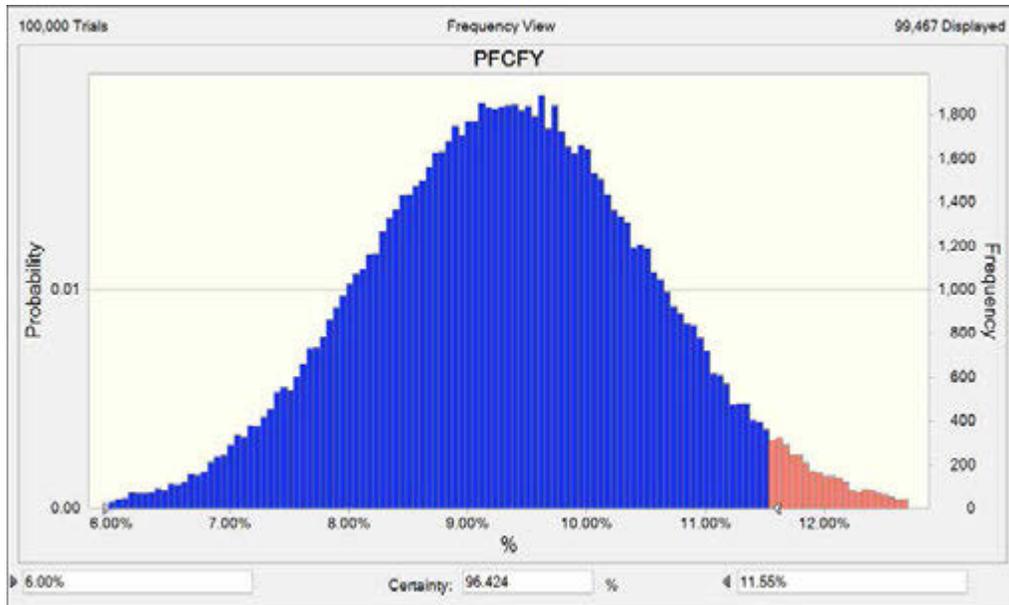


Figure 14: Distribution of average PFCFY (%)

LTAT

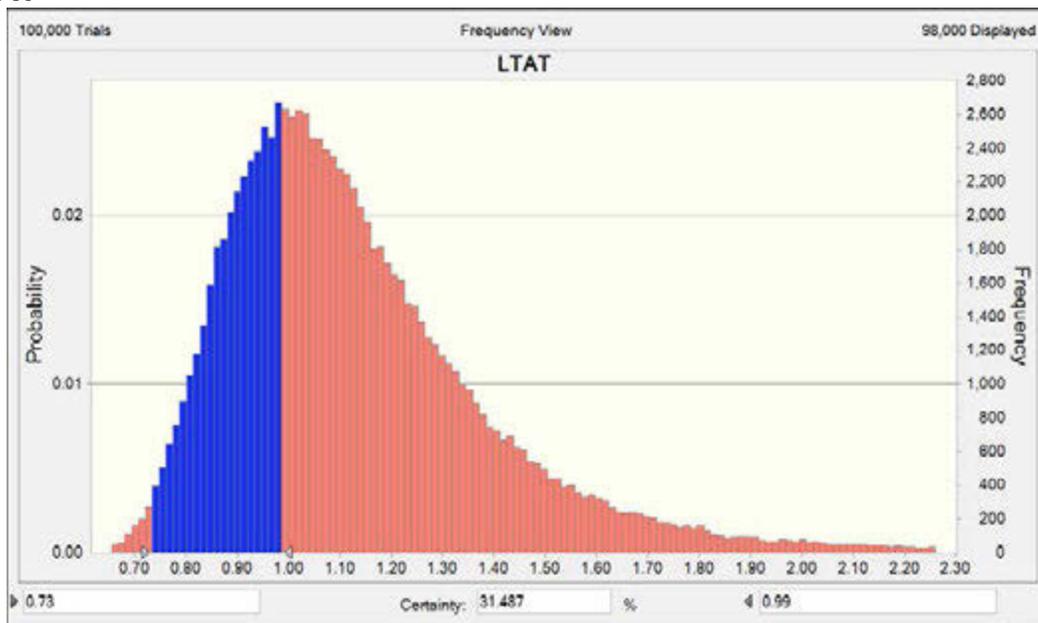


Figure 15: Distribution of average LTAT

LTA/IC

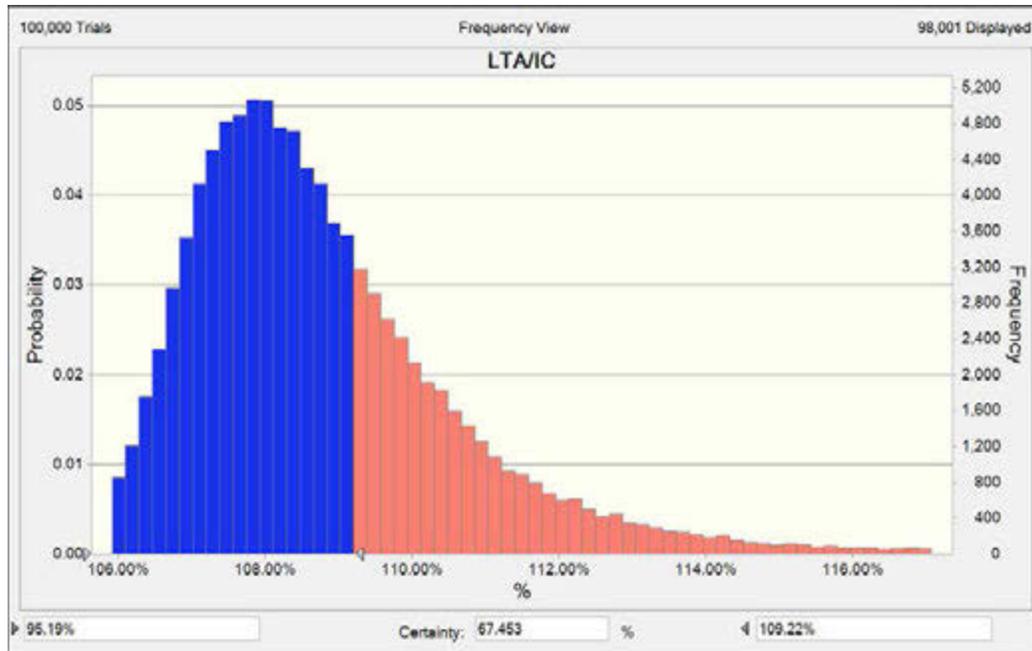


Figure 16: Distribution of average LTA/IC

Figures 13-16 above show the output distributions for PFCFY, LTAT, FROIC, and LTA/IC. In order to properly tune our PDCF, these metrics should fall in line with historical values or accurately account for any expected changes to the company's operations. We can see that estimated PFCFY, FROIC, and LTA/IC all fall within their historical bounds, indicating that we have accurately tuned the model for estimated. Estimated LTAT is expected to rise slightly above its historical bounds, but PGNiG's LTAT has risen over the last 5 years as well, rising from 0.76 in 2010 to 0.99 in 2015. For LTAT to continue rising in the future, revenues must continue to rise at a faster rate than total LTA and this condition should be met assuming crude oil prices also continue their ascent.

Ultimately, the outputs from the Monte Carlo simulation suggest that PGNiG's is somewhat undervalued. We can be confident in our model's realism and accuracy because our model tuning parameters are well within historical ranges. For example, our expected FCF/share and EPS are not contingent on a wildly increasing potential FCF yield, or on an unrealistic LTAT.

Sensitivity Analysis

In order to quantify how much each parameter in our model contributes to the overall uncertainty and variance, we perform a sensitivity analysis. Through this analysis, we can determine which of the 150+ parameters in the PDCF have unusually high correlations with FCF/share, and take steps to determine if this seems justified or is a flaw in our assumption set.

We performed two 'rounds' of sensitivity analyses, with each round composed of:

- 1) Gathering the top 25 parameters with the highest correlation with FCF/share in the PDCF.

- 2) Adjusting the Monte Carlo assumptions for the highest correlation parameters accordingly.
- 3) Generating a new distribution for the estimated FCF/share.

Round 1

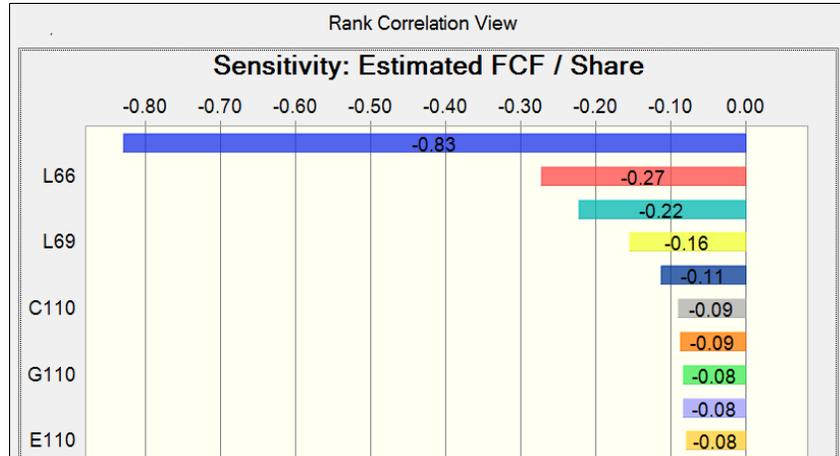


Figure 17a: Rank Correlation for the first round of sensitivity analysis. The blue bar with correlation of -0.83 represents the correlation of CAPEX margin in year 10 with FCF/share

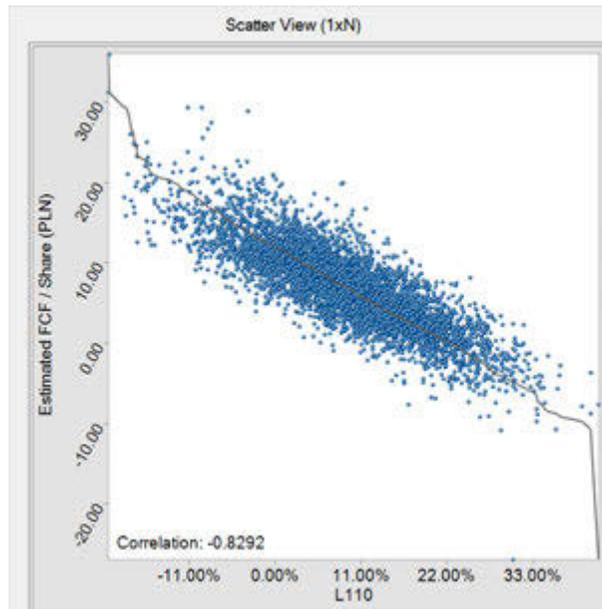


Figure 17b: Scatter plot of CAPEX margin (x-axis) with FCF/share in year 10 (y-axis)

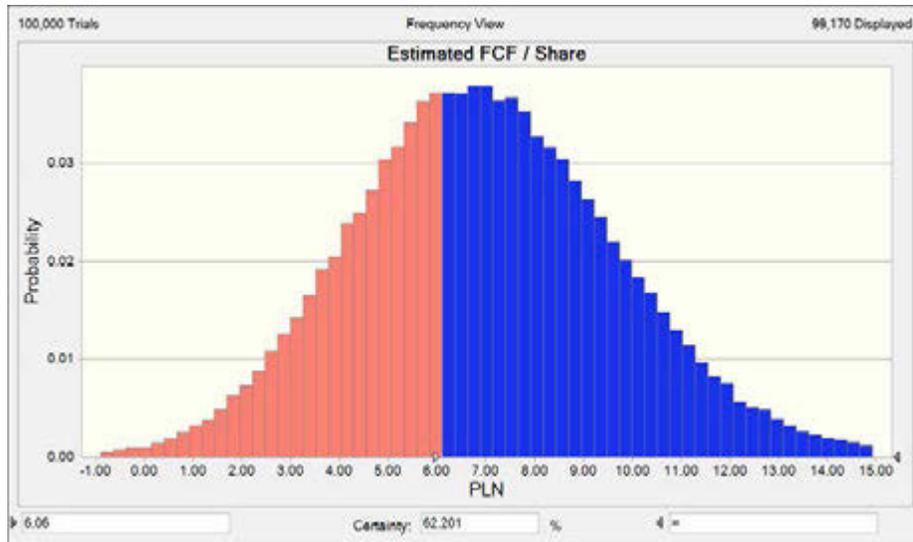


Figure 17c: New distribution of FCF/share after setting CAPEX margin in year 10 to a constant

After running the model as described in the above sections, a rank correlation calculation found the CAPEX margin on revenue in year 10 to have a correlation of -0.88 with estimated FCF/share (Fig. 17a). As a result, for any given value of this CAPEX margin, the range of possible FCF/share estimates was extremely tight (Fig 17b). We thus set this margin to a constant 9%, rather than a distribution with mean 9%, and found that the spread of the FCF/share distribution was markedly lower, but the mean remained the same. This shows that we were able to decrease variance in our estimates without affecting the interpretation of the estimates.

Round 2

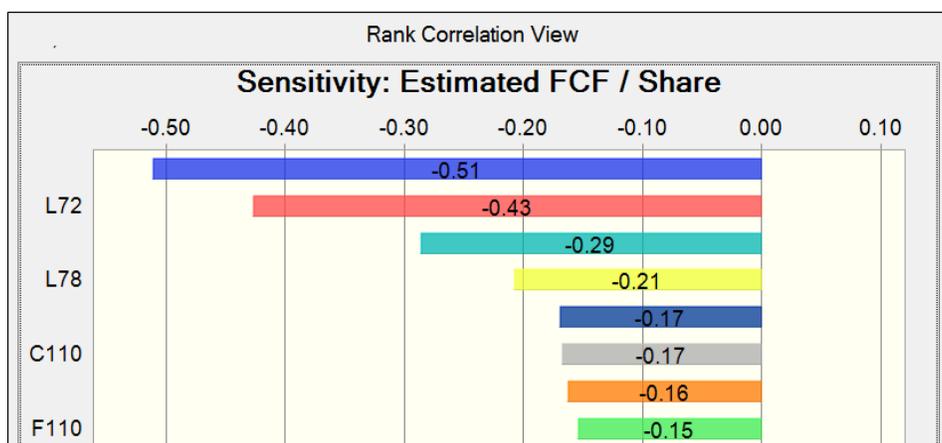


Figure 18a: Rank Correlation for the second round of sensitivity analyses

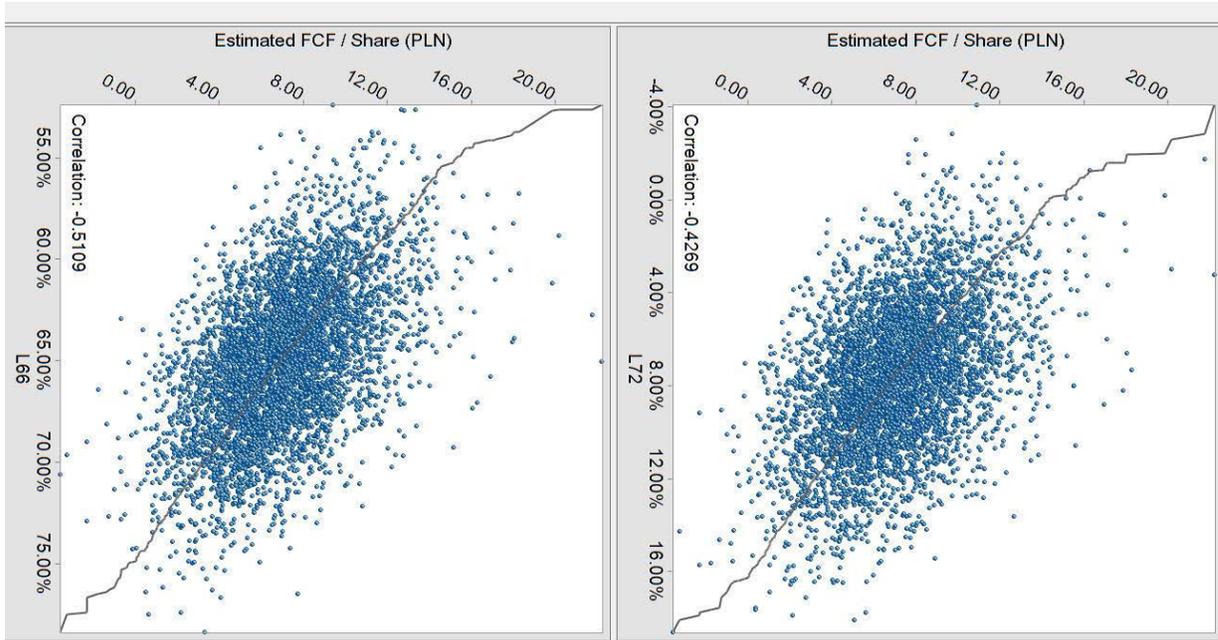


Figure 18b: Scatter plot of COGS margin (left) and Employee Benefits (right) margin against FCF/share

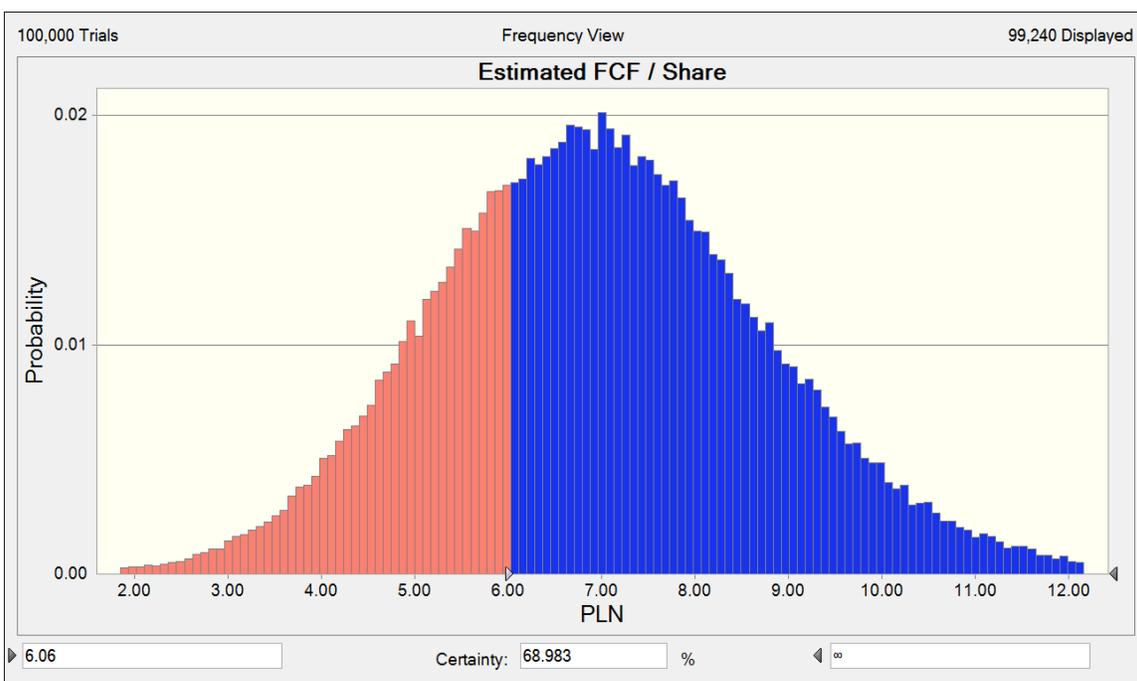


Figure 18c: New distribution of FCF/share

In the rank correlation for the second round of sensitivity analyses, the blue bar with correlation of -0.51, the red bar with correlation of -0.43, and teal bar with correlation -0.29 refer to the COGS margin in year 10, Employee Benefits margin in year 10, and Contracted Services margin in year 10 respectively (Fig 18a). As shown in the scatter plots, any given value for either

the COGS margin or Employee Benefits margin still constrains the FCF/share estimate. Again, we set the margins for each of these three operating costs in year 10 to a constant, rather than a distribution. After doing this, the spread of the distribution for FCF/share decreased again, but the mean of the distribution remained at approximately PLN 6.91, which does not change our interpretation of the Monte Carlo.

After performing the rank correlation a third and final time, all correlations were less than 0.33 and the scatter plots were appropriately distributed.

Management Compensation

Details on short and long term management compensation metrics are unavailable. However, some general goals for PGNiG were obtained from their earnings calls and investor presentation:

- Increase EBITDA to approximately PLN 7.4bn in 2022.
 - Our PDCF and MC model estimates EBITDA at PLN 7.8bn in 2022.
- Maintain stable value of sales.
- Maximize cash flow from infrastructure and generation.
- Strengthen exploration and production area.

Conclusion and Investment Decision

The story of PGNiG is highly tied to the price of crude oil. When oil prices were relatively high and increasing between 2010 and 2015, revenue from PGNiG's business segment grew rapidly, and the share price grew, as well. During 2013 and 2015 in particular, share price jumped up for the entire year. Over the same time period, between 2010 and 2015, cost margins for materials used increased significantly, but PGNiG also managed to cut down on costs allocated for employee benefits and contracted services, allowing them to maintain stable EBITDA. The bottoming out of oil in late 2015 and early 2016, however, significantly hurt revenues across the board, and oil price is the biggest question mark in the valuation of PGNiG. If oil prices continue to rise and stabilize, as they have done since the price floored, then the company stands to see significant revenue and value growth from their T&S and E&P segments, both of which saw double digit YoY growth between 2010 and 2015. Currently, oil prices are similar to their early-2015 value, suggesting that segment revenues may be able to return to 2015 levels. Past that, the future is unclear. Thus, our investment decision is to **HOLD** until more information on the direction of oil prices is available.

Appendix

PGN PW PLN C 5.55 -- W5.55 / 5.57W 17950 x 83780
 On 27 Jan d Vol 3,106,845 0 5.54W H 5.61W L 5.52W Val 17.279M

PGN PW Equity 90 Actions - 90 Output - 90 Settings Financial Analysis

Polish Gornictwo Naftowe i Gazownictwo SA Periods 10 Annuals Currency PLN

Key Stats 1 I/S 3 B/S 4 C/F 5 Ratios 6 Segments 7 Adj 8 ESG 9 Custom

11 Profitability 12 Growth 13 Credit 14 Liquidity 15 Working Capital 16 Yield Analysis 17 DuPont Analysis

In Millions of PLN except Per Share

12 Months Ending	FY 2010 12/31/2010	FY 2011 12/31/2011	FY 2012 12/31/2012	FY 2013 12/31/2013	FY 2014 12/31/2014	FY 2015 12/31/2015
Returns						
Return on Common Equity	10.92	7.21	0.56	6.09	9.63	7.01
Return on Assets	7.58	4.85	5.17	3.98	5.80	4.32
Return on Capital	10.05	6.39	7.44	5.75	8.29	6.11
Return on Invested Capital	0.75	5.23	7.05	6.45	7.90	6.17
Margins						
EBITDA Margin	20.12	14.11	17.00	10.61	10.67	16.93
Operating Margin	12.95	7.27	9.88	10.92	11.37	9.28
Incremental Operating Margin	86.86	-	20.36	19.95	17.79	-
Pretax Margin	13.00	0.25	0.07	0.45	10.57	0.27
Income before XO Margin	11.55	7.63	7.80	5.99	0.23	5.86
Net Income Margin	11.53	7.63	7.80	5.99	8.23	5.85
Net Income to Common Margin	11.53	7.63	7.80	5.99	8.23	5.85
Additional						
Effective Tax Rate	16.31	7.53	12.12	29.13	22.17	29.13
Dvd Payout Ratio	28.85	0.00	34.21	46.14	41.80	49.77
Sustainable Growth Rate	7.77	7.21	5.63	3.71	5.61	3.52

Zoom 100%

Australia 61 2 9777 6030 Brazil 5511 2595 9300 Europe 44 20 7330 7030 Germany 49 69 9204 1210 Hong Kong 852 2977 6030
 Taiwan 81 3 3201 8900 Singapore 65 4212 1000 U.S. 1 212 310 2000 Copyright 2017 Bloomberg Finance L.P.
 SN 472235 E37 GMT-5:00 6597-1043-0 28-Jan-2017 15:01:55

Appendix 1: Historical Returns and Margins



Appendix 2: Short-term, Long-term and Total Debt. Note the conversion from long-term to short-term debt in late 2016



Appendix 3: Large Increase of CCE



Appendix 4: Debt Maturation. Note the PLN 2.5bn maturation value in 2017



Appendix 5: Dividend Yield



Appendix 6: Insider Transactions

PGN PW PLN +6.09 +0.03 W6.09 / 6.11W 21867 x 21000
 At 11:03 d Vol 3,818,930 0 6.06W H 6.19W L 6.01W Val 23.256M
 PGNiG Equity 90 Actions 97 Output 90 Settings Financial Analysis
 ADJ Polskie Gornictwo Naftowe i Gazownictwo SA Periodicity Annuals Currency PLN
 Key Stats B/S C/F Ratios Segments Add ESG Custom
 10 Adj Highlights 12 GAAP Highlights 13 Earnings 14 Enterprise Value 15 Multiples 16 Per Share 17 Stock Value
 In Millions of PLN
 12 Months trailing 12/31/2008 12/31/2009 12/31/2010 12/31/2011 12/31/2012 12/31/2013 12/31/2014 12/31/2015 09/30/2016 12/31/2016 12/31/2017
 11 Market Capitalization 21,240.0 22,361.0 21,061.0 24,022.0 30,719.0 30,385.0 26,255.0 30,356.0 31,180.0
 11 Cash & Equivalents 1,428.4 1,292.6 1,532.6 1,903.0 1,990.0 2,423.0 3,046.0 6,318.0 5,553.0
 11 Preferred & other 9.0 10.5 13.4 7.0 4.0 6.0 5.0 5.0 4.0
 11 Total debt 912.8 2,008.2 2,199.1 4,999.0 10,211.0 7,861.0 5,838.0 6,382.0 6,404.0
 11 Enterprise Value 20,733.4 23,106.1 21,722.0 27,493.0 38,998.0 33,129.0 29,092.0 30,395.0 30,044.0
 11 Revenue, Adj 18,432.0 19,331.5 21,283.2 23,004.0 28,730.0 32,044.0 34,304.0 36,664.0 32,819.0 32,749.2 33,967.2
 11 Growth % YoY 10.7 4.9 10.1 8.1 24.9 11.3 7.1 6.3 -14.0 -10.2 3.7
 11 Gross Profit, Adj 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0
 11 Margin % 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0 11.0
 11 Net Income, Adj 865.3 1,238.7 2,213.9 2,680.0 2,189.2 2,164.0 3,239.3 2,903.6 2,567.9 2,412.7 2,528.7
 11 Margin % 4.7 6.4 10.4 9.1 7.6 6.8 9.4 7.9 7.8 7.4 7.6
 11 EPS, Adj 0.15 0.21 0.38 0.35 0.37 0.37 0.59 0.44 0.44 0.41 0.45
 11 Growth % YoY -62.5 41.4 78.7 -6.0 5.2 -1.2 49.7 -20.2 -14.2 -9.7 9.0
 11 Cash from Operations 1,623.1 2,942.3 3,800.4 2,570.0 2,242.0 7,332.0 6,748.0 7,047.0 6,275.0
 11 Capital Expenditures 2,579.5 3,890.8 3,669.9 4,306.0 3,780.0 3,290.0 3,781.0 3,134.0 3,699.5 3,737.8
 11 Free Cash flow -956.4 -1,298.3 -120.5 -1,926.0 -1,546.0 4,262.0 2,967.0 3,893.0 2,290.0 1,124.5 1,618.5

Appendix 7: Revenues, Market Cap and Cash Flow

PGN PW PLN Market W6.07 / 6.15W 1500x1050
Prev 6.09

PGN PW Equity Export Settings Security Ownership
POLSKIE GORNICTWO NAFTOWE I ISIN PLPGNIG00014

Current Historical Matrix Ownership Summary Insider Transactions Options

Search Name All Holders, Sorted by Size Save Search Delete Search Refine Search
Text Search Holder Group All Holders Allocate Multi-Managed
24) Color Legend Shrs Out 5,778.3M % Out 88.44 % Float 27.68 SI % Out N.A.

Holder Name	Portfolio Name	Source	Opt	Position	% Out	Latest Chg	File Dt
1 POLAND STATE TREASURY		Annual Report	All	4,178,771,608	72.32	-92,946,228	12/31/15
2 ING OFE	Multiple Portfolios	MF-AGG		124,877,307	2.16	0	12/30/16
3 AVIVA GROUP		ULT-AGG		113,829,057	1.97	0	01/31/17
4 OFE PZU ZLOTA JESIEN	Multiple Portfolios	MF-AGG		83,009,153	1.44	0	12/30/16
5 VANGUARD GROUP		ULT-AGG		55,784,590	0.97	591,808	01/31/17
6 METLIFE PTE	Multiple Portfolios	MF-AGG		51,509,831	0.89	0	12/30/16
7 BLACKROCK		ULT-AGG		45,554,405	0.79	94,271	03/07/17
8 AXA		ULT-AGG		40,273,007	0.70	784,166	01/31/17
9 SEB		ULT-AGG		29,035,565	0.50	1,805,529	09/30/16
10 ASSICURAZIONI GENERALI SPA		ULT-AGG		24,848,617	0.43	61,456	12/30/16
11 INN GROUP NV		ULT-AGG		22,582,843	0.39	5,429,692	06/30/16
12 ALLIANZ	Multiple Portfolios	MF-AGG		21,554,401	0.37	0	12/30/16
13 SCHROEDERS PLC		ULT-AGG		20,815,815	0.36	1,579,167	01/31/17
14 PKO BP BANKOWY OFE	Multiple Portfolios	MF-AGG		20,775,542	0.36	0	12/30/16
15 REGON OFE	Multiple Portfolios	MF-AGG		19,782,267	0.34	0	12/30/16
16 AVIVA INVESTORS POLAND SA	Multiple Portfolios	MF-AGG		18,544,452	0.32	15,902,448	06/30/16
17 NORDEA BANK AB		ULT-AGG		17,999,262	0.31	0	12/30/16
18 GOVMT PENSION INVST FUND JAP	Multiple Portfolios	MF-AGG		15,180,412	0.26	0	03/31/16
19 BZ WBK TOWARZYSTWO FUNDUSZY	Multiple Portfolios	MF-AGG		14,805,733	0.26	10,761,699	06/30/16

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Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2017 Bloomberg Finance L.P.
SN 571814 EST GMT-5:00 G260-3892-0 08-Mar-2017 01:24:57

Appendix 8: Shareholders. Poland State Treasury owns over 70% of shares.

PGN PW PLN Market W6.07 / 6.15W 1500x1050
Prev 6.09

PGN PW Equity Output Settings Relative Valuation

Comp Source Analyst Curated (BI) Name BI EU EP Val Curr PLN

Segment	Revenue %	Metric	PGN	Low	Comp Range	High
Whole Firm	100%	Est P/E Current Yr	14.75	2.19		17.31
Utility Networks	88%	EV/EBITDAX	N.A.	1.14		13.67
Exploration & Production	9%	Sales Growth Yoy	6.30	-52.07		103.74
Power Generation	3%	EBITDA Margin (%)	18.21	-781.82		156.03
		E&P Spending	N.A.	-63.36M		4.95B

Overview Comp Sheets Markets EPS Preview Ownership Credit Custom

Name (BI Peers)	Mkt Cap (PLN)	Last Px (PLN)	Chg Pct 1D	Pct Chg Pct 1M	Rev - 1 Yr Gr:Y	EPS - 1 Yr Gr:Y	P/E	ROE	Dvd 12M Yld
Average	16.98B	39.09	0.39%	-2.77%	-1.80%	61.82%	15.47	10.38%	2.49%
100) POLSKIE GORNICTWO N	35.19B	6.09	0.50%	9.14%	6.30%	-20.24%	22.77	8.26%	2.96%
101) UKRNAFTA OPJC	--	--	--	--	32.18%	1.29k%	--	-25.93%	--
102) NOVATEK PJSC	158.80B	52.30	-1.15%	-1.15%	13.07%	131.41%	8.74	36.34%	1.86%
103) KAZMUNAIGAS EXPLORA	17.43B	254.07	0.00%	-3.67%	37.25%	-46.10%	10.20	7.03%	--
104) AKER BP ASA	24.18B	71.58	3.48%	-6.66%	8.81%	322.65%	58.55	7.25%	2.10%
105) CAIRN ENERGY PLC	6.44B	11.15	3.08%	-1.41%	--	-15.19%	--	-1.40%	--
106) ITHACA ENERGY INC	2.43B	5.87	0.00%	0.00%	-1.97%	33.01%	2.70	21.91%	--
107) SOCO INTERNATIONAL P	2.17B	6.54	1.54%	-8.04%	-52.07%	--	--	-5.75%	3.04%
108) FAROE PETROLEUM PLC	1.81B	4.97	-3.61%	-7.41%	-12.26%	37.23%	--	-21.19%	--
109) PREMIER OIL PLC	1.52B	2.98	-1.23%	+23.09%	-34.50%	-436.23%	--	-14.09%	--
110) EXILLON ENERGY PLC	1.19B	7.36	1.72%	-11.90%	-24.03%	27.14%	3.89	18.22%	--

(Accounting Adjustments: Adjusted for Abnormal Items When Applicable) 10 Analyze List

Australia 61 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2017 Bloomberg Finance L.P.
SN 571814 EST GMT-5:00 G260-3892-0 08-Mar-2017 01:25:18

Appendix 9: Relative Valuation