Petróleo Brasileiro S.A. (Petrobras)
Assessing Ability to Pay Debt 2017-2021

BSAD 191B

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Executive Summary

Petrobras has incurred a substantial amount of debt in order to finance numerous capital expenditures for long-term oil production and access to deep-water pre-salt reserves. After analyzing and graphing out Petrobras' senior debt payments over the next 13 years (2017 through 2030), we found that 65% of the debt is due by the end of 2021. We ultimately created a model that can simulate Petrobras' ability to pay and assess the probability they default. By creating a model and running thousands of simulations, it is evident that by restructuring their 2021 debt, Petrobras can reduce the probability of default in 2021 from 9.57% to 0.58%.

Political Risks

Petrobras is linked heavily with Operation Car Wash (Operação Lava Jato in Portuguese), an ongoing corruption investigation that initially started out as an investigation into money laundering. Petrobras' former head of refining and supply, Paulo Roberto Costa was arrested on March 20, 2014. Since then Operation Car Wash has expanded into an investigation of former executives of Petrobras for allegedly accepting bribes to award contracts at artificially high prices (Connors, 2015). Later in 2014, a Brazilian prosecutor declared a 'war on corruption' and further arrests have been made, including former Petrobras engineers. In February of 2016, the then CEO of Petrobras, Maria das Gracas Foster, along with other executives, resigned abruptly (Stauffer, 2015). Although many people were and still are implicated, as of now, the only two people to be found guilty; Costa, who served one year of house arrest due to his plea bargain, and the former international director of Petrobras, Nestor Cervero, who received a five-year sentence in May 2015. The only fines issued have been to the Brazilian engineering conglomerate, Odebrecht, who pled guilty to paying bribes to receive contracts such as building stadiums for the 2014 World Cup (Brice). This fine was for $4.5B, but was reduced to $2.6B on April 17th, 2017 (Brendan).

Because of Operation Car Wash and corruption in Brazil, president Rousseff was impeached in August of 2016 and the new president Michel Temer has pledged to keep charging those involved in Operation Car Wash, continuing the 'war against corruption' (Peduzzi). Petrobras and Brazil continue to increase transparency and work to fight corruption. In late 2014, Petrobras banned 23 suppliers cited in the investigation from bidding on tenders. Coface.com and Transparency.org show improved ratings for Brazil over the last years (**See Exhibit 1 & Exhibit 2**). Exhibit 1 shows a trending improvement in Brazil's Corruption Perception Index, with Brazil ranking just above the average score for South American countries. Although Brazil's country rating is 'C', which is 'high' for default risk, the Business Climate comes in at A4, which is 'Acceptable'. Strengths listed on Coface for Brazil also include "improved institutional transparency following recent corruption scandals" (Coface).

Brazil's policy stability rating and the increasing investment grade of Petrobras strengthens confidence that political risk is decreasing. Under Henisz and Zelner's Political Constraint Index, Brazil scores 0.74, with 1.0 being the most stable (**See Exhibit 3**). Since the credit rating had been downgraded to B3 in February of 2016, Petrobras has seen successive upgrades to B1 as of April 2017 and currently has a stable outlook (Moody's, Petroleo). Our model depicts Political Risk through the rate spread and is accurately weighted against oil price.

Exchange Risk

87% of Petrobras' outstanding debt is denominated in the United States dollar (USD) (**See Exhibit 4**). Oil is also quoted in USD. However, Petrobras' revenue is in Brazilian Reais (BRL). This means that Petrobras is exposed to transfer risk. Although sudden inflation of the BRL could affect Petrobras ability to pay debt, we did not deem exchange risk as very high. The Brazilian Real in comparison to the Dollar has also been relatively stable. Despite a 7.2% increase in USD/BRL exchange rate from November 1st to December 1st, 2016, it has since dropped 10% (**See Exhibit 5**). We believe the increasing investment grade of Brazil, currently at Ba2 and rated stable (Moody's), as well as Brazil's "ability to withstand external shocks: creditor to outside world, substantial reserves" (Coface) minimizes exchange risk.

Oil Industry

The Brazilian Oil & Gas sector has substantially evolved since the monopoly of Petrobras ended in 1997 due to market de-regulation. Brazil became a net exporter in 2007 due to major multinational oil companies entering the Brazilian market. This is in large part due to Petrobras discovering the Tupi field, the first major pre-salt oil field, which contained an estimated reserve of 6-8 billion barrels of oil equivalent ("Pre-Salt"). Pre-salt formations are believed to be a significant fraction of the world oil reserves (reserves up to 50 billion barrels of oil), however, drilling down 2000-3000 m in the Atlantic is costly ("Pre-Salt"). As of March 2017, Petrobras released a statement announcing that their current oil output was 2.74 million boed (2.61 million being produced in Brazil, 130,000 abroad), while 1.26 million barrels come from pre-salt layers (46% of the Petrobras total production in 2016) (Brazilian Oil). Petrobras is moving in a different direction than OPEC: instead of making production cuts to increase oil prices, they have attempted to increase production output despite current prices.

In 2016, Petrobras estimated that the pre-salt fields would break even at an oil price of $45/bbl, or $52/bbl if natural gas was also extracted (Nogueira). This is a high break-even point, which was highly unprofitable when oil prices dropped below $30 in 2016 (Riley). Recently Petrobras has been exporting lighter, sweet crudes than in the past (from the pre-salt layers), which are easier and cheaper to refine into gasoline and diesel. Demand for this light crude and less polluting fuels are increasing in China, India, Korea, and the U.S. (major crude consuming countries) where new standards to reduce sulfur content in fuels is becoming more prominent (Brazilian Oil). Petrobras can use these higher oil demand and sales to cut into their debt and ameliorate Brazil's economy.

Petrobras' profits are directly correlated with oil prices. In the model, the predicted oil price from 2017 through 2021 is found using a normally distributed model. Oil prices in 2017 have so far averaged $55/bbl (U.S. Energy). Petrobras made their own Brent Oil Price Projections through 2021 which was referenced in the simulation (**See Exhibit 11**). The simulation model has the ability to show multiple oil price estimates under various scenarios.

Simulation Methodology

The debt restructuring simulation originated from a need to explain how political and economic factors affect Petrobras' ability to repay senior debt. The simulation illustrates a debt restructuring schedule that considers three distinct factors: Oil Prices, Treasury Rates, and a Rate Premium. Using data from the past five years to calculate a mean and standard deviation, each factor went through 10,000 simulations to predict different outcomes over the next five years **(See Exhibit**

15). The simulated outcomes were then run through an equation that calculates Petrobras' ability to pay for each of the five years **(See Exhibit 13**). The Current Debt Simulation shows the potential concern for Petrobras, a predicted default rate of 9.57% in 2021. To create a restructuring plan to reduce the risk of default in 2021, the simulation was re-run under three different restructuring scenarios by changing the amount of debt repaid over the last two years **(See Exhibit 14)**. The restructuring scenarios were then used to determine the optimal amount of debt to be restructured **(See Exhibits 16, 17, & 18).**

<u>Treasury Rate</u>
The simulation uses the 10-Year US Treasury Rate as the base borrowing rate for Petrobras' debt. The standard deviation of .379% reflects the reliability of using the US Treasury rate as the risk-free rate **(See Exhibit 7 & Exhibit 8).**

<u>Rate Premium</u>
The rate premium, or rate spread, represents the weight associated with political risk in Brazil. The rate premium reflects Brazil's sovereign rating, as well as Petrobras' corporate rating, which have shifted in part due to corruption over the last three years; increasing transparency requirements; and changes in Government administrations **(See Exhibit 9 &10)**.

<u>Brent Oil Price</u>
The price of Brent Oil represents the main economic factor in the debt restructuring simulation. Petrobras uses Brent Oil prices in the company's forecasting reports. The estimates from Petrobras' report **(see Exhibit 11)** show a mean price of $62.8/bbl, with a standard deviation of $5 in 2017, which then increases by $1 each year after.

Recommendations

The restructuring simulation helped to identify an optimal restructuring plan that lowered Petrobras' default rate from 9.57% to 0.58%. To achieve the reduction in default rate, Petrobras' must shift the payment of $4.1 Billion of Senior Debt that matures in 2021, to 2020. There are five Petrobras' corporate bonds maturing in 2021, with combined principal amounts totaling $12.817 Billion **(See Exhibit 19)**. The bonds with the highest APR are the ones which are the most optimal to restructure. The two bonds identified in Exhibit 14 account for $4.5 Billion of the 2021 Debt. Petrobras must negotiate a lower APR with the lending banks of the selected bonds. One of those lenders is JPMorgan Chase, which has recently expanded its involvement in debt restructurings, and which already serves as a manager of distressed bonds exchanges. In September, JPMorgan Chase helped Brazilian mining company Samarco Mineracao SA restructure about $3.8 billion in debt (Lucchesi). At the time of restructuring, Samarco Mineracao held a non-investment grade rating of C (Moody's). While Petrobras' bonds are not classified as distressed, the function of the market is similar in its mechanics. However, Petrobras' bonds represent a safer investment for JPMorgan. JPMorgan willingness to help restructure a Brazilian company with a junk rating provides Petrobras with the opportunity to create a restructuring plan in cooperation with a willing lender at a lower rate. Another incentive for JPMorgan's potential involvement in this restructuring deal is due to Petrobras' preventative approach to debt restructuring, rather than a reactionary one.

While Petrobras is financially able to restructure its current debt obligations at the current time, another upgrade in its investment rating would provide a more beneficial restructuring. The past two credit reports from Moody's, Petrobras has had its corporate rating upgraded. The optimal path going forward includes waiting until Petrobras' rating achieves investment grade. However, if the credit rating stays at its current level, or decreases, Petrobras must still restructure by the end of 2019 to be able to successfully decrease their default risk.

Conclusion

Managing a long-term debt is an important factor, and poor management can destroy a company's credit rating. Taking into account political and economic factors, there is significant reason to believe a debt restructuring plan is necessary. By restructuring debt and subsequently reducing default risk, Petrobras will significantly increase its long-term stability. With the simulation, there is concrete evidence that supports the claim that moving $4.2B in debt from 2021 to 2020 is the correct course of action.

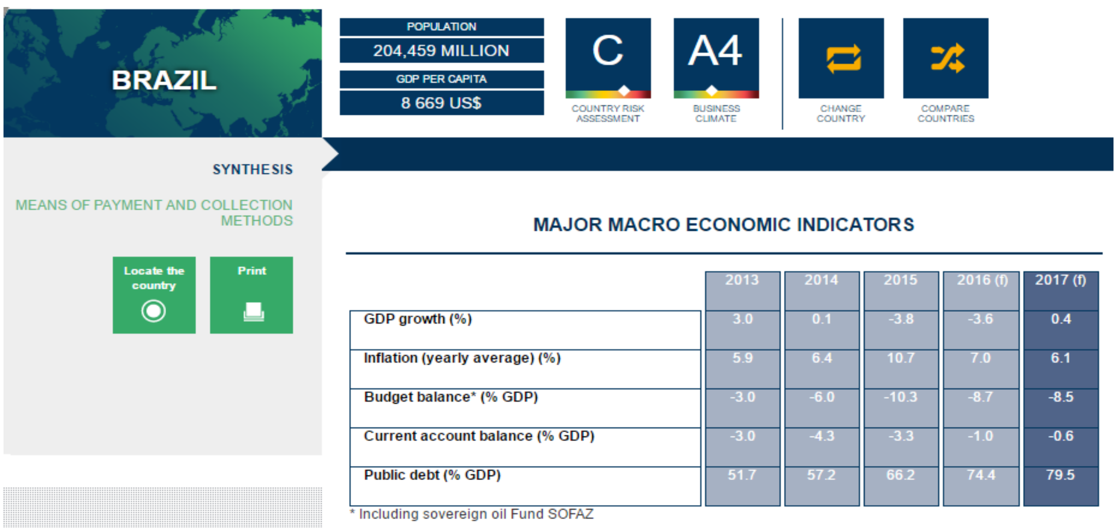
Exhibits

Exhibit 1: Brazil's Corruption Perception Index

2016 Rank	Country	2016 Score	2015 Score	2014 Score	2013 Score	2012 Score	Region
79	Brazil	40	38	43	42	43	Americas

Note: 100 = Very Clean

Exhibit 2: Country and Business Ratings; Brazil



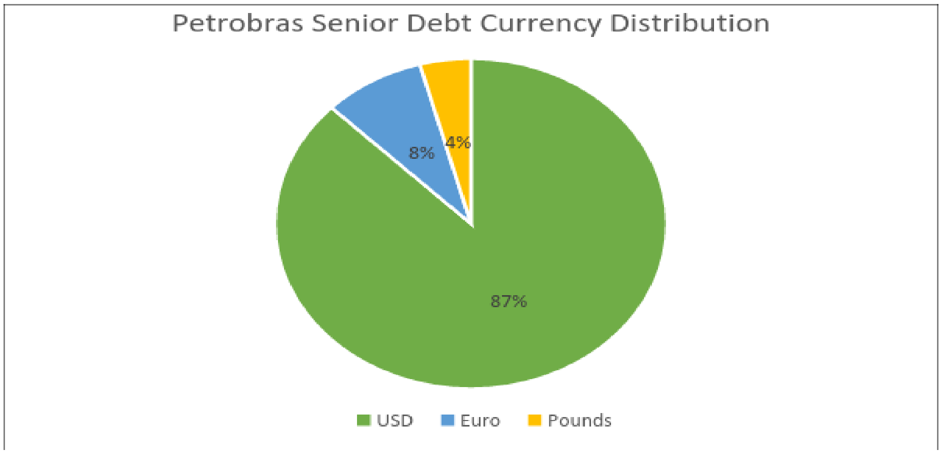
	2013	2014	2015	2016 (f)	2017 (f)
GDP growth (%)	3.0	0.1	-3.8	-3.6	0.4
Inflation (yearly average) (%)	5.9	6.4	10.7	7.0	6.1
Budget balance* (% GDP)	-3.0	-6.0	-10.3	-8.7	-8.5
Current account balance (% GDP)	-3.0	-4.3	-3.3	-1.0	-0.6
Public debt (% GDP)	51.7	57.2	66.2	74.4	79.5

* Including sovereign oil Fund SOFAZ

Source: Coface.com

Exhibit 3: Class Slides 3/9/17. Spring 2017. BSAD191. Univ. of Vermont. Prof. Kingsley

Exhibit 4: Petrobras Debt Currency Distribution



Source: Debt Prospectus, 2017

Exhibit 5: 1 Year USD/BRL Exchange Rate

Exhibit 6: Current Debt Schedule

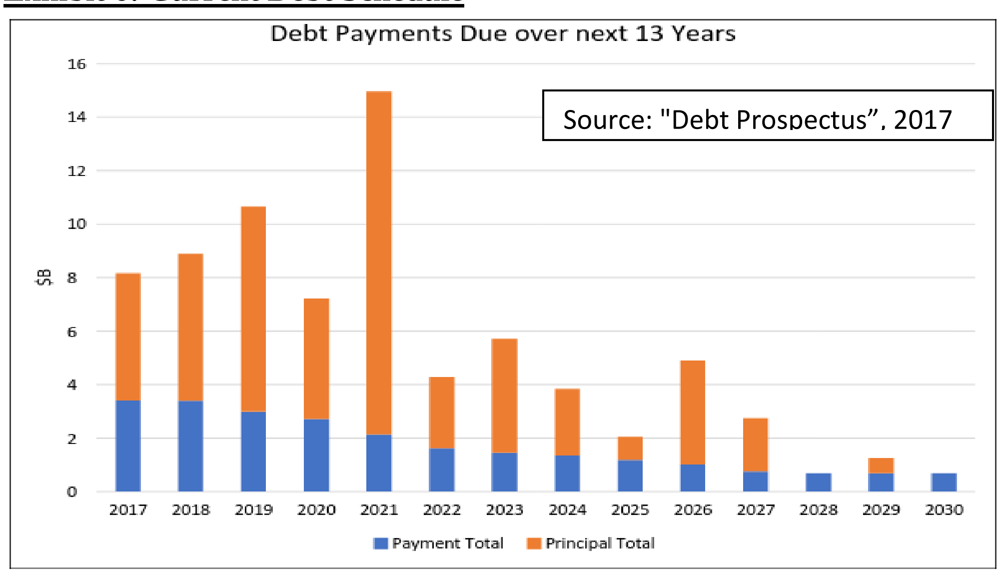


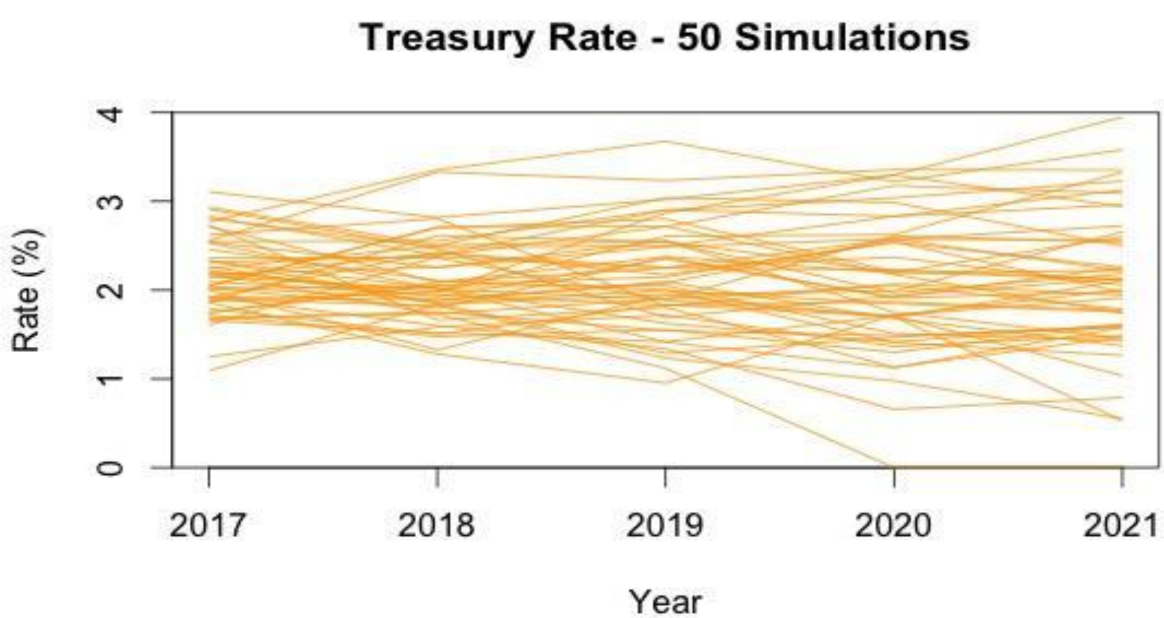
Exhibit 7: Historical 10-Year Treasury Rate

Source: U.S. Department of the Treasury, 2017

Mean: 2.1489%

Standard Deviation: 0.37939%

Exhibit 8: Treasury Rate Simulation Example



Source: U.S. Department of the Treasury, 2017

Exhibit 9: Historical Rate Premium

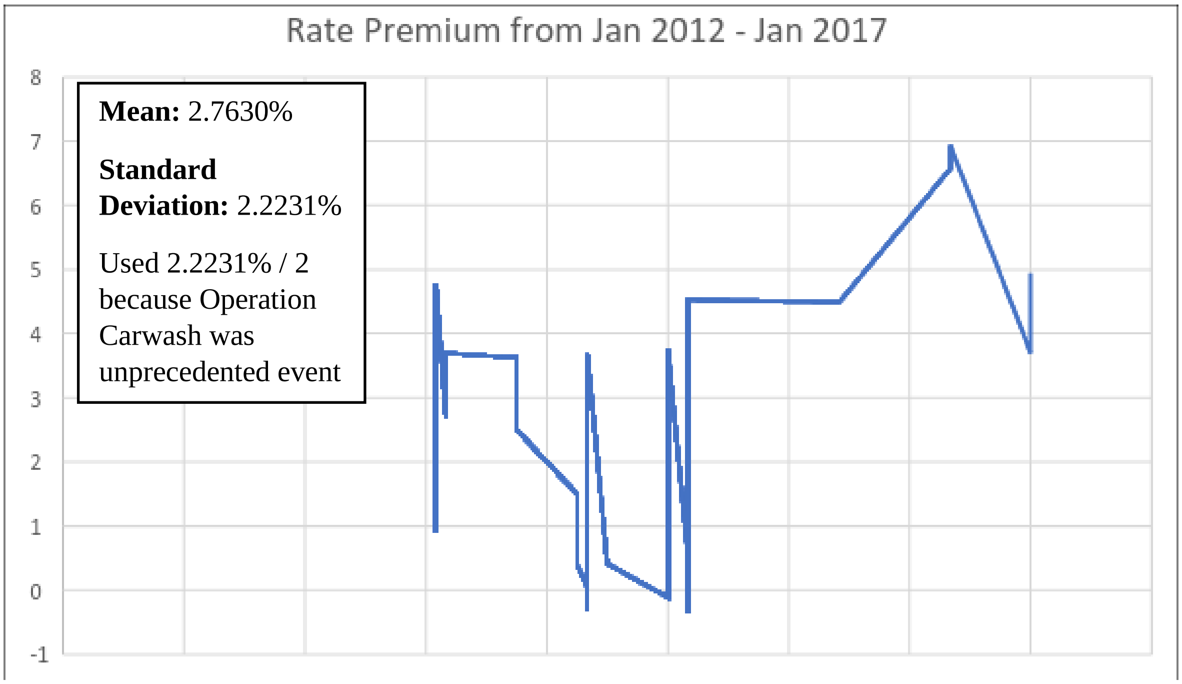
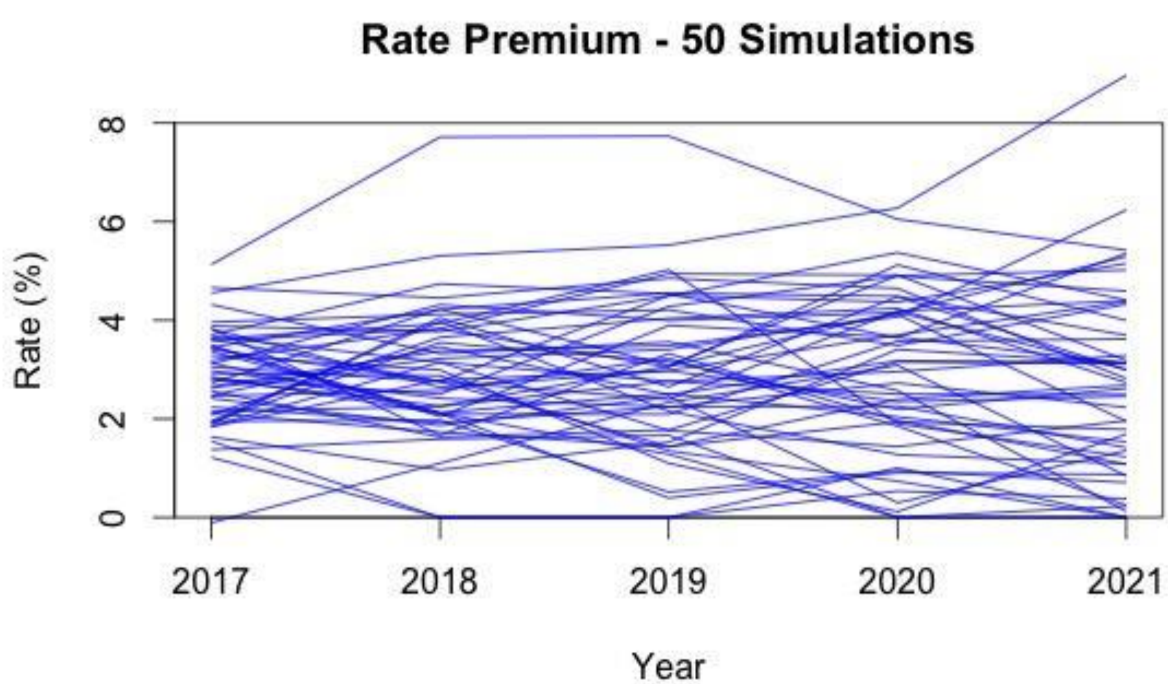
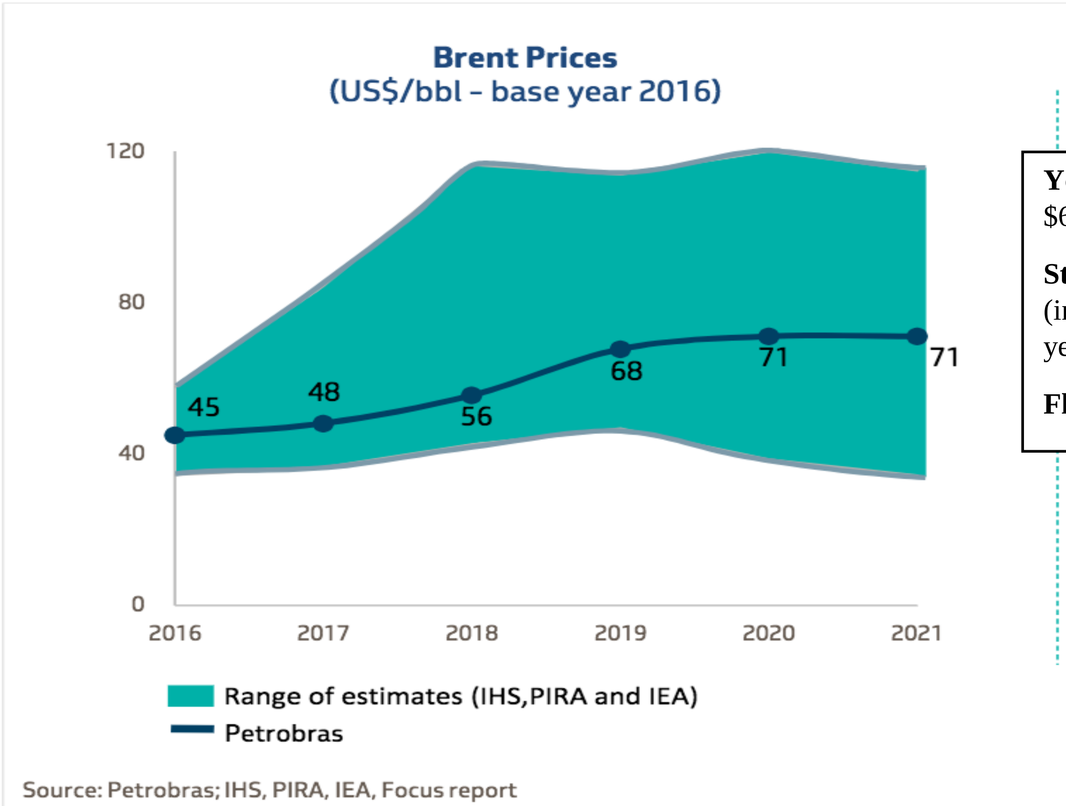


Exhibit 10: Rate Premium Simulation Example



<u>Exhibit 11: Assumptions for Brent Oil Price Simulation</u>



Yearly Mean: $48, $56, $68, $71, $71

Standard Deviation: $5 (increasing by 1 each year)

Floor: $20

Source: Petrobras General Overview December 2016

<u>Exhibit 12: Brent Oil Price Simulation Example</u>

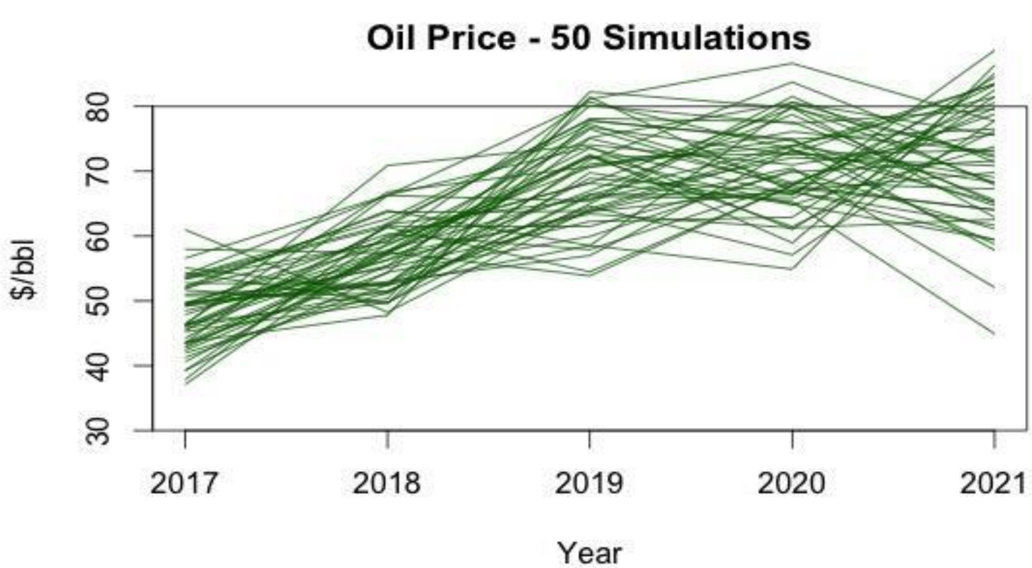


Exhibit 13: Simulation equation of Ability to Pay Derived from Individual Factors

$9,077,775,756.67 = avg of last 3 years

-Assume they could have paid $14B/year (so, not in danger of default)

-Need to make Actual Rate negative factor (higher rate = bad, lower rate = good)

Therefore: $14B = CONSTANT x ((oil Price) + (10)(13 – Actual Rate))

(Note: Actual Rate = US Treasury Rate + Rate Premium)

Substituting Starting Averages:

$14B = CONSTANT x (45) + (10) (13 – (2.7630 + 2.1489))

CONSTANT = $111,216,148.585

Exhibit 14: Calculation of Different Restructuring Scenarios

-Pain point is 2021 ($12,817,500,000)

-Excess capacity at 2021

-Need to move debt from 2021 to 2020

-Don't want to have 2021 be higher than 2020 (than same issue exists in 2020)

- So minimum 2021 debt is ($4,500,000,000 + $12,817,500,000)/2 = <u>$8,658,750,000</u>

Step = ($12,817,500,000 - $8,658,750,000)/ 3 = <u>$1,386,250,000</u>

<u>Amount 1</u>: $12,817,500,000 – (1) $1,386,250,000 = <u>$11,431,250,000</u>

2020 = $4,500,000,000 + (1) $1,386,250,000 = $5,886,250,000

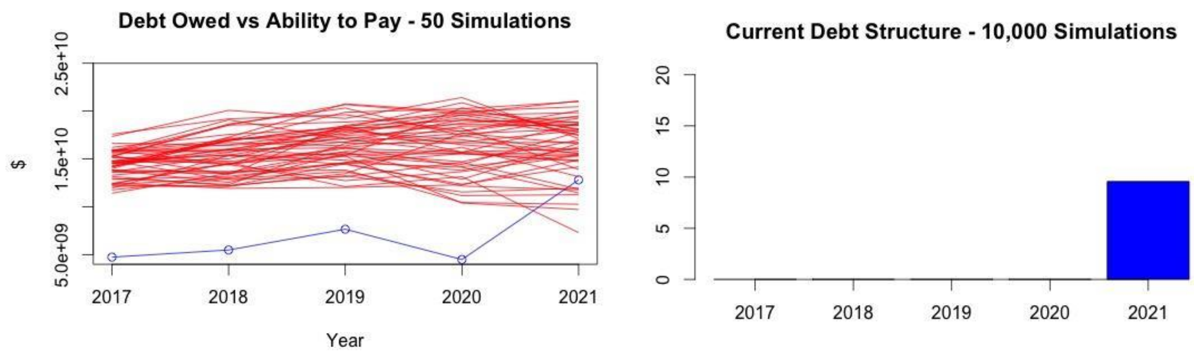
<u>Amount 2</u>: $12,817,500,000 – (2) $1,386,250,000 = <u>$10, 045,000,000</u>

2020 = $4,500,000,000 + (2) $1,386,250,000 = $7,272,500,000

<u>Amount 3</u>: $12,817,500,000 – (3) $1,386,250,000 = <u>$8,658,750,000</u>

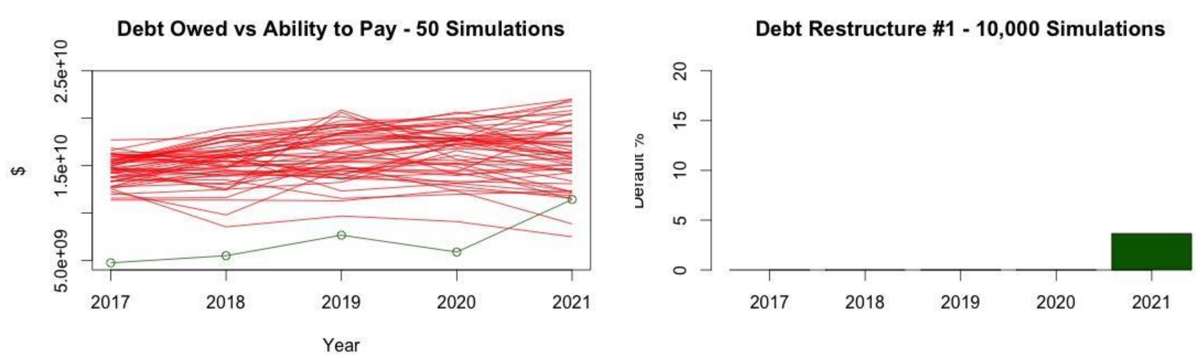
2020 = $4,500,000,000 + (3) $1,386,250,000 = $8,658,750,000

Exhibit 15: Simulation with Current Debt Structure



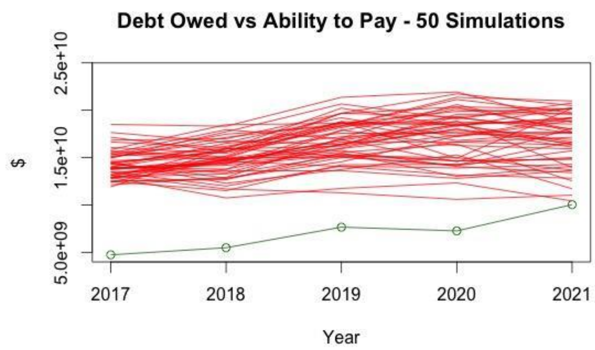
Debt ($B)	$4.75	$5.50	$7.67	$4.50	$12.82
Default Rate	0%	0%	0%	0%	9.57%

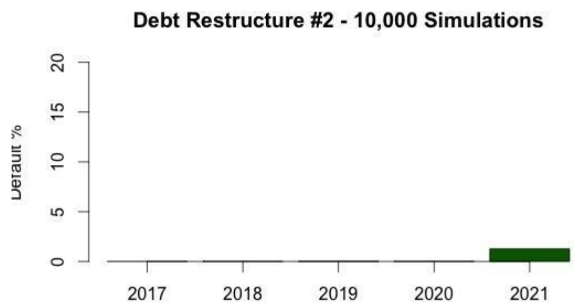
Exhibit 16: Simulation with Debt Restructuring #1



Debt ($B)	$4.75	$5.50	$7.67	$5.89	$11.43
Default Rate	0%	0%	0%	0%	4.18%

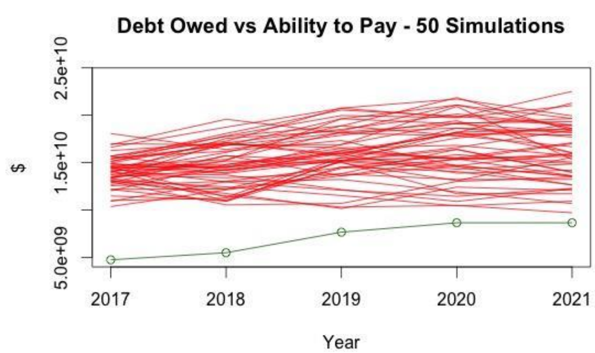
Exhibit 17: Simulation with Debt Restructuring #2

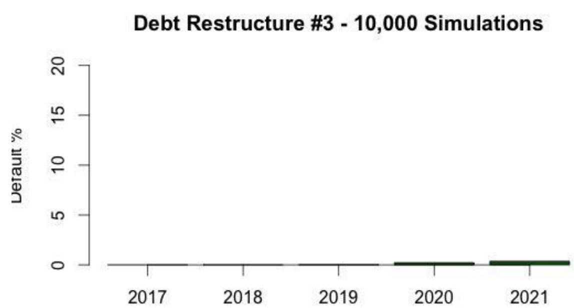




Debt ($B)	$4.75	$5.50	$7.67	$7.27	$10.05
Default Rate	0%	0%	0%	0%	1.26%

Exhibit 18: Simulation with Debt Restructuring #3





Debt ($B)	$4.75	$5.50	$7.67	$8.66	$8.66
Default Rate	0%	0%	0%	0.22%	0.36%

Exhibit 19: Senior Debt maturing in 2021

Principal Amount	Currency	Current $ Ex Rate	Amount ($)	Actual rate (APR)
$750,000,000.00	Euro	1.09	$817,500,000.00	3.750%
$2,500,000,000.00	US	1	$2,500,000,000.00	5.375%
$2,750,000,000.00	US	1	$2,750,000,000.00	5.375%
$1,750,000,000.00	US	1	$1,750,000,000.00	8.375%
$5,000,000,000.00	US	1	$5,000,000,000.00	8.375%

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