International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Project Financing Strategy in the Oil and Gas Downstream Industry (Case Study: The Integrated Oil Refinery and Petrochemical Plant Project at PT ABC)

Nodya Mandalika[1], Uke Marius Siahaan[2], Sylviana Maya Damayanti[3]
[1,2,3]School of Business and Management, Bandung Institute of Technology (ITB), Indonesia

ABSTRACT: The global oil refinery industry faces challenges such as crude oil price volatility, environmental awareness, and renewable energy trends. Indonesia's oil consumption is increasing, reaching 1580 million bpd in 2022, but the country heavily relies on imports for domestic demand. The petrochemical industry, crucial for the downstream plastic industry, is forecasted to grow at a 5%-6% rate between 2022 and 2031. However, domestic production capacity is lower than demand, and Indonesian manufacturers are few. PT ABC, a joint venture between Indonesia's State Own Enterprise and European oil and gas companies, plans to build the first integrated oil refinery and petrochemical complex in Indonesia. This integration will provide economic benefits by sharing feedstocks, products, and utilities, and saving energy costs. However, significant capital investments are required. The research is performed to analysis the feasibility of the capital investment project and to evaluate potential source of fund to finance the project, such as shareholder's equity, bank loans, and corporate bond. The research will determine the NPV, IRR and Payback Period of the project and compare it from different source of funds. The research performed also evaluate several factors that could influence feasibility of the project. As the result, it shows that at discount rates of 8%, 10%, and 12%, the project is feasible. However, volatility of the crude oil price will give significant impact to the project's feasibility. In addition, it also recommends PT ABC to choose a mix financing between international bank loans and shareholder's equity at a 60:40 ratio.

KEYWORDS: Feasibility Study, Project Financing, Oil Refinery, Petrochemical, Integrated Complex

INTRODUCTION

1. Oil Refinery Industry

The oil refinery sector, which converts crude oil into various fuel products, faces challenges such as price fluctuations, environmental concerns, transitioning to renewable energy sources, and geopolitical issues. OPEC predicts that crude oil consumption will continue to grow at a slower rate between 2025 and 2035 before stabilizing at 108 million barrels per day (bpd) from 2035 onwards (Lawler, 2021). However, global oil refining capacity is expanding due to greenfield developments in Africa, Latin America, and the Middle East. From 2023 to 2027, an additional 4.4 million barrels per day are expected to be on-streams to address shortages in specific markets, integrate into petrochemicals in China, or upgrade local crude into more valuable products in the Middle East (McKinsey and Company, 2023).

The global oil refining market is experiencing a Compound Annual Growth Rate (CAGR) of 4.28% between 2020 and 2030, with a value of USD 1,687 billion in 2022 (Grand View Research, 2023). Asia Pacific countries, particularly China and India, have become significant players due to their growing economies and rising middle class, leading to a substantial rise in demand for transportation fuels. Meanwhile, Indonesia has been a net oil importer since 2003 (CEIC, 2022), and the Indonesian government needs to import either crude oil or refined oil to address the oil shortfall. The nationwide total oil refining capacity is 1 million barrels per day, and Indonesia aims to raise its national oil refining capacity from 1 million bpd to a maximum of 1.45 million bpd in 2027. This expansion will decrease the need to import refined oil and boost the country's energy self-sufficiency.

2. Petrochemical Industry

The petrochemical industry, a sector of the chemical industry, converts hydrocarbon feedstocks into various chemical products. The global petrochemical market had an expected economic value of over USD 556.1 billion in 2021, with primary petrochemical products including ethylene, propylene, butadiene, and aromatics. Emerging markets, particularly Asia, have seen significant growth due to rapid economic growth, industrialization, and middle-class income expansion. Middle Eastern countries have contributed to

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

the expansion by providing plentiful and cost-effective feedstocks, leading to larger investment in petrochemical projects (Saadi and Carpenter, 2022).

The global petrochemical market is projected to reach over USD 910.5 billion by 2030, driven by rising demand in commercial applications and the automotive industry (The Brainy Insight, 2022). Plastic packaging application is a primary driver for increasing demand, accounting for more than 44% of the total market in 2021 (Source: grandviewresearch.com). The need for plastic packaging, especially in developing countries, is forecasted to boost demand for petrochemicals in the future. Meanwhile, the Indonesian market is expected to see a CAGR of 5%-6% for petrochemical products like polyethylene, polypropylene, styrene, and butadiene monomers from 2022 to 2035. However, production from major petrochemical companies like PT Chandra Asri Petrochemical (PT CAP), PT Trans-Pacific Polymer Indonesia (PT TPPI), PT Lotte Chemical Titan, and PT Polytama Propindo still below market demand, and the demand is still largely dependent on imports. To enhance domestic manufacturing capacity, it is essential to invest in expanding existing facilities or constructing new production facilities.

3. Integrated Oil Refinery and Petrochemical Plant

The oil refinery industry is facing challenges due to strict emission regulations, high-fuel efficiencies, biofuels, and electric vehicles. The chemical sector is expected to increase crude oil demand by 4% per year until 2035, driven by population growth, improving living standards, and demographic changes, particularly in developing countries in Africa and Asia (Sadoun, 2018). This has led to the need for continuous evolution to achieve larger gross refinery margins.

One solution is combining oil refineries and petrochemicals into integrated facilities, which can provide several advantages. This involves identifying synergies and maximizing operational and economic benefits by sharing and exchanging various streams such as feedstocks, by-products, and utilities. A standalone plant incurs significant utility costs, but integrating both plants can save energy costs by combining electric power, steam, process water, cooling system, and hydrogen transfers (Sadoun, 2018). Efficient molecule management can maximize return on investment, and creating by-product streams can bring operational benefits, enhance profitability, and improve overall process economics (Qureshi et al, 2018). By using infrastructure better, facility operators can mitigate price volatility by allowing low-value products from one chain to be utilized as valuable feedstock in another. For example, processing crude oil at 65 USD/barrel generates a margin of around 15 USD/barrel, while integrating with a petrochemical complex could improve the margin by 30 USD/barrel (Sadoun, 2018).

The Refinery and Petrochemical Integrated Development (RAPID) project located in Pengerang, Southern Johor, Malaysia, is one example of an integrated facility in Asia (owned by Petronas, Malaysia).

4. PT ABC Company Profile and the Business Issue

PT ABC is a joint venture (JV) company established by an Indonesian State Own Enterprise (SOE) as the main shareholder, in partnership with an European oil and gas corporation. The JV company was created to build and operate the first integrated oil refinery and petrochemical complex in Indonesia. The integrated plant is designed to process 300,000 bpd of crude oil and produce oil refinery products, such as gasoline RON 95 and RON 98 meeting EURO-V standard, aviation fuel (Jet A1), diesel and Sulphur. The petrochemical plant is designed to produce aromatic products, such as paraxylene, as well as olefin derivatives, such as styrene, butadiene, polypropylene, HDPE, and LLDPE. The integrated plant has a complexity rating of 13.3 according to the Nelson Complexity Index (NCI), and become the most complex plant over the past decade in Asia region. PT ABC is anticipated to increase the domestic oil production by approximate 30% and contribute to the government's national energy reliance goal. In the petrochemical sector, PT ABC is expected to make significant contribution on reducing import and boosting domestic plastic industry.

An integrated oil refinery and petrochemical plant will require adoption of advanced technology and substantial capital investment. To achieve the economic scale of the business opportunity, the integrated plant must be built in relatively large production capacity. At the scale that PT ABC planned to build, it may need investment ranging from 10 to 20 billion USD. Constructing the integrated plant in smaller production capacity will make the economic value of the investment less attractive as it generates lower cash flow to provide return for the investment. PT ABC must conduct a comprehensive financial analysis and risk assessment to assess the long-term feasibility and profitability of a business opportunity. This includes evaluating market conditions, global economic conditions, and internal factors like financial performance and human resource capability. Securing capital investment is challenging

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

due to the project's high-risk nature. PT ABC must develop a financial strategy, either using equity or debt, and evaluate the cost of capital, availability, and associated risks on each financial source.

The research is performed to analyze and answers the following questions:

1. Is the integrated oil refinery and petrochemical plant project economically feasible?
2. Which factor that is most sensitive affecting the economic feasibility of this project?
3. What are the financing sources available for this project?
4. What is the optimum financing strategy to fund this project?
5. What are the factors that need to be anticipated to execute this project?

LITERATURE REVIEW

1. Project Financing

Project financing is a method of raising funds through debt, equity, and limited guarantees through a newly established company, partnership, or contractual joint venture (known as Project Vehicle). It typically involves the construction of a large, capital-intensive facility project and the operation of a specific business activity. This method is often highly leveraged and financed by lenders, who rely on the specific project cash flow and other assets owned by the project vehicle to repay the debt. Lenders cannot extend the claim to the broader assets of the project sponsors if the project vehicle cannot meet its debt obligations. Typically, a greenfield project development will involve many project participants.

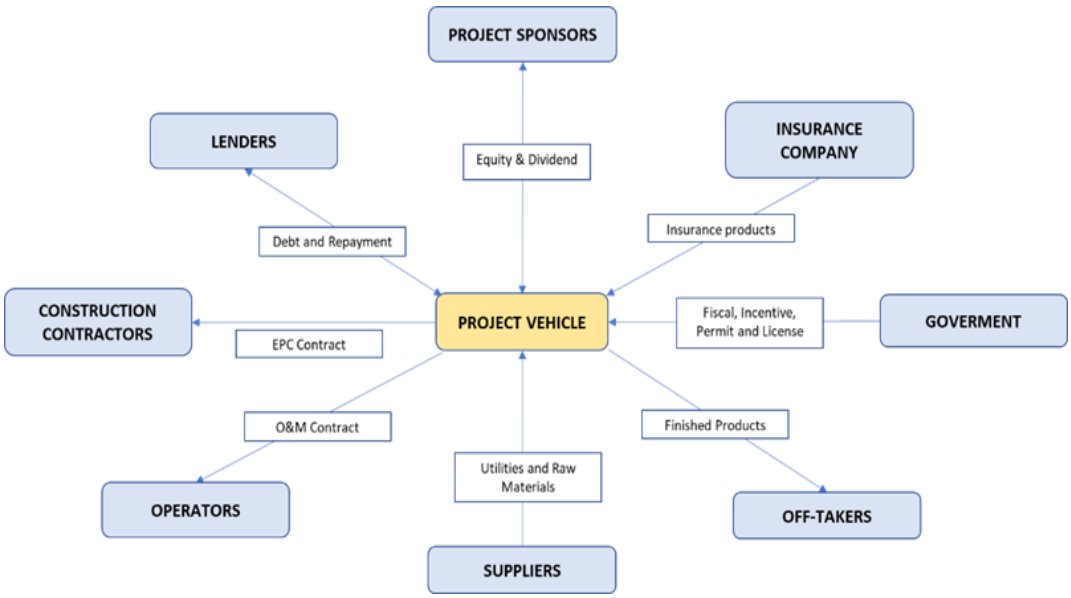

Figure 1. Project Financing Participants

A Project Sponsor(s) can be an individual or a company, that initiates the project and usually has prior experience in the implementation and operation of similar project. Typically, Project Sponsors will establish a special-purpose vehicle (SPV) for executing and operating a given project. Project Vehicle can be in the form of joint venture company. The shareholders, acting as Project Sponsor(s), are required to make capital investments in the Project Vehicle according to the terms in the agreement. Meanwhile, the construction contractor is a company that design and construct the project under an Engineering, Procurement and Construction (EPC) contract with Project Vehicle.

Lenders are individuals or institutions that lend funds to other parties with the expectation of repayment, usually with interest, over a specified period. They can be multilateral and bilateral agencies (World Bank), commercial lenders (private banks) and insurance companies, or government institutions (ECA). Furthermore, the insurance companies will provide insurance products required by the terms of agreement between any parties involved in the Project Financing mechanism.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

There are other participants that are usually found in the project execution, but they are not involve directly in the project financing transactions. An Off-taker is a company that is procure all or majority of outputs from the project under a formal contract. The off-taker can be either single entity or several entities. A third-party operator is a company that assumes responsibility for the operations and maintenance (O&M) of the project facility. Suppliers is responsible for providing the necessary utilities (fuels, power electricity, water) and key raw materials for the project facility. In the developing countries, government may play a crucial role in assisting project development, such as offering fiscal or other form of incentives, providing special guarantees, and granting special permits or licenses.

2. Source of Funds

In the project financing, generally, it is divided by two domain which are debt financing and equity financing based on the repayment scheme and their involvement in the company operations.

2.1 Equity Financing

Equity financing involves raising capital in exchange for ownership of a project or asset, with equity investors becoming partial owners and sharing in the project's profits and losses. This method does not require regular interest payments or repayment of the principal amount, and if the project underperforms, investors are not obligated to pay fixed returns. However, issuing new equity capital may dilute existing shareholders' ownership and may lead to conflicts with existing shareholders. Equity financing can be more expensive than debt if investors expect higher returns to compensate for higher risk. There are two primary types of equity: i) Common Equity, where investors provide funding in exchange for shares in the project and entitled to dividends, and ii) Preferred Equity, where investors receive fixed dividends and has priority over Common Equity in profit distribution.

Equity contributions to a company can come from various sources, including shareholder equity, venture capital (VC), private equity (PE), or public offering. **Shareholder equity** is provided by the existing project sponsors to show their commitment to the project. **Venture Capital** invests in the early and high growth stages of a company, typically in industries with high growth potential. Meanwhile, **PE** is rather investing in mature companies with established operations and revenue streams, such as manufacturing, retail, or healthcare, and is less risky and requires lower return than VC. PE often invests when the company is looking for expansion or restructuring operations. Lastly, **Public offering** allows the company to access a larger pool of funds, including individual investors. Public shareholders receive dividends based on the company's profitability and dividend policy and can benefit from capital gains when the stock price increases.

2.2 Debt Financing

Debt funding is a method to access large amounts of funds provided by lenders, often involving borrowing money that must be repaid over time, typically with interest. There are several types of debt financing, including **loans**, which involve borrowing money from a bank or financial institution with defined interest rates and repayment schedules, and **bonds**, which are debt securities issued by the project company to raise funds from a wider market of investors.

Loans can be obtained from various sources, such as commercial banks, investment banks, multilateral agencies, export credit agencies, or syndicated loans. Loans often has defined interest rates and repayment schedules that provide predictability in financial planning. It must be repaid with interest regardless of the project's performance and it is tax-deductible. Soft loans can also be obtained from government or shareholders for national strategic projects, often with lower interest rates than banks or financial institutions. Meanwhile, bonds can be issued in the form of corporate bond, project bond, or convertible bond, which can be converted into equity shares. The bond issuer agrees to make periodic interest (coupon) payments and repay the principal amount at the bond's maturity date. The interest paid to bondholders is also tax deductible. Usually project company issues bonds based on their credit ratings. A lower-rated project company has limitation to raise bonds or allowed to issue a small amount of bond but with high interest return.

Both equity and debt capital can be used in combination to fund a project, but the project company must find the right balance to get the minimum financing cost while maximizing the benefit of the provided funds.

3. Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM) was developed by William Sharpe in 1960, to determine the required rate of return of an investment based on its risk associated. CAPM establishes a connection between the expected return and the non-diversifiable risks, which is risk that arise from the market conditions that cannot be eliminated by diversification.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

CAPM has three (3) essential components, they are:

1. Beta Coefficient

Beta coefficient is a measure of how much an asset's return moves in reaction to changes in the overall market return. Beta coefficient of an asset is measured based on the asset's historical returns, whereas market return is measured based on stock composite index, in example the S&P500 index. Beta coefficient for the entire market is equal to 0. Asset betas can have either positive or negative. A positive beta indicates asset move in the same direction as the market, while a negative beta means asset move in the opposite direction of the market (Gitman and Zutter, 2015).

2. Risk-Free Rate

Risk-Free rate refers to the rate of return on an investment that is considered to have no risk associated with it. It is often represented by the yield of government bonds. Therefore, risk-free rate will depend on the specific country where the investment is being made.

3. Market Risk Premium

Market Risk Premium is the difference between market return and the risk-free rate. Market Risk Premium refers to the additional return that investors want when investing in assets that carry higher levels of risks. The more volatile the assets, the higher market risk premium will be. According to the explanation provided above, CAPM can be simply formulated as follow:

$$r_a = R_F + [\beta_a x (r_m - R_F)]$$

Whereby:

r_a = return on asset *a*
R_F = risk-free rate
β_a = beta coefficient asset *a*
r_m = market return; return on the market portfolio of asset *a*

4. Weighted Average Cost of Capital (WACC)

The Cost of Capital is the cost that company must spend to fund a new investment opportunity. It also represents the minimum rate of return that a project must earn to increase value to the company. The Cost of Capital reflects the expected average future cost of funds over the long-run and the entirety of the company's financing activities (Gitman and Zutter, 2015). The company's source of funds often come from the borrowing the money (debt capital) or by issuing the stocks (equity capital), whereby both sources have the cost associated with it (cost of debt and cost of equity). The Weighted Average Cost of Capital (WACC) is a financial indicator that represents company's average after-tax cost of funds from all sources to finance its assets.

In the economic modelling, WACC is used as the discount rate to determine the net present value of a business opportunity. In other words, WACC is the minimum rate of return that investors needed to consider investing in a business. A high WACC indicates that the business is riskier, because the company is paying more for the capital they need, as the investors require additional return to compensate the risks. Conversely, a low WACC means that company will pay less for the equity or debt that they use to grow the business. Low WACC may happen to the companies or businesses that are more established, large, and safer to invest as they have demonstrated values to lenders and investors. The WACC is highly industry-specific, meaning that comparing the value across the similar companies within the industry will be beneficial to justify the WACC value. WACC can be simply formulated as below:

$$WACC = \left[\frac{E}{V} \times R_e\right] + \left[\frac{D}{V} \times R_d \times (1 - T_c)\right]$$

Where:

E : market value of firm's equity
D : market value of firm's debt
V : total value of capital (E + D)
Re : cost of equity
Rd : cost of debt (before-tax)
Tc : corporate tax rate

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Cost of equity

The cost of equity is the rate of return that an investor requires to compensate for the risk of stock. The Capital Asset Pricing Model (CAPM) is a method used to calculate the cost of equity, whereby the cost of equity is equal to risk-free rate plus the risk premium, as explained in the previous section.

Cost of debt

The cost of debt can be determined by averaging the yield of maturity from the company's outstanding debts. The interest payments made by company are tax deductible, resulting in a reduction of the company's taxable income and thus lowering company's tax liability. To determine the company's net cost of debt, we must use the after-tax basis calculation. This can be done by multiplying the before-tax cost of debt, (rd), by the difference between 1 and the tax corporate rate, (Tc).

5. Capital Budgeting

Capital budgeting is the process of evaluating and selecting long-term investments that are consistent with the company's goal of maximizing owners' wealth (Gitman and Zutter, 2015). Capital budgeting, also known as investment appraisal or expenditure decisions, is the process by which a company evaluates and selects long-term investment projects, that usually require significant capital expenditures and have the potential to influence the company's future profitability and total worth. Long-term investment refers to the strategic allocation of capital into assets or securities with objective of retaining them for an extended duration, often more than a year. Long-term investments are made with the objective of earning profits over a long period of time rather than focusing on short-term benefits. Capital budgeting process primarily involves analyzing cash inflows and outflows of a project to determine whether the expected return meets a set of standards or benchmarks. There are several methods in the Capital Budgeting, however, this research will focus the three (3) most commonly used:

1. *Payback Period*

The payback period is the duration needed to repay the initial investment expenditure. The Payback Period is calculated by dividing the initial capital expenditure with the annual cash flow (in the case of annuity).

$$Payback\ Period\ = \frac{Cost\ of\ Investment}{Average\ Annual\ Cash\ Flow}$$

The following decision criteria can be applied when the payback period is utilized to determine accept-reject decisions:

• If the duration of payback is shorter than the maximum allowable payback period, we can take on the project.

• If the duration of payback exceeds the maximum allowable payback period, the project should be rejected.

The maximum allowed payback period is defined by management of the company subjectively based on many variables, such as; the project type (expansion, replacement or renewal), the product life cycle; or the perceived risk of the project. The longer the company must wait the invested funds, the greater the possibility of a disaster company may have exposed. The shorter the payback period, the lesser company will expose to the risk. One drawback of the Payback Period is its failure to account the time value of money. Many companies or investors use payback period as an additional tool to complement other decision criteria.

2. *Net Present Value (NPV)*

Net Present Value (NPV) is the different between the present value of all cash inflows and the present value of all cash outflows over specific period of time. It calculates the project's value in today's currency by discounting future cash flows at the project's required rate of return (discount rate). NPV has incorporated the concept of the time value of money in this instance. NPV can be simply formulated as follows:

$$NPV = Present\ Value\ of\ Cash\ Inflows - Initial\ Investment$$

$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} - CF_0$$

Where:

CF0 = Project's initial investment

CFt = Cash inflows

r = Discount rate

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

t = time or period

The following decision criteria can be applied when using NPV to make accept-reject decisions:

- If the NPV positive (> 0), then accept the project.
- If the NPV is negative (< 0), then reject the project.

The discount rate represents the cost of capital or the returns that may be obtained from other investments with similar risk levels. If the NPV is greater than zero (0), it indicates that the rate of return will exceed the discount rate. In other words, the company will generate profit greater than its cost of capital. The higher the NPV value, the more attractive the project.

3. Internal Rate of Return (IRR)

The Internal Rate of Return (IRR) is the discount rate at which the NPV of an investment opportunity becomes zero (0), because the present value of cash inflows equals the initial investment (Gitman and Zutter, 2015). IRR represents the annual rate of growth that an investment is expected to generate. IRR is calculated using the same concept of Net Present Value (NPV), but it sets the NPV equal to zero. IRR can be formulated as follows:

$$NPV = 0 = \sum_{t=1}^{n} \frac{CF_t}{(1+IRR)^t} - CF_0$$

$$\sum_{t=1}^{n} \frac{CF_t}{(1+IRR)^t} = CF_0$$

The following decision criteria can be applied when IRR is used to make accept-reject decisions:

- If the IRR is more than the cost of capital, then project can be accepted.
- If the IRR is less than the cost of capital, then project should be rejected.

These criteria ensure that the company will earn profit at least its required return. In general, the higher the IRR value, the more attractive the investment to be made.

6. Sensitivity Analysis

The sensitivity analysis determines the degree of responsiveness of the output variable to a change in one of the input variables, assuming all the other input variables remain constant. Sensitivity analysis is widely used in capital budgeting decisions to assess the impact of variations in key variables, such as sales, variable cost, fixed cost, cost of capital, and marginal tax rate, that can affect outputs, such as project Net Present Value (NPV), Internal Rate of Return (IRR), and discounted payback period. Additionally, it helps to identify the risks associated with a project. To focus on the crucial elements, researchers typically design different scenarios and different sets of assumptions on the future condition. Scenario analysis sometimes using three (3) different set of values for the critical assumptions: most likely, optimistic, and pessimistic.

7. US Index

The purpose of the US' Index is to assess the company's repayment capability by comparing its Basic Business Profitability (BBP) to the Loan Interest Rates (I), (Siahaan, 2019), and it is formulated as follows:

$$US\ Index = \frac{Basic\ Business\ Profitability}{Loan\ Interest\ Rate}$$

Basic Business Profitability is a profit margin of a company that is derived from its business activities, which are financed by either debt/loan or equity capital. BBP is formulated as follows:

$$BBP = \frac{Earning\ before\ Interest\ and\ Taxes}{Total\ Assets}\ x\ 100\%$$

Company needs capital to finance its assets to generate Operational Profit. If its capital source is obtained from debt or loans, then the company has an obligation to pay interest expense according to the agreed-upon conditions of payment. The loans should generate Basic Business Profit (BBP) at minimum of the Loan Interest Rate (I), in order the company meets its loan interest

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

obligation to the Bank. Company should take the right decision on its capital structure, whether it is financed by debt or equity, to maximize its Operating Profit. According to the US' Index theory, the signs of US' Index values are defined as follows:

- US' Index > 1, the company may consider for maximizing debt financing
- US' Index < 1, the company should consider to maximizing equity financing
- US' Index = 1, the company free to choose either go with debt or equity to finance its assets. It depends on the company's financing appetite.

RESEARCH METHODOLOGY

The research will be conducted in quantitative method and mostly performed through desktop research.

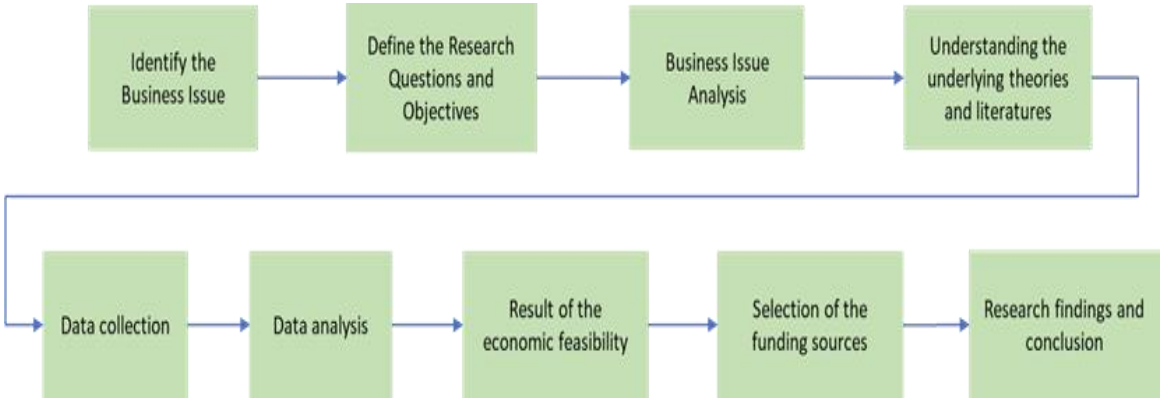

Figure 2. Research Design

1. Data Collection

This research will gather the required data and information from both primary and secondary resources. Primary data is retrieved from PT ABC internal project information, such as project capital expenditures (CAPEX), operational expenditures (OPEX), and revenues. Meanwhile the secondary data is being collected from external institutions and similar company in the same industry, such as loan interest, country risk free rate, market risk premium, applicable taxes and others. The combined data of primary and secondary will be used in data analysis stage.

2. Data Analysis

After completing the data and information collection, research continues with data analysis that is performed in quantitative method. The data will be mathematically calculated and simulated to give comprehensive understanding of the financial situation for the business opportunity. Data analysis will include the followings:

- Project cashflow analysis (Revenues, CAPEX, OPEX)
- Weighted Average Cost of Capital (WACC) analysis
- Payback Period (PBP), Net Present Value (NPV), Internal Rate of Return (IRR), and Profitability Index
- US Index
- Sensitivity analysis

The result of the data analysis will be used to determine the economic feasibility of the project and understanding factors that can influence greatly to the economic feasibility. This research will also evaluate alternative of the source of funds and provide comparison between the available options.

ANALYSIS AND RESULTS

1. Feasibility Analysis

The following table is the general assumptions used by the author to perform economic feasibility analysis for the project.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Table I. List of Project Assumptions

List of Feasibility Analysis Assumptions	Optimistic	Most Likely	Pessimistic
Operational Duration	30 years	30 years	30 years
Corporate Tax Rate	22%	22%	22%
Discount Factor	8%	10%	12%
Funding	Full Equity	Full Equity	Full Equity
Tax Holiday	20 years	20 years	20 years
Project Cost Contingency	5%	5%	5%
Depreciation (Straight-Line)	20 years	20 years	20 years

Here is some explanation of the assumptions used in the analysis:

a. *Corporate Tax Rate*
The Indonesian government has issued the Tax Regulation Harmonization Law no. 07/2021 that stipulated the corporate income tax become 22% for the fiscal year 2022 onward.

b. *Discount Factor*
The typical discount factor used in the oil and gas industry is at 10% (Thom, 2021). In the feasibility analysis, the author will evaluate 3 different figures of discount factor, which are 8%, 10% and 12%, to understand the impact of the discount factor toward the feasibility indicators result.

c. *Funding*
For the feasibility analysis, the author assumed that the project will be funded from PT ABC's equity entirely. As there is no debt involved, there will be no interest expense considered in the analysis.

d. *Tax Holiday*
The Indonesian Ministry of Finance has issued PMK No. 150/PMK/2018 to encourage investment in pioneer industries. These industries, which offer high value, new technology, and impact on national strategic value, are eligible for tax incentives in the form of tax reductions and tax holidays. PT ABC, which plans to build an Integrated Oil Refinery and Petrochemical plant, meets these criteria, making it eligible for incentives of 100% tax reduction for 20 fiscal years.

e. *Depreciation*
Twenty (20) years of economic life for the fixed assets have been chosen based on typical design life time for the equipment in the oil and gas and petrochemical industries. By using the Straight-Line method, the physical assets will be depreciated at equal percentage over the economic life of the project with zero salvage value assumption.

The project generates revenue from selling various products from the oil refinery plant, including gasoline, diesel, and paraxylene, and from the petrochemical plant, including polyethylene, polypropylene, styrene, and ethylene glycol. The plant can also sell solid sulfur, a by-product from chemical reactions. Production capacity is ramped up from 94% in the first year to 100% for the rest of the operation period, with a 350-day production period and 40-day maintenance shutdowns every four years.

Table II. Total Project Revenues

Revenue	Total (in full USD)
Gasoline	135,016,480,085
Kerosene	30,112,843,691
Diesel	115,077,272,171
Ethylene Glycol	18,786,191,581
LLDPE	13,578,665,131
HDPE	20,012,681,036
Styrene	27,126,384,536

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Polypropylene	53,318,822,187
Paraxylene	54,029,478,208
Sulphur	3,111,393,028
Total Revenue	**470,170,211,654**

Majority of the operating cost is coming from the raw material purchase, which contributes up to 85% from the total operating cost. Crude oil and condensate oil are the largest portion among the raw material purchase cost and contribute almost 89% from the total raw material purchase cost. Crude oil and condensate oil prices is highly volatile following supply and demand changes in the market. For the project analysis, both prices assumed in steady growth over the operation period. Meanwhile, the remaining 15% from the operating cost is coming for the Operation and Maintenance (O&M) cost, utilities costs and general overhead cost. The O&M cost is covering the cost of catalyst and chemicals, operating spare parts, personnel, insurances, and protection funds. The total O&M cost is estimated up to 52% from the total operating cost. Furthermore, utilities cost is expended for the electricity power from PLN and cost of LNG material for the internal power generation plant, that is forecasted for about 47% from total operating cost. The remaining portion is allocated for the general overhead cost that is estimated for about 1% from the personnel cost.

Table III. Total Operating Cost

Operating Cost	**Total (in full USD)**
Raw Material	
Crude Oil 1	3,232,795,527
Crude Oil 2	10,388,410,572
Crude Oil 3	13,777,963,145
Crude Oil 4	74,125,590,448
Crude Oil 5	131,493,851,337
Crude Oil 6	59,190,553,750
Methanol	2,963,064,769
LPG	18,113,458,771
LNG	12,435,375,753
1-Butene	1,099,761,745
1-Hexene	272,469,693
O&M, Utilities and Overheads	57,001,182,021
Total Operating Cost	**384,094,477,532**

The capital expenditures will be allocated initially for the Engineering Cost, which includes Basic Engineering Design (BED), Front-End Engineering Design (FEED), Project Management Consultant (PMC) service, Process Technology Licensors fees, and other expenses. Land cost covers land acquisition and early work costs, such as clearing, marking, fencing, and security, while the Site Development cost prepares the land for construction activities, including geotechnical analysis, soil excavation, cut-and-fill, compaction, and levelling. Furthermore, PT ABC must allocate an Owner's cost to cover costs such as permits, insurances, spare parts, testing, inspection activities, trainings, operational equipment, and catalyst material.

The Engineering, Procurement, and Construction (EPC) cost will be the largest proportion, accounting for detail engineering design, procurement and delivery of equipment, machinery, material, and accessories, construction, commissioning, and start-up of the Integrated Oil Refinery and Petrochemical plant. The EPC cost could comprise up to 75%-80% of the total CAPEX. A contingency cost, estimated at 5% of the total EPC cost plus Owner's cost, is also considered to anticipate risks and unknown circumstances during the project execution.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Table IV. Total Capital Expenditures

Capital Expenditures	Total (in full USD)
EPC Cost	14,417,106,568
Engineering Cost	321,866,410
Pre-Opex	623,051,502
Land Cost	330,346,629
Site Development	355,633,278
Owner Cost	512,247,690
Total-1	16,560,252,077
Contingency (5%)	746,467,713
Total Capex	**17,306,719,790**

As the revenues and operating costs have been identified, therefore, project cash flow statement can be summarized as follow:

Table V. Project Income Statement

Operation Activities	Total (in full USD)
Total Revenue	470,170,211,654
Total Operating Cost	384,094,477,532
EBITDA	**86,075,734,122**
Depreciation and Amortization Expense	17,306,719,790
EBIT	**68,769,014,332**
Interest Expense	-
Earning Before Tax	**68,769,014,332**
Tax Expense	15,129,183,153
Tax Holiday (20 Tax Years)	7,739,644,956
Earning After Tax	**61,379,476,135**

The feasibility analysis will be performed by using the Capital Budgeting method. Capital Budgeting is the process of evaluating and selecting long-term investment that can maximize the owner's wealth. The economic feasibility of the long-term investment will be evaluated by using the three main indicators, which are the Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PBP). To determine those three indicators, we need to calculate the Free Cash Flow (FCF) of the project over the life time, and then discounted by using the selected discount factor to obtain the discounted free cash flow.

$$Free\ Cash\ Flow = Earning\ After\ Tax + Depreciation\ and\ Amortization - Capital\ Expenditures$$

The result of project feasibility indicators summarized in the table below.

Table VI. Summary of the Project Feasibility Indicators

	Optimistic	Most Likely	Pesimistic
Discount Rate	8%	10%	12%
NPV (in full USD)	11,045,217,967	6,149,088,088	2,494,816,862
IRR (%)	13.76%	13.76%	13.76%
Payback Period (Years)	7.32	7.32	7.32
Conclusion	**FEASIBLE**	**FEASIBLE**	**FEASIBLE**

When the NPV result shows greater than zero (positive value) means the project is acceptable. Meanwhile, when IRR value greater than the discount rate, means the project is feasible. From the analysis performed, we can understand that the different values of

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

discount rates will impact to NPV value only. Furthermore, with the IRR value of 13.76%, we can understand that this is the maximum cost of capital to maintain feasibility of the project. PT ABC must be able to obtain the cost of capital lower than this IRR value. Payback Period of 7.32 years is reasonable in the oil and gas industry as they capital investment is relatively high. Therefore, it takes time to recover the investment made. Based on the analysis above, the author concludes that the project is **feasible**.

2. US Index Analysis

Although the feasibility analysis performed based on full equity financing, PT ABC may explore the possibility to use debt financing for this project. US Index can be used to analyze repayment capacity of the loan applicant, monitor loans, and guiding loan restructuring and repayment process. It is used within financial institutions on assessing the influence of leverage on profitability and loan quality. For the US Index analysis, the author uses interest rate of 5.6% based on assumption of the international bank financing rate. Table below indicates the result of US Index calculation for this project.

Table VII. US Index Result

	Optimistic	**Most Likely**	**Pessimistic**
Discount Rate	8%	10%	12%
Average PV EBIT (in full USD)	697,346,818	558,807,866	459,043,637
Total Assets (in full USD)	17,306,719,790	17,306,719,790	17,306,719,790
BBP	4.03%	3.23%	2.65%
Interest Rate (% p.a)	5.60%	5.60%	5.60%
US Index	**0.72**	**0.58**	**0.47**

With US Index value less than 1, it shows that leverage negatively affect profitability, leading to higher financial risk and potential challenges in managing debt. PT ABC must maximize equity over the debt, as the project cash flow generated is being considered not sufficient to cover the debt. As alternatives, PT ABC must improve cash flow management by enhancing revenue streams and cost reduction, or performing debt restructuring by extending the loan tenure, reducing the interest rate, or converting some debt into equity to lower immediate repayment obligations.

3. Sensitivity Analysis

PT ABC will face numerous uncertainties in the development and execution of the Integrated Oil Refinery and Petrochemical plant. Sensitivity analysis helps understand how different variables impact decision outcomes by changing inputs at a time. The author has selected several variables that may impact the project's feasibility, including:

i) Variability of total project cost, due to increased equipment, material, and labor prices, technology changes, regulation changes, and project management effectiveness.
ii) Crude oil price volatility, that can be influenced by production quota agreements by OPEC, geo-political situations, embargoes, or sanctions applied to major oil exporter countries.
iii) Petrochemical prices, that are influenced by supply and demand outlooks, with demand increasing in emerging countries and consumers raising awareness to reduce plastic packaging usage. Crude oil price volatility also affects petrochemical products as the key raw material.

To understand the significance of these variables, the authors simulate these variables by changing inputs by -20%, -10%, +10%, and +20% from the baseline figure. The impact of these changes on feasibility indicators like NPV, IRR, and Payback Period is observed. Below is the tabulating result of the sensitivity analysis.

Table VIII. Project Cost Changes Effect to Project Feasibility

Project Cost	**NPV (in full USD)**	**IRR**	**PBP (Years)**
-20%	9,610,432,046	17.09%	6.19
-10%	7,879,760,067	15.26%	6.73
Baseline	6,149,088,088	13.76%	7.32
+10%	4,418,416,109	12.50%	7.96
+20%	2,687,744,130	11.41%	8.60

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Table IX. Crude Oil Price Changes Effect to Project Feasibility

Crude Oil Price	NPV (in full USD)	IRR	PBP (Years)
-20%	21,799,708,051	22.42%	4.84
-10%	13,974,398,070	18.19%	5.87
Baseline	6,149,088,088	13.76%	7.32
+10%	(1,676,221,893)	8.90%	10.57
+20%	(9,501,531,875)	2.70%	19.60

Table X. Petrochemical Price Changes Effect to Project Feasibility

Petrochemical Price	NPV (in full USD)	IRR	PBP (Years)
-20%	(893,966,254)	9.41%	10.06
-10%	2,627,560,917	11.66%	8.41
Baseline	6,149,088,088	13.76%	7.32
+10%	9,670,615,259	15.77%	6.58
+20%	13,192,142,430	17.72%	6.03

Below table is summarizing the impact of the variables changes to NPV, IRR and Payback Period at the maximum and minimum variation (-20% and +20%).

Table XI. Summary of Sensitivity Analysis

Variables	Impact to NPV		Impact to IRR		Impact to PBP	
	Variation -20% from baseline	Variation +20% from baseline	Variation -20% from baseline	Variation +20% from baseline	Variation -20% from baseline	Variation +20% from baseline
Project Cost	56%	-56%	24%	-17%	-15%	18%
Petrochemical Price	-115%	115%	-32%	29%	37%	-18%
Crude Oil Price	255%	-255%	63%	-80%	-34%	168%

NPV is strongly affected by the variation of the crude oil price, then followed by the variation in the petrochemical price. Meanwhile, the project cost gives moderate impact to NPV. IRR is significantly affected by the variation in the crude oil price, while both the project cost and petrochemical price will give moderate impact. PBP is highly impacted by the variation in the crude oil price, and other variables will give moderate to least impact on it.

4. Source of Funds Analysis

The author analyzes 4 potential sources of funds to finance the project and comparing the impact to the project feasibility indicators (NPV, IRR and PBP). They are:

1. Maximizing Shareholder's Equity
2. International Bank Loans
3. Domestic Bank Loans
4. Corporate Bond

The author is excluding from the analysis of potential funds like Venture Capital or Private Equity due to their high investment return and potential diluting of existing shareholders' ownership. Offering Public Shares requires complex analysis and preparation in regards of corporate governance, financial, legal, compliance, and market readiness. Currently, PT ABC is considered not ready to offer Public Shares due to these factors.

In order we can perform analysis for the source of funds, we need to determine cost of capital for the project first. The project cost of capital will be calculated by using Weighted Average Cost of Capital (WACC) formula as explained in the Chapter 2. WACC consist of 2 main components:

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

1. Cost of Equity
   Cost of Equity is calculated by using the Capital Asset Pricing Model (CAPM). There are 3 essential components that need to be determined:
   a. Beta Coefficient
      Beta Coefficient value selected is 0.67, based on levered beta value for the Oil and Gas (Integrated) industry from Damodaran's data (updated in January 2024). This beta value is selected because it is the most representing profile of the industry that is being evaluated for this project.
   b. Risk Free Rate
      Risk Free Rate value selected is 6.9%, according to on the Indonesian Government Bond Yield for 20 years issued by Indonesian Stock Exchange.
   c. Market Risk Premium
      Market Risk Premium value selected is 7.38%, based on the Equity Risk Premium from Damodaran's data (updated in January 2024).

Table XII. Cost of Equity Calculation

Risk Free Rate:	6.9%
Beta:	0.67
Market Risk Premium:	7.38%
Cost of Equity:	11.84%

2. Cost of Debt
   Cost of Debt for this analysis is determined by averaging the forecasted future Sovereign Overnight Financing Rate (SOFR) plus profit margin. This is assuming that the loans coming from international banks. Based on author's analysis, the before-tax cost of debt value for this project is selected at 5.6%. Additionally, the Corporate Income Tax of 22% must be considered to obtain the after-tax cost of debt.

Once cost of equity and cost of debt have been determined, and by considering the proportion between debt portion and equity portion in the capital structure, the WACC value can be calculated according to table below. The WACC value will vary for each source of fund options that being evaluated, depending on the debt-equity ratio and interest rate being selected for the analysis.

Table XIII. WACC Calculation

Debt Portion:	60%
Equity Portion:	40%
Corporate Tax Rate:	22%
Cost of Debt (before Tax):	5.6%
WACC (after Tax)	**7.36%**

4.1 Option 1 - Maximizing Shareholder's Equity

Based on result of the US Index analysis in section IV.1.7, it is advised for PT ABC to maximize the equity financing. Table below is showing the result of project feasibility indicators for the maximizing equity financing option.

Table XIV. Maximizing Shareholder's Equity

Debt Portion:	0%
Equity Portion:	100%
WACC	1.84%
NPV (in full USD)	2,743,879,844
IRR (%)	13.76
PBP (years)	7.32

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

The project is considered acceptable due to the NPV is still greater than zero and IRR value is higher than the WACC value. The Payback Period of 7.32 years is also reasonable. In conclusion, the project remains **viable** with the full equity financing option. Nevertheless, care must be taken when utilizing significant amount of shareholder's equity, as it could strain shareholder's cash flow, limiting their ability to cover the operational expenses or to respond any unexpected economic challenges.

4.2 Option 2 - International Bank Loans

Large firms usually prefer international bank loans due to their larger capital pools and lower interest rates, as well as the economic stability and lower inflation rates in developed countries compared to emerging countries. Additionally, developed countries often have excess capital that needs outflow due to lower economic and investment growth. The international bank's interest rate that is being used in the analysis is at 5.6%. PT ABC can optimize the project feasibility by iterating the debt-equity ratio at the same interest rate, 5.6%, as shown in the table below.

Table XV. International Bank Loans

Debt Portion:	60%	70%	80%
Equity Portion:	40%	30%	20%
WACC	7.36%	6.61%	5.86%
NPV (in full USD)	3,590,564,910	4,058,396,920	4,684,708,679
IRR (%)	8.92%	8.22%	7.55%
PBP (years)	12.53	13.62	14.59

Increasing the debt portion will decrease the WACC value, due to the cost of debt is lower than the cost of equity. Consequently, the NPV is also increasing. Conversely, an increase in the debt portion results in an increase in the interest expense, which in turn reduces the Free Cash Flow. As a result, the IRR value will decrease. Furthermore, as the Free Cash Flow decreases, it will require longer time to recover the investment made. Therefore, the Payback Period is increasing. In this financing option, the project remains **feasible**. However, higher debt-equity ratio may bring another risk for PT ABC, such as reducing the investment for growth, vulnerability to the economic downturns and increasing the risk of bankruptcy.

4.3 Option 3 - Domestic Bank Loans

Typically, interest rate from the domestic bank will be higher than the international banks. This is due to higher domestic inflation rate, economic volatility, and higher policy rates defined by Bank Indonesia compare to the develop countries. For this analysis, the author has selected the domestic interest rate at 10%. Table below indicates the project feasibility indicators result by simulating the deb-equity ratio.

Table XVI. Domestic Bank Loans

Debt Portion:	10%	20%	30%
Equity Portion:	90%	80%	70%
WACC	11.44%	11.04%	10.63%
NPV (in full USD)	1,802,557,942	837,392,984	(151,812,552)
IRR (%)	12.64%	11.56%	10.54%
PBP (years)	8.05	8.93	10.04

With higher interest rate offered from the domestic bank, PT ABC must pay higher interest expense. Increasing debt portion will decrease the Net Income and Free Cash Flow. The analysis reveals that starting at 30% debt portion, total present value of the Free Cash Flow is less than present value of the Capital Investment. Therefore, the NPV is negative. Additionally, decreasing of Free Cash Flow will result in a decrease of the IRR and make the investment recovery is longer (higher Payback Period). With this result, the option to get loans from domestic bank become **not feasible**.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

4.4 Option 4 – Corporate Bonds

Corporate bond value will vary depending several factors, such as credit rating and financial health of the bond issuer, bond tenor, and payment schedule. For this analysis, the author assumes PT ABC to issue 10-years maturity of corporate bond with 9% coupon rate to be paid annually. PT ABC also needs to repay the principal at the bond maturity date. Table below shows how project feasibility indicators vary when simulating the debt-equity ratio.

Table XVII. Corporate Bond

Debt Portion:	20%	30%	40%
Equity Portion:	80%	70%	60%
WACC	10.88%	10.40%	9.91%
NPV (in full USD)	1,338,608,133	585,075,014	(203,010,199)
IRR (%)	11.74%	10.75%	9.8%
PBP (years)	8.27	10.57	12.53

Based on the analysis, it reveals that NPV become negative when debt portion starting around 40%. As the bond issued (debt portion) increases, the total coupon and principal that PT ABC must pay also increase. This is reducing the IRR and require longer time to return the investment (higher Payback Period). With this result, the option to get funds from corporate bond become **not viable**.

5. Summary Source of Funds

Based on the evaluation of the 4 options for source of funds, each of the option bring the advantages and disadvantages for the project as indicated in the table below. PT ABC must analyze further carefully for all the options according to their internal investment and risk policy.

Table XVIII. Summary of the Fund Alternatives

No.	Source of Funds Alternatives	Advantage	Disadvantage
1	Maximize Shareholder's Equity	- No repayment obligation - Maintain project feasibility (attractive)	- Higher cost of capital (high WACC) - It can strain shareholder's cashflow, limiting their liquidity to cover operational expenses or responding unexpected economic challenges
2	International Bank Loans	- Access to larger capital pools - Lower interest rate than domestic bank (low WACC) - Maintain project feasibility (attractive)	- Foreign exchange risk - Geopolitical and economic policy changes risk in the lender's country
3	Domestic Bank Loans	- More familiar with domestic market and regulatory environment	- Higher interest rate than international bank (high WACC) - Limited capital availability - Project feasibility indicators become less attractive (not viable)
4	Corporate Bond	- Access to larger capital pools	- Higher cost of capital (high WACC) - Higher total debt services compare to bank loans (total coupon and principal payment) - Project feasibility indicators become less attractive (not viable)

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

6. Risk Analysis

Risk is an uncertain event or condition that can negatively impact the achievement of objectives, particularly in project financing. It encompasses various types of risks, including completion, financial and economic, marketing, operating, and political risks.

Table XIX. Risk Analysis Summary

No.	Risk Category	Risk Event	Risk Cause	Mitigation
1	Completion Risk	Risk of not completing the project on time, within budget, or to specifications	Delays in construction, cost overruns, technical failures, force majeure	Fixed-price contracts, contingency reserves, thorough planning, Liquidated damages, performance bond, warranty bond
2	Market and Operating Risk	Risk of not generating expected revenues or facing operational issues	Market demand changes, feedstock limited supply, new competition	Market studies, long-term supply contracts, long-term off-take agreement
3	Financial Risk	Risk related to financing structure, funds availability, cost of capital	Interest rate fluctuations, currency exchange rates, credit risk	Hedging instruments, currency swap, mixed financing structures, forward sales and option contracts
4	Political Risk	Risk of changes in political conditions or policies impacting the project	Regulatory changes, expropriation, political instability	Political risk insurance, stakeholder management, stabilization clauses
5	Environmental and Social Risk	Risk of negative environmental and social impacts	Environmental degradation, community opposition, regulatory non-compliance	Impact assessments, environmental management plans, community engagement
6	Economic Risk	Risk related to the broader economic environment affecting the project's financial viability	Economic downturns, inflation, changes in interest rates	Economic forecasts, flexible financial planning, diversification

7. Business Solution

The US Index evaluation indicates that PT ABC must maximize equity financing, which has its own advantages and disadvantages. The cost of equity funding is generally higher than debt funding, as it involves profit and loss sharing for the shareholders. Maximizing shareholder's equity may strain their cashflow and limit their ability to respond to economic challenges and operational expenses. Meanwhile, for the debt financing, loans from international banks offer lower interest rates and better access to larger capital sources globally. PT ABC can also negotiate the best interest rates from international banks, as they may offer different terms and conditions depending on the project's risks. Domestic bank loans and corporate bonds are less attractive due to limited utilization as it gives negative NPV at certain debt portion.

The author recommends choosing an international bank loan with a 60:40 debt-equity ratio to fund the project. The international bank loan offers attractive interest rates, lower WACC value (IRR > WACC), a high NPV (NPV > 0), and reasonable payback period. The debt-equity ratio at 60:40 aligns with internal company policy and common in business practices. This recommendation ensures the project's feasibility by balancing the advantages and disadvantages from each financing option. PT ABC must secure off-take agreements from potential customers and suppliers, perform proper cashflow management to repay debt services, implement risk mitigation plans, and continuously scan for emerging risks in the future.

8. Implementation Plan and Justification

Based on the analysis and proposed business solutions mentioned in the previous sub-chapters, the author develops an implementation plan as a recommendation for PT ABC. Table below indicates the main activities to be performed with the tentative timeline.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Table XX. Implementation Plan

No.	Activities	Months																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Update Bank Feasibility Study																		
2	Develop Financial Model																		
3	Non-Deal Roadshow																		
4	Financial Investment Presentation and Approval																		
5	Fund Raising Preparation																		
6	Fund Raising Process																		
7	Drawdown																		

The Bank Feasibility Study should be updated to align with the latest situation and current strategies in the project development. The Financial Model should be robust and rigorous, and requiring verification or validation from subject matter experts. The non-deal roadshow should also be conducted to understand the market perspective and level of interest in the view of lenders. Financial Investment Presentation and Approval from Shareholders is crucial to obtain their final decision on whether the project can proceed to the next step or if further strategic refinement is required. The process should continue with submitting loan applications, due diligence by lenders, and finalizing the loan agreement. PT ABC may hire a Financial Advisor (FA) to guide through all activities, ensuring comprehensive input and output information and a robust basis for the decision-making process.

CONCLUSION

The conclusion is the crystallization of the result of analysis and the author's interpretation the findings from the preceding chapters. The conclusion presented systematically to answer the research questions:

Is the integrated oil refinery and petrochemical plant project economically feasible?

Yes, the integrated oil refinery and petrochemical plant that is going to be built by PT ABC is economically feasible. The feasibility analysis performed in Chapter IV shows that with the discount factor simulated at 8%, 10% and 12%, all the project indicators remain feasible. NPV is greater than zero, with the highest NPV achieved at 8% discount rate. IRR value at 13.72% and Payback Period at 7.32 years.

Which factor that is most sensitive affecting the economic feasibility of this project?

Based on the Sensitivity Analysis performed in Section 4.1.1.8, it shows that variability of the crude oil price is giving the greatest impact to the project feasibility. Even at 10% crude oil price increase, the project NPV become negative, meaning the project is no longer feasible. The second factor that is also sensitive affecting the project's feasibility is the petrochemical price. With the 20% price decrease, the NPV become negative already. Meanwhile, variability of the project cost gives the least impact among the other variables being evaluated.

What are the financing sources available for this project?

From the equity financing, the shareholder's equity is the most preferred one as it could maintain the project feasibility. Meanwhile, for the venture capital/private equity option is not preferred due to high expected return from the investors. And for the public share is not preferred due to PT ABC is not ready for "go-public" and require more rigorous preparation. From the debt equity, loan from international banks is the most attractive one, due to lower interest rate compare to domestic bank loan. Corporate bond is not preferred due to high cost of capital and high debt services (interest and principal payment).

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

What is the optimum financing strategy to fund this project?

Based on the analysis performed at the Chapter IV, the author recommends PT ABC to choose international bank loans with debt-equity ratio at 60:40. With the low interest rate from international bank loan, it could lower the WACC value, and IRR value is higher than the WACC. NPV is positive and Payback Period is still reasonable.

What are the factors that need to be anticipated to execute this project?

There are several factors that need to be anticipated during project execution:

- Variability of the crude oil price may negatively impact to the project feasibility
- Market supply and demand of the petrochemical products may influence product price and impact to project feasibility.
- Global economic situation can influence the financial policy and regulation in lender's country, thus impacting to project feasibility.

The author summarized the recommendation that can be implemented by PT ABC:

- Suggest leveraging debt from international bank loan, as they are providing lower interest rate and they can provide access to larger capital sources.
- Maintain debt-equity ratio around 60:40 to combine source of capital from debt financing, which is loan from international bank, and from shareholder's equity. This is to ensure project feasibility.
- Implement risk management properly and ensure the mitigation plan and actions are in place and continuously monitor for any emerging risks during project execution.
- Obtain off-take agreement with the potential customers, especially for the petrochemical products.
- Secure feedstocks supply agreement, especially from the crude oil suppliers.
- Manage construction execution properly to ensure timely completion and within the budget. Delay on the construction completion will require more cost and delaying the revenue generation from the facility production.

Recommendation for future study is providing analysis for new potential source of funds and alternative project financing schemes that can be applied for the similar project.

REFERENCES

1. CEIC. (2023). Indonesia Konsumsi Minyak. Retrieved from https://www.ceicdata.com/id/indicator/indonesia/oil-consumption
2. Ding, C., Fitzgibbon, T., Govindahari, H., Roth, Brian. (2023). The near-term outlook for refining: Where to now? Retrieved from https://www.mckinsey.com/industries/oil-and-gas/our-insights/the-near-term-outlook-for-refining-where-to-now
3. Gitman, L.J., Zutter, C.J. (2015). Principles of Managerial Finance 14th edition. Pearson Education Limited.
4. Grand View Research. (2023). Oil Refining Market Size, Share & Trends Analysis Report, By Product (Light Distillates, Middle Distillates), By Fuel Type (Gasoline, Gasoil, LPG), By Complexity Type, By End-Use, By Region, And Segments Forecast, 2023 to 2030. Retrieved from https://www.grandviewresearch.com/industry-analysis/oil-refining-market-report
5. Grand View Research. (2023). Petrochemicals Industry Data Book – Ethylene, Propylene, Butadiene, Benzene, Xylene, Toluene and Methanol Market Size, Share, Trend Analysis, And Segment Forecasts, 2023 – 2030. Retrieved from https://www.grandviewresearch.com/sector-report/petrochemicals-industry-data-book
6. Khan, M.F.K, Parra, R.J (2003). Financing Large Projects. Pearson Prentice Hall
7. Lawler, A. (2021). OPEC Forecasts Oil Demand Rebound before post-2035 plateau. Retrieved from https://www.reuters.com/business/energy/opec-sees-oil-demand-rebounding-then-plateauing-after-2035-2021-09-28/
8. Mullins, D.W. Jr., (1982). Does the Capital Asset Pricing Model Work?. Retrieved from https://hbr.org/1982/01/does-the-capital-asset-pricing-model-work#
9. Pinto, J.M., (2017). What is Project Finance?. Investment Management and Financial Innovations Volume 14.
10. Price Water Cooper. (2023). Oil and Gas in Indonesia: Investment and Taxation Guide 2023. Retrieved from https://www.pwc.com/id/en/pwc-publications/industries-publications/energy--utilities---mining-publications/oil-gas-guide-2023.html

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 07 July 2024
DOI: 10.47191/ijcsrr/V7-i7-76, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

11. Qureshi, V., Chate, V., & Srivastava, P. (2018). Refining-Petrochemicals Integration: an Indian vie. Retrieved from https://www.digitalrefining.com/article/1001478/refining-petrochemicals-integration-an-indian-view
12. Riusxander, H., Sumirat, E., (2013). Feasibility Study for Gas Power Plant Project in Kabupaten Muara Enim. The Indonesian Journal of Business Administration Vol.2, No.10, 2013:1144-1154
13. Saadi, D., Carpenter, C. (2023) Commodities 2023: Middle East's Shift in Focus from Refining to Petchems gather pace. Retrieved from https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/chemicals/121222-middle-easts-shift-in-focus-from-refining-to-petchems-to-gather-pace-in-2023#
14. Sadoun, A. (2018). Why the Integrated Complex is the Future. Retrieved from https://www.meed.com/gulf-petrochemical-refinery-integration/
15. Sammo, A., Ackah, D. (2019). Project Investment and Financing, a Study on Business Case Development and Models. Project Management & Scientific Journal Vol.1, Issue 3, pp.01-26, Journal DOI:10.15373/22501991
16. Setiawan, V.N., (2022). Impor Minyak RI Masih Menggila, Ini Buktinya. Retrieved from https://www.cnbcindonesia.com/news/20221208162427-4-395033/impor-minyak-ri-masih-menggila-ini-buktinya#
17. Setiawan, V.N., (2022). Perlahan-lahan, Konsumsi BBM RI Diramal Menciut. Retrieved from https://www.cnbcindonesia.com/news/20220706174219-4-353505/perlahan-lahan-konsumsi-bbm-ri-diramal-menciut
18. Siahaan, U. M. (2020). The use of US' index theory to enhance quality of loan within banking industry and financial institutions. In Proceedings of the Universitas Dhyana Pura Conference, Bali, November 13, 2020 (pp. 347-366). ISBN 978-602-53420-6-6.
19. Thebrainyinsights.com. (2022). Petrochemical Market Size by Type (Ethylene, Propylene, Butadiene, Benzene, Methanol, Toluene, and Others), By Application (Aerospace, Agriculture, Automotive, Building & Construction, Consumer & Industrial Goods, and Others), Global Industry Analysis, Share, Growth, Trends, and Forecast 2022 to 2030. Retrieved from https://www.thebrainyinsights.com/report/petrochemical-market-13061#summary
20. Thiumsak, T. (2023). Industry Outlook 2024-2026: Refinery Industry. Retrieved from https://www.krungsri.com/en/research/industry/industry-outlook/energy-utilities/refinery/io/industry-outlook-refinery-2024-2026

Cite this Article: Nodya Mandalika, Uke Marius Siahaan, Sylviana Maya Damayanti (2024). Project Financing Strategy in the Oil and Gas Downstream Industry (Case Study: The Integrated Oil Refinery and Petrochemical Plant Project at PT ABC). International Journal of Current Science Research and Review, 7(7), 5497-5516