DISCOUNTED CASH FLOW VALUATION OF THAI OIL PUBLIC COMPANY LIMITED

PHAWEELITA SIRACHINDABHIROM

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……..……..
Phaweelita Sirachindabhirom
Candidate

……	……
Asst. Prof. Nareerat Taechapiroontong, Ph.D. Advisor	Asst. Prof. Piyapas Tharavanij, Ph.D. Chairperson
……...	……
Duanporn Arbhasil, Ph.D. Dean College of Management Mahidol University	Vasan Siraprapasiri, M.Sc. Committee member

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Phaweelita Sirachindabhirom

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PHAWEELITA SIRACHINDABHIROM 5849020

M.M. (FINANCIAL MANAGEMENT)

THEMATIC PAPER ADVISORY COMMITTEE: ASST.PROF.NAREERAT TAECHAPIROONTONG, Ph.D., ASST.PROF. PIYAPAS THARAVANIJ, Ph.D., VASAN SIRAPRAPASIRI, M.Sc.,

ABSTRACT

This thematic paper aims to value the stock price of Thai Oil Public Company Limited (TOP) base on discounted cash flow valuation method which has the concept that stock price of the firm should reflect its fundamental value in term of cash flow, growth and risk. Together with strong performance and competitive cash operating cost among peers including expectation of strong domestic oil demand growth in next year, we expect the bright future for TOP. As a result, the target price of TOP shall approximately equal to 83.0 Baht per share while the current price settles at 73.0 Baht per share; therefore, the valuation is indicative to BUY. However, there are variety of factors that are beyond control that would cause a fluctuation in price of refinery and petrochemical products which might be directly impact to company's performance.

In conclusion, the valuation study is to suggest company intrinsic value which the method still has some limitations. Therefore, the value must be consider carefully. However, the study can still provide guidance on processes of intrinsic valuation for investors and interested person in material construction companies.

KEY WORDS: TOP / Valuation / Discounted Cash Flow / Construction Material

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aromatic	A group of unsaturated cyclic hydrocarbons containing one or more benzene rings of six carbon atoms. They are highly reactive and chemically versatile. The group name is derived from the strong and not unpleasant odor characteristic of most chemicals in this family.
bdp	Barrels per day
bbl or bbls	Barrels (1 Bbl = 158.984 liters)
benzene	An aromatic hydrocarbon in the form of a colorless, flammable liquid. It is created by catalytically reforming naphtha, in the thermal cracking process, and is used in the production of other chemicals such as styrene, cumene, cyclohexane, aniline and chlorobenzene.
bitumen	Heavy oil product normally used for road pavement and construction
complex refinery	A refinery that has manufacturing processes (conversion units or upgrading units) to upgrade lower value hydrocarbon products to higher value products. The type of of complexity of the refineryprocessing facilities indicates the degree

continuous catalyst regeneration platformers (“CCR”)

	Refinery units that change the molecular structure of lower octane gasoline components to higher octane in the presence of catalyst.
cracking (“CCU”)	A process of breaking down larger molecules of heavy oil into smaller ones by the action of heat, with the aid of catalyst.
crude distillation unit (“CDU”)	A refinery unit that separates crude oil into fractions, by the aid of heat, based on the difference in boiling point of hydrocarbons. The lightest fraction includes refinery fuel gas, LPG and gasoline. The middle fraction includes kerosene and diesel. The heaviest fraction (bottom stream) is mainly fuel oil, which has the lowest value. Fuel oil can be further processed in the conversion unit to produce more valuable products.
crude oil	Crude oil is a mixture of hydrocarbon which is used as the principal feedstock in the refinery for the production of petroleum products.
diesel	A general term of fuel used in diesel (compressionignition) engines.
distillates	Distillates may refer to any refined oil products.
feedstock	Hydrocarbon compounds, such as crude oil, natural gas liquid and imported residue that are fed into processing units and/or blended into refined products.
fluidized catalytic cracking unit (“FCCU”)	

	A refinery process unit that uses catalyst to convert low value, heavy components to higher value, lighter components such as high octane gasoline and other products.
fuel oil	Oil generally used as furnace fuel. It is also widelyused as a main source of energy for electricity generators and bunkering.
gross refining margin ("GRM")	Value of production ("VOP") minus cost of intake ("COI") and cost of purchased utilities. VOP is calculated based on the quantity of products from the refinery during a certain period multiplied by the prices of each product type. COI is calculated based on the quantity of crude oil and other feedstock used in the refinery process during a certain period multiplied by cost of crude.
heavy products	Fuel oil, long residue and bitumen.
high vacuum unit ("HVU")	A refinery unit that further fractionates the black fuel oil fraction produced by the CDU, which is also known as long residue, to produce a light fuel oil fraction (light vacuum gasoil and heavy vacuum gasoil) and a heavy fuel oil fraction (short residue). In the HVU, separation occurs in the fractionation column at a high temperature and under vacuum conditions to prevent a cracking reaction.
hydrocracker unit ("HCU")	A refinery process unit using catalyst and hydrogen that converts low value, heavy components to higher value, lighter components such as high cetane diesel and other products.

hydrodesulfurization unit (“HDS”) A refinery process unit using catalyst and hydrogen that removes sulfur from components to produce low sulfur diesel.

hydrotreating unit (“HDT”)A refinery process unit that removes contaminants such as sulfur, nitrogen from naphtha and lighter components.

isomerization unit (“ISOM”)A refinery unit that processes light naphtha (low octane gasoline component) and converts it to highoctane gasoline by using a catalyst and hydrogen. Also known as a penex/molex unit.

jet fuel A refined product used for both commercial aviation and military aircraft. There are several jet fuel specifications. It is also known as turbine fuel. The primary source of jet fuel blending stocks is kerosene from CDU and hydrocracking unit.

kerosene A refined middle-distillate petroleum product that is used for jet fuel, cooking, heating, lighting, solvent and for blending into diesel and fuel oil.

light products LPG, unleaded gasoline, reformate and isomerate.

linear alkyl benzene (“LAB”)A family of organic compound commonly used as a raw material in the manufacture of biodegradablehousehold detergents.

LPG Liquefied petroleum gas. Consists primarily of propane and butane and is produced for use for cooking, home heating and as an intermediate material in the manufacture of petrochemicals.

lube base oil — The main component of finished lubricants derived from heavy crude oil fraction in vacuum distillation.

thermal cracking unit ("TCU") — A refinery unit that breaks up heavy oil molecules into lighter, more valuable fractions (e.g. gasoline, kerosene) by the use of high temperature without the aid of catalysts.

very large crude carriers ("VLCC") — A supertanker with a capacity between 160,000 and 320,000 deadweight tons. Deadweight tonnage("DWT") is the amount of cargo, fuel, water, stores and crew that a tanker can carry when fully loaded

CHAPTER I
VALUATION

1.1 Highlights

1.1.1 BUY on TOP as a valuable stock with sustainable growth to continue

With our analysis and our assumption, we expect an upside gain 13.7% at our target price of 83.0 baht per share under DCF and relative valuation method. We are confident that TOP's overall net profit will stay solid; given its rising refinery earnings will offset the weaker non-refinery earnings i.e. petrochemical and lube base earnings. Moreover we expect better contributions from completed operated in Q1/16 and Q2/16 respectively.

1.1.2 Strong performance and competitive cash operating cost among peers

As TOP's past performance told, we strongly believe that TOP could deliver strong performance going forward due to 1) the reliability of TOP plants reflected through stable high utilization rate even higher than Thailand's industry average, 2) TOP as one of the most complex refinery and 3) TOP's low competitive cash operating cost considered as the first quartile in the Asia Pacific region. TOP cash operating cost is only 1.4-1.5$/bbl lowest in Thai's peers and much competitive than Korean & Indian refiners of which the cost are around 2-3 $/bbl, Chinese refiners of which the cost are around 3-4 $/bbl. Not to mention European/Russian refiners which were considered as high cost players at around 4.5-5$/bbl. All of those are critical success factors for refinery to have competitive refining margins while low cash operating cost. That could definitely reduce risk of volatility of commodity prices. Thus we do like TOP stock despite it is in volatile business.

1.1.3 Buoyant GRM and strong domestic oil demand growth in 2017 could made bright future for TOP

We expect the tighter supply and colder weather from La Nina effect in 4Q16 would strengthen GRM. The mega refineries have planned shutdowns (Yasref with 400KBD and Ras Tanura with 550KBD), leading to tight supply. Meanwhile, refined-product spreads would be higher, especially gas oil which has supported by strong demand during winter.

We believe that refinery margin could be strong and could have some improvements which could help offset softer outlook on petrochemical business as oil demand growth outpacing refinery capacity addition in Asia Pacific and Middle East. Moreover we have a positive view on middle distillate; JET and gasoil, spread supported by recovered demand in coal sector and strong recovered economy growth especially in Asia where majority of demand growth exists. Thus it would benefit TOP as a middle distillate refiner.

We also believe in strong growth of oil demand in Thailand tracking with the GDP growth which driven mainly by private consumption, public spending and expansion in tourism. Thus it's positive to domestic oil demand growth expected to grow 2.3% in 2017 led by middle distillate products; JET and Diesel which is majority consumption in Thailand. Therefore, we think that TOP as a leading domestic refining player will definitely gain benefit from the strong domestic demand as TOP normally sales to domestic market more than 80%.

1.2 Business Description

Thai Oil is one of the leading integrated publicly listed refining and petrochemical companies in Thailand. It currently own and operate the largest single-site complex refinery in Thailand measured by nameplate capacity which is one of the most complex refineries in the Asia-Pacific region. As of 30 September 2016, Thai Oil has refining nameplate capacity of approximately 275,000 bpd of crude oil and other feed-

stock, representing approximately 22% of the total refining nameplate capacity in Thailand, according to the EPPO (Figure1.1) However in terms of market share in Thailand, Thai Oil has 34% market share for refined petroleum product as of 30 September 2016 which is calculated by total domestic sales of refined petroleum products of Thai Oil divided by total sales of petroleum products in Thailand excluding LPG as a feedstock and own used.(Figure1.2). Thai Oil is the principal refiner for the PTT Group.

Thai Oil's vision is a leading fully integrated refining and petrochemical company in Asia Pacific. Company's missions are to be in top quartile on performance and return on investment, to create a high-performance organization that promotes teamwork, innovation and trust for sustainability and to emphasize good Corporate Governance and commit to Corporate Social Responsibility.

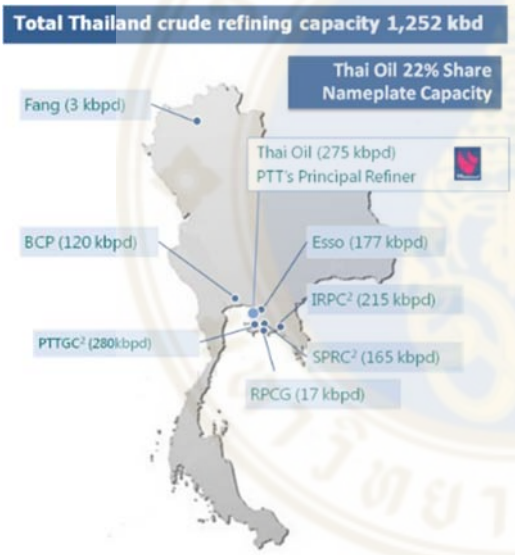

Figure 1.1 Total Thailand crude refining capacity

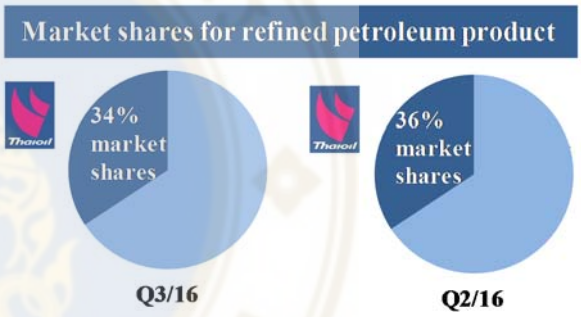

Figure 1.2 Thai Oil market shares for refined petroleum product

Thai Oil is organized into eight core business units: oil refining, lube base oil, petrochemical, power generation, marine transportation services, solvent, ethanol and other businesses. The refining, petrochemical and lube base oil business units are highly integrated, which enhance an overall higher margin. These three business units; refining, petrochemical and lube base oil, are also majority of company's sales and operating revenue which is accounting for approximately 90% of their total group contri-

bution. The remaining contributions are from power generation business units accounting for 5-8%, and others such marine, solvents, ethanol and other business units totally accounting for 2-3%.

Thai Oil refinery, the Sriracha Complex, is located near the Laem Chabang deep sea port in Sriracha, Cholburi Province, approximately 124 kilometers southeast of Bangkok, the capital city of Thailand. The strategic location of the Sriracha Complex provides our off take customers access to a convenient product delivery network. This network allows company's off take customers to take delivery of refined petroleum products efficiently and in a cost-effective manner via the connecting multi-product pipeline owned and operated by our related party, Thappline, as well as via ground transportation and coastal vessels. The Sriracha Complex currently has three CDUs, two CCRs, an ISOM, two HCUs, a FCCU, a TCU, three HDTs, two HDSs, three HVUs and various supporting units that allow them to produce refined petroleum products that meet their customers' requirements. The various conversion units enable the company to vary the output of our refinery and produce the blend of products which maximizes their gross refining margin, and provides them with significant flexibility in the use of feedstock. Thai Oil is also capable of processing a wide range of crude oil, including crude oil from the Middle East, Asia (excluding Thailand), other foreign sources and Thailand, although our choice of feedstock at any time depends on relative prices and yields. Their gasohol, gasoline and diesel products are compliant with the sulfur content requirements of the Euro IV standard (sulfur 50 ppm) and the company is the first refinery in Thailand to achieve this standard.

The feedstock for Thai Oil refinery primarily comprises crude oil imported by PTT and other suppliers from the Middle East and other regions and sold through a combination of long-term purchase contracts and spot market purchases to allow them flexibility in obtaining crude oil. Thai Oil Single Buoy Mooring (SBM) facilities allows them to receive crude oil and other feedstock directly from Very Large Crude Carrier (VLCC), thereby reducing their crude freight cost and increasing their feedstock offloading efficiency.

Thai Oil consumed approximately 102.4 million barrels of crude oil for the year ended December 31, 2015, and approximately 78.4 million barrels of crude oil for the nine months ended September 30, 2016. In 2015, crude oil originally sourced from

the Middle East, Asia (excluding Thailand), others foreign sources and locally accounted for, by volume, 77.1%, 12.0%, 2.3% and 8.6% of total crude oil consumption, respectively. In the nine months ended September 30, 2016, crude oil originally sourced from the Middle East, Asia (excluding Thailand), others foreign sources and locally accounted for, by volume, 78.9%, 9.3%, 3.5% and 8.3% of their total crude oil consumption, respectively.

In terms of their refined petroleum products, they include light products approximately 32% consisting of LPG (4%), unleaded gasoline (ULG) (16%) and heavy naphtha (12%) (Platformate), middle distillates (60%) consisting of diesel (Gas Oil-GO) (35%) and jet fuel (JET)(22%), and heavy products 9% in the form of fuel oil (FO) (6%) and Long Residue (LR)(4%) (Figure1.3) Thai Oil produces mainly middle distillate products which are Thailand's in-demand products thus the company can capture high domestic portion. The majority of their refined petroleum products are sold domestically to PTT. They also sell refined petroleum products domestically to other major oil companies, including Bangchak (BCP), Shell Thailand and Chevron, as well as other independent oil wholesalers and offtake customers such PTG Energy Public Company Limited and Susco Public Company Limited, and domestic jobbers (including independent wholesalers and petrol stations). In 2015 and for the nine months ended September 30, 2016, they sold, by volume, 80.0% and 87.0% of our refined petroleum products in the Thai domestic market, which is approximately 31% and 34% of the market share in Thailand according to DOEB and exported the remaining 20.0% and 13.0% of products to other countries in Asia, including Singapore, Cambodia, Vietnam, Laos and Myanmar either through PTT or other oil traders. (Figure1.4)

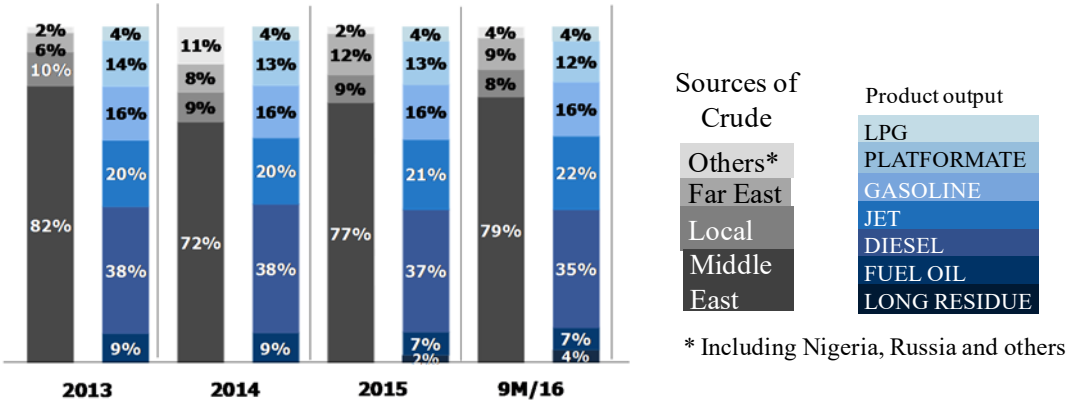

Figure 1.3 TOP's source of crude and product yield

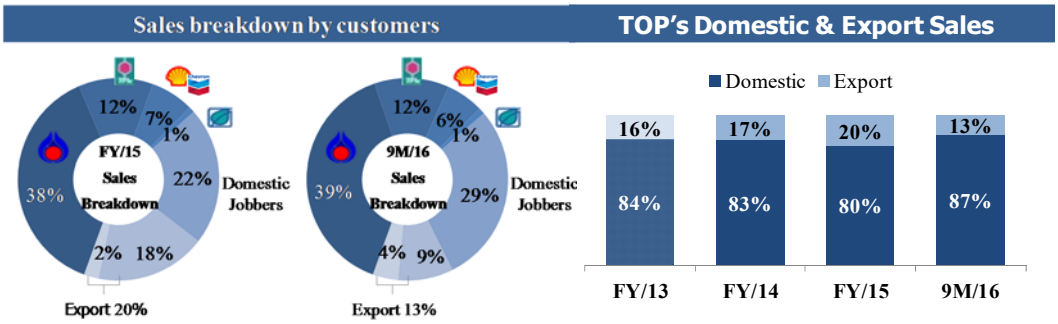

Figure 1.4 Sales volume breakdown by customer and by domestic and export

1.3 Industry Overview and Competitive Positioning

1.3.1 Macro-Economic Analysis

Thai Oil's results of operations are directly affected by sales volume and sales prices of our products, which in turn are influenced by general macroeconomic conditions globally and in Thailand.

1.3.1.1 2017's world GDP growth at 3.4% and gradually rises throughout 2021 supporting global oil demand growth

The global economy will improve slightly toward the end of 2016 into 2017. According to the International Monetary Fund forecast in Oct 2016, global GDP grew by 3.4% in 2017, improved from the growth rate at 3.1% in 2016, and it will gradually rises throughout 2021. The average world GDP growth in 2018-2020 is expected to be at 3.7%. Although the new forecast revised down by 0.1% for 2016 and 2017 relative to the previous forecast in April, reflects a more subdued outlook for advanced economies following the June U.K. vote in favor of leaving the European Union (Brexit) and weaker-than-expected growth in the United States, financial market sentiment toward emerging market economies has improved with expectations of lower interest rates in advanced economies, reduced concern about China's near-term prospects following policy support to growth, and growth in emerging Asia especially India, Vietnam, Thailand and Indonesia continues to be resilient. (Figure1.5)

1.3.1.2 Thailand's economy is expect to continue at a gradual pace (GDP at 3.2%) driven mainly by private consumption, public spending and expansion in tourism. The Thai economy is projected to grow at 3.2% in 2017 at about the same rate as in this year. Domestic demand will remain a key driver of growth on the back of continuity of government policies after the draft constitution was approved in the referendum. In particular, new investment in transportation infrastructure such as the dual-track railway and Bangkok Mass Transit projects are expected to start in the second half of the year. Tourism is expected to return to normal after the adverse impacts of explosions in the southern provinces and the crackdown on zero-dollar tour operators diminish. Nonetheless, growth momentum of merchandise exports is likely to remain limited and will continue to weigh on the economic recovery given weaker-than-expected growth in trading partners' economies and structural problems in Thailand's export sector.

	2016	2017	2018-21
	Oct-16[1]	Oct-16[1]	Oct-16[1]
US	1.6%	2.2%	1.8%
EU	1.9%	1.7%	1.8%
China	6.6%	6.2%	5.9%
India	7.6%	7.6%	7.9%
Thailand	3.2%[2]	3.2%[2]	3.1%[1]
Indonesia	4.9%	5.3%	5.8%
Vietnam	6.1%	6.2%	6.2%
World	3.1%	3.4%	3.7%

Figure 1.5 Real GDP % Year-on-Year growth

1.3.1.3 BOT expect Thailand's core inflation at 1.0% in 2017 while headline inflation at 2.0%. Core inflation forecast in 2016 and 2017 is expected to remain unchanged from the previous estimate at 0.8% and 1.0% respectively. Increased demand pressures from the economic recovery are offset by a decline in costs because of lower oil prices. Headline inflation is revised down in line with a downward

revision in the crude oil price forecast. While the Committee expects headline inflation to return to the lower bound of the target band within this year at 0.3% and 2.0% in 2017, the timing would largely depend on movements in global crude oil prices.

1.3.1.4 A flat future for the monetary policy rate at 1.5% deemed conducive for economic recovery to preserve space amid external uncertainties

The Committee maintained the policy interest rate in the August and September meetings. The overall economic outlook remains largely unchanged from the meetings in the preceding quarter. The economy is expected to recover at a gradual pace and inflation is projected to return to the target band, with monetary conditions continuing to be accommodative. While a potential increase in risk accumulation under the prolonged low interest rate environment continues to warrant close monitoring. Nevertheless, after Brexit the Thai economy is faced with greater risks on the external front, which will affect the outlook of Thailand's trading partners and overall confidence. While there is a high degree of uncertainty associated with these risks, their consequences can be severe should they materialize. The Committee thus emphasizes the need to preserve policy space, continuing to monitor and assess risks to the economic outlook in order to formulate appropriate monetary policy.

1.3.1.5 Trump's victory on US presidential election 2016 and concerns on economic conditions. Markets have been so surprised after the results came out and heavily nervous reacted to his aggressive policy. Major Trump policies includes Foreign Policy i.e. to make changes of US lifted sanction in Iran, to open development of nuclear weapons by Japan and South Korea that will lead to risky of political unrest, the Tax Policy of reducing both corporate income tax and individual income tax which will could be seen as an easing policy that will spur domestic spending within the US, the Trade Policy of discarding the Trans-Pacific Partnership (TPP), changing current trade agreements or anti-trade with China, which will bring volatility to world globalization, the Immigration Policy building a border with Mexico to prevent illegal immigrants that will shrink the U.S. labor force and increase labor costs and the Climate Change Policy of not believe in the global warming theory so he may thus abandon all efforts towards promoting alternative energy (subsidies and supporting funds) while encouraging fossil fuel consumption. Overall, Trump's policies if implemented will put the recovery of the U.S. economy at risk. However, it's early to say the impact of the

policy because there are still some steps to follow before he actually takes over the Oval Office in January 2017. Now that the public has voted, the electoral votes will be counted and announced on January 6, 2017 with the official inauguration of the new president on January 20, 2017. In the interim, he will select his cabinet and talk about his policies.

1.3.1.6 Short term impact of Trump's victory to Thailand: weak commodities, baht weakness. While, Trump does not appear to have a specific stance towards Thailand, the country's economy faces downside risk if the new US president-elect carries out his campaign promises to: 1) impose tariff barriers 2) withdraw military support from key allies in the region (possibly leading to regional geopolitical realignments) and 3) alter US energy policy. The most likely impact could come from possible currency weakness and lower oil prices. However, reduced expectations of a US Fed rate hike in December could offset some of the adverse impact. Also, Thailand's direct export exposure to the US is limited. Thus we do not think that Trump's proposed policies will significantly impact the Thai economy.

1.3.2 Industry Analysis

1.3.2.1 Demand for refined products has been partly driven by GDP growth. IEA expected global oil demand growth at 1.2 MBD in 2017 mainly driven economic growth and cheap oil price boost. Based on information of IEA, EIA and IMF, it can clearly seen that historical global oil demand has been partly driven by GDP growth as shown in the graph; (Figure 1.6). During pre and post-crisis, world oil demand grow around 2-3% a year on average within the level of GDP growth except the crisis in the year 2008 and 2009 where the stagnant economy and recession during hamburger crisis contracted oil demand growth. Furthermore in year 2010, the oil demand growth is exceptionally high supported by Chinese economic boost after the global financial crisis where Chinese GDP grew 10.3% yoy. Going forward, IEA expected global oil demand growth at 1.2 MBD in 2017 mainly driven by economic growth (according to IMF, world GDP is expected to grow 3.4% in 2017). Asia will be the region driving oil demand growth at 0.7 MBD accounting for 60% of total world oil demand growth followed by Middle East and U.S. of which oil demand growth is expected to grow around

0.2 MBD (accounting for 13% of total world oil demand growth) and 0.1 MBD (accounting for 12% of total world oil demand growth) respectively (Figure 1.7). Moreover the current low oil price environment is supportive for global oil demand benefiting to refineries due to strong refining margin.

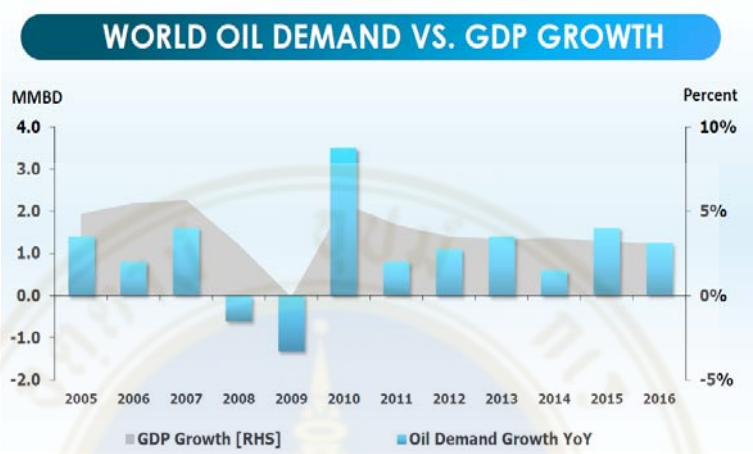

Figure 1.6 World oil demand& GDP growth

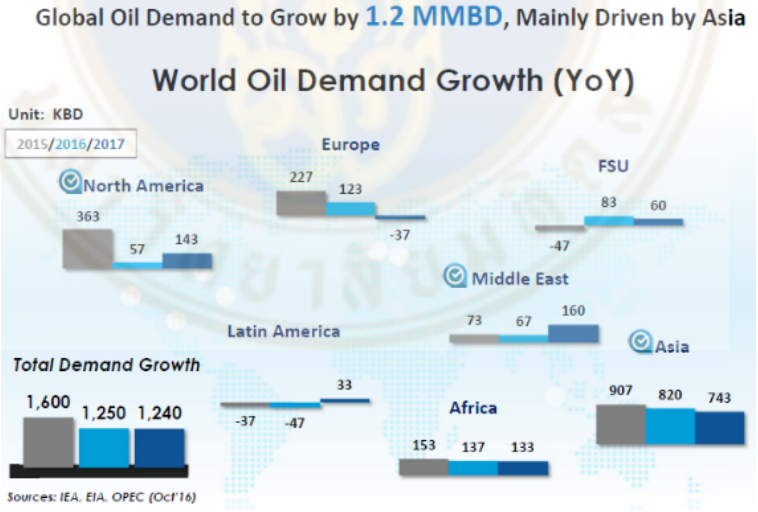

Figure 1.7 2017 global oil demand growth

1.3.2.2 Oil price will gradually increase in 2017 after OPEC's deal on production cut 1.2 MBD first time since 2008 and IEA expect Non-OPEC oil supply growth at 0.4 MBD. OPEC has reached the agreement to cut its oil output to 32.5 MBD, with around 4.6% cut or around 1.2 MBD (compared to the October level of 33.6

MBD) across OPEC producers except for Libya, Nigeria, Iran, and Indonesia, effective 1st of January 2017. The duration of this agreement is six months, extendable for another six months to take into account prevailing market conditions and prospects. At the next OPEC meeting 25 May 2017, the ministers will evaluate how well the group production cut has worked to rebalance markets and whether an additional 6 months of adjusted production is necessary. Moreover OPEC is expecting 600 KBD of incremental production cuts from 8-10 non-OPEC producers, 300 KBD of which is expected from Russia and that would be the next event to watch on 9 Dec; OPEC and non-OPEC conference.

Oil price will be rebound as a consequence of lower supplies led be OPEC's production cut. Non OPEC supplies mainly from Russia and US shale oil producers will take this higher price environment as an opportunity to recover their production. Referring to global oil producer breakeven cost (Figure1.8),US shale oil producers will be benefit when the oil price is above 50$/bbl it's more than their breakeven cost resulting in higher production. That's in line with what IEA forecast of Non-OPEC supply growth at 0.4 MBD led by US and Russia equally at 0.2 MBD each. Thus we think that oil prices will not sustainably remain above $55/bbl, as the goal of oil output cut is to normalize inventories, not high oil prices. OPEC might be aware of the flattening of the oil cost curve and the unprecedented velocity of the shale supply response. Eventually, global oil demand and supply will rebalance in 1H2017 supporting the oil price will gradually increase by then resulting in the still low oil price environment which will be beneficial to oil demand and refinery margin. (Figure1.9)

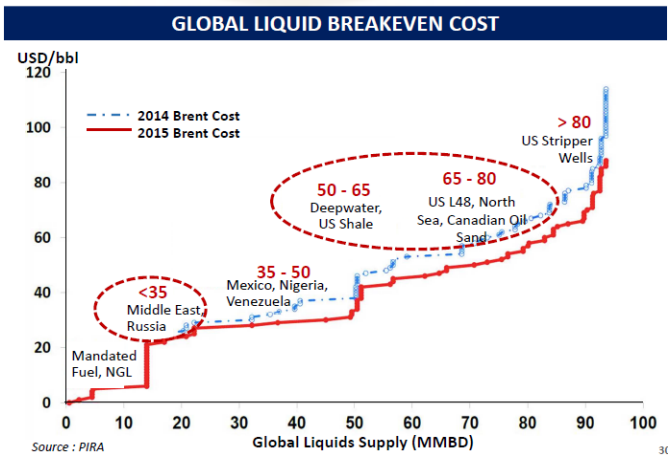

Figure 1.8 Global Liquid Producer Breakeven Cost

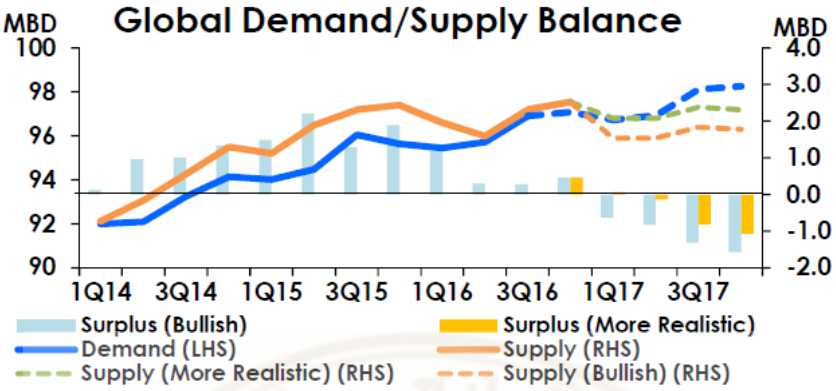

Figure 1.9 Global Oil Demand and Supply Rebalance

1.3.2.3 Stronger refining margin in 2017 from demand growth outpacing refinery capacity addition and gasoil spread better off gasoline from recovered demand. According to the FACT data (FACT Global Energy), Asia Pacific and Middle East oil demand growth is expected to be outpace the refining capacity additions in 2017 and going forward.(Figure1.10). It can clearly be seen that the demand growth will be at almost 1.2 MBD while the refining capacity additions mainly in China and Middle East netting off capacity closure in Japan will be approximately 0.7 MBD that will lead to expected strong refining margin in 2017. The refinery capacity surplus will be much lower in 2017 and in 4 years ahead (Figure1.11). Therefore refining margin in 2017 and in the near future is expected to be strong and improve going forward. Moreover we expect better middle distillate product spreads from recovered demand from coal and oil market recover and it should grow faster than gasoline products as over the past two years, coal and oil operations, which we estimate account for 30% of global diesel consumption (directly or indirectly), have seen a steady decline in production. With both coal and oil prices finding a floor and rising, we see demand recovering. (Figure1.12). Thus Thai Oil would benefit from this as TOP is higher middle distillate refiners.

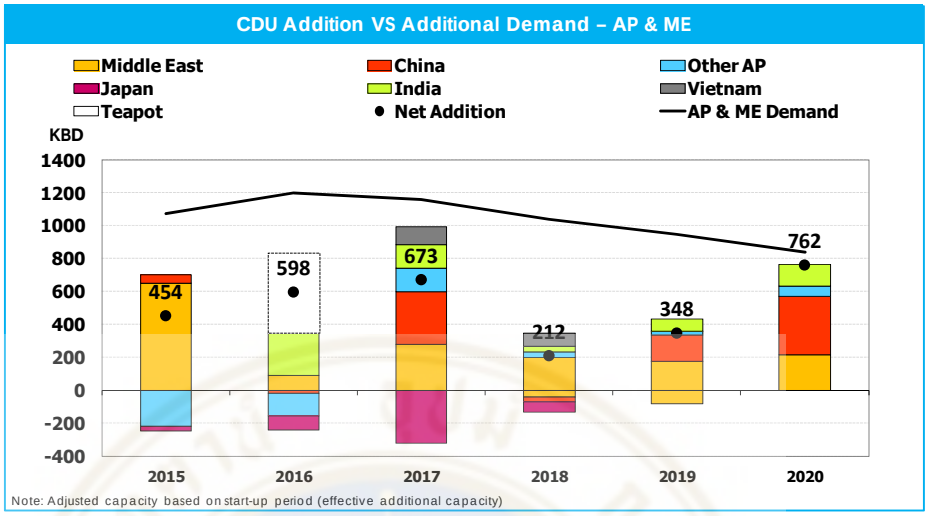

Figure 1.10 AP&ME oil demand growth better than refinery addition in 2017

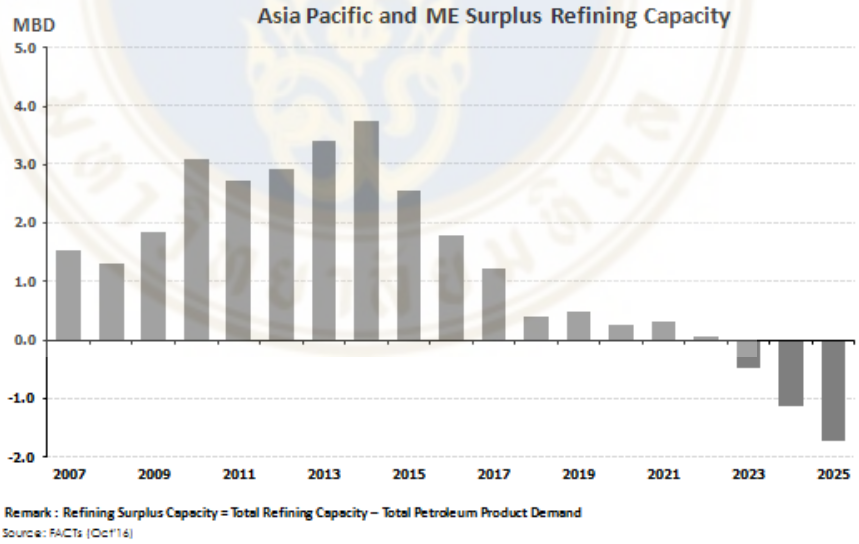

Figure 1.11 AP&ME surplus refining capacity

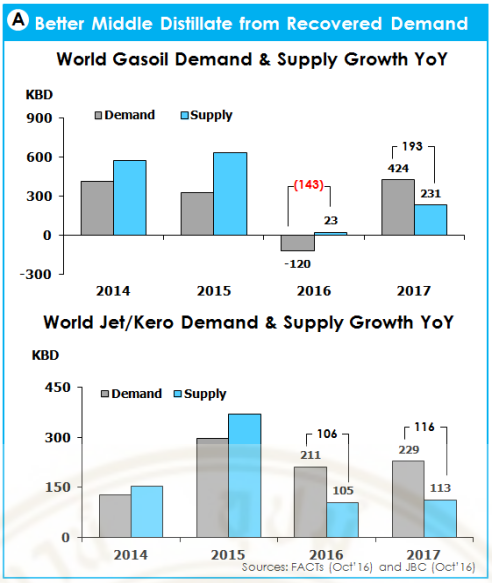

Figure 1.12 World middle distillate demand and supply growth

1.3.2.4 Healthy domestic oil demand growth at 2.3% supported by strong economy. In the few years immediately after the Asian financial crisis in 1997, demand for refined products in Thailand decreased as the Thai economy contracted. However, from 2004 through 2015, refined products consumption in Thailand increased for most of the years. This significant increase in consumption correlates closely with GDP growth in Thailand. During the past period from 2011 to 2015, the domestic oil demand growth was average at 4.4% p.a. while Thai economy, measured in terms of real GDP, grew at a CAGR of 3.4%. That was including one-time exceptional high growth of the domestic oil demand as low oil price attracting more oil demand. (Domestic oil demand growth was at 7.1% p.a. in 2015 decoupling its GDP growth). Total domestic oil demand growth is expected to grow at 2.3% in 2017 led by middle distillate products; JET and Diesel.. Accordingly, Thai Oil as a leading domestic refining player will definitely gain benefit from the strong domestic demand as TOP normally sales to domestic market more than 80%.

1.3.2.5 Aromatics spreads will be pressured in 2017 from additional supplies. We expects bearish aromatics margin in 2017 as we see additional supplies mainly from India, Saudi Arabia and Vietnam coming online over next year with total effective capacity more than 3 million tons accounting for 7% of total AP and ME

capacity. (India: Reliance-PX 2.3 million ton, Saudi Arabia: PetroRabigh-PX 1.3 million ton and Vietnam: Nghi Son-PX)(Figure1.13). Aromatics business accounts for 15%-20% of TOP earnings thus it could pressure TOP earnings but we expect the impact might be offset by the increasing refining margins in 2017

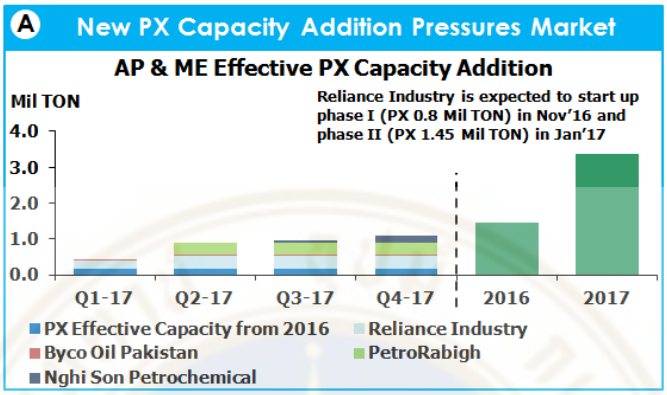

Figure 1.13 AP & ME Effective PX Capacity Additions

1.3.2.6 Stronger LAB market on steady demand growth. As Thai Oil's new business unit; LAB had successfully commission in February this year, we expect the business unit will continuously contribute its margin going forward with still-strong LAB market on steady demand growth. We see strong AP/ME demand growth at 2.6% following better economic growth and higher population. Moreover there will be no new plant startup in 2017.

1.3.2.7 Stable Base Oil market on lower global capacity addition while softer Bitumen market on accumulated inventory amid potential recovered regional demand. We expect base oil market remains good as global demand growth expected to be at 0.5-1.0% following better economic. Plus lower base oil supplies additions next year compared to this year mainly from lube base oil group II. But Thai Oil's lube base plants solely produce lube base oil group I which will not have new capacity addition and the demand is captive.(Figure1.14), Thus we expect stable lube base margin. However Bitumen market is expected to be softer due to still-high accumulated inventory in major import countries i.e. China, Indonesia and Vietnam. Thailand bitumen demand is expected to be improving in 2017 on higher road maintenance plan at the growth rate at2.9% YoY. (Figure1.15)

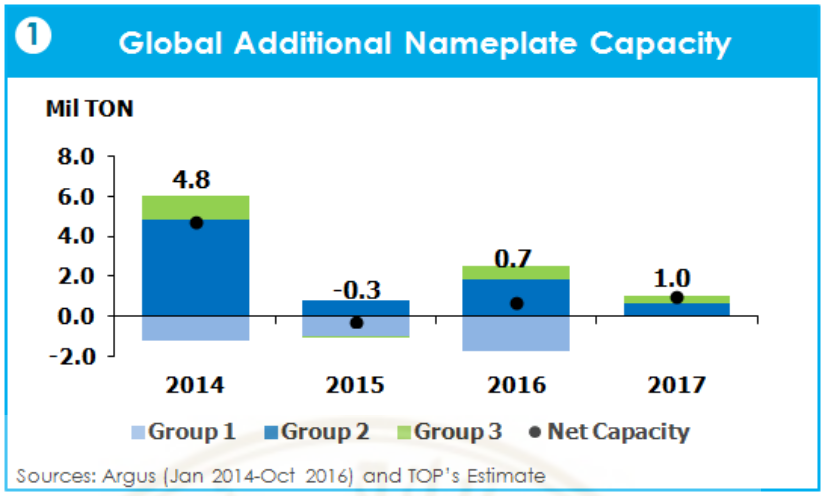

Figure 1.14 Global additional nameplate capacity of lube base plants

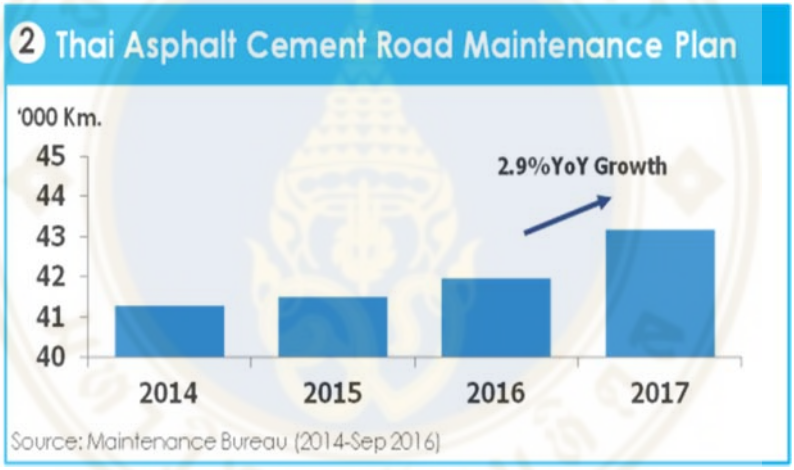

Figure 1.15 Thai asphalt cement road maintenance plan

1.3.3 Competition Analysis

1.3.3.1 Thailand's Largest and One of the Region's Most Advanced and Competitive Refineries. TOP currently own and operate the Sriracha Complex, the largest single-site complex refinery in terms of nameplate capacity in Thailand with a refining nameplate capacity of approximately 275,000 bpd of crude oil and other feedstock as of December 31, 2016, representing approximately 22% of the total refining nameplate capacity in Thailand, according to the EPPO. Its refinery is integrated with petrochemical platform, is one of the most complex refineries in the Asia-Pacific region. The plants have the ability to process a variety of crude and feedstock, reducing

dependence on any given type of feedstock. This allows company to achieve efficient production, thus minimizing both logistics costs and product wastage throughout the production chain. It also benefit from ability to produce higher value-added petrochemical products instead of selling those products in their intermediate stage at lower margins to the market. The technologically superior plant enables the company to produce a more favorable products slate, with a focus on the more profitable middle distillates and less on heavy oils which have lower profit margins. For example, in response to the diminishing spreads for paraxylene and benzene, TOP could reduce the production of paraxylene and benzene, and produced a greater quantity of other refined petroleum products, such as unleaded gasoline 95 and gasohol, instead in order to minimize the impact on profit margins as well as adjust its production proportions according to market conditions.

1.3.3.2 Diversified Earnings through Integration with, and Stable Contribution from, their Subsidiaries. TOP diversified its business beyond oil petroleum refining, which is heavily affected by commodity pricing, the operations have been expanded to a broad range of downstream products including petrochemical products, lube base oil and its by-products, solvent products, surfactants 110 and ethanol, and whose derivative products also in many cases enjoy higher profit margins. The company benefit from diversified portfolio of businesses and products which enables the company to reduce dependence on any one product. This could reduce earnings volatility and increase operating margins. In addition, it also invested in support businesses, including marine and pipeline transportation, power production and energy services. The ability to produce or provide many of the services required for its businesses further reduce the volatility of the price at which we can procure these at, thus improving operating margins.

1.3.3.3 Industry with High Natural Barriers to Entry and Strong Market Positioning. Although there are no regulatory barriers preventing new entrants from entering the Thai refining market, the significant investments required in the construction of a new refinery, as well as the long lead times which would be required before the new refinery becomes operational, means that the oil refinery industry is one with high natural barriers to entry. Furthermore, TOP distributes products to various long term customers under long term contracts, including PTT. We believe the long-

term customers and offtake relationships place the company in an advantageous position compared with any new competitors.

1.4 Investment Summary

1.4.1 A valuable stock with sustainable growth to continue

With our analysis and our assumption, we expect an upside gain 13.7% at our target price of 83.0 baht per share under DCF method. Thus we recommend BUY on TOP. We think that TOP's overall net profit will stay solid; given its rising refinery earnings will offset the weaker non-refinery earnings i.e. petrochemical and lube base earnings. Moreover we expect better contributions from completed projects such as LAB and 2 small power plants which Thai Oil has successfully commissioning operated in Q1/16 and Q2/16 respectively.

1.4.2 TOP as a regional and Thailand's top tier refinery with low competitive cash cost enables strong performance

As TOP's past performance told, we strongly believe that TOP could deliver strong performance going forward due to 1) the reliability of TOP plants reflected through stable high utilization rate even higher than Thailand's industry average (Figure1.16), 2) TOP as one of the most complex refinery reflected through a top rank in the Nelson index; refinery's upgrading capability index for comparison. (Figure1.17), 3) TOP's low competitive cash operating cost considered as the first quartile in the Asia Pacific region by Solomon Benchmarking (Figure1.19); TOP cash operating cost is only 1.4-1.5$/bbl lowest in Thai's peers and much competitive than Korean & Indian refiners of which the cost are around 2-3 $/bbl, Chinese refiners of which the cost are around 3-4 $/bbl. Not to mention European/Russian refiners which were considered as high cost players at around 4.5-5$/bbl (Figure1.18). All of those are critical success factors for refinery to have competitive refining margins while low cash operating cost could definitely reduce risk of volatility of commodity prices. Thus we do like TOP stock despite it is in volatile business.

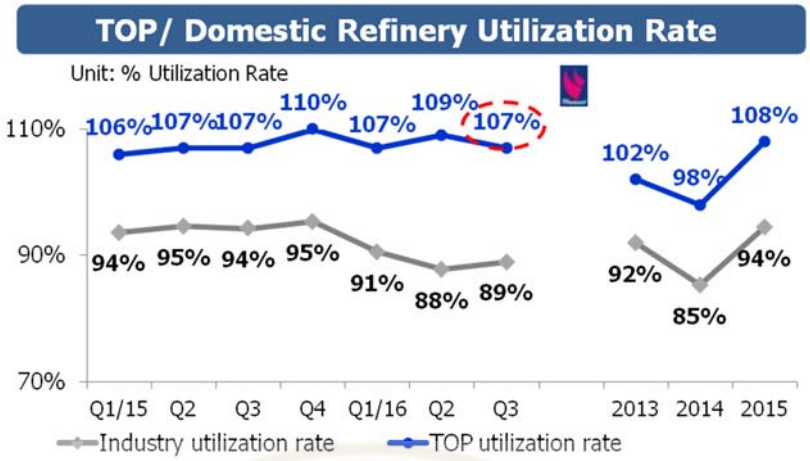

Figure 1.16 TOP/Domestic refinery utilization rate

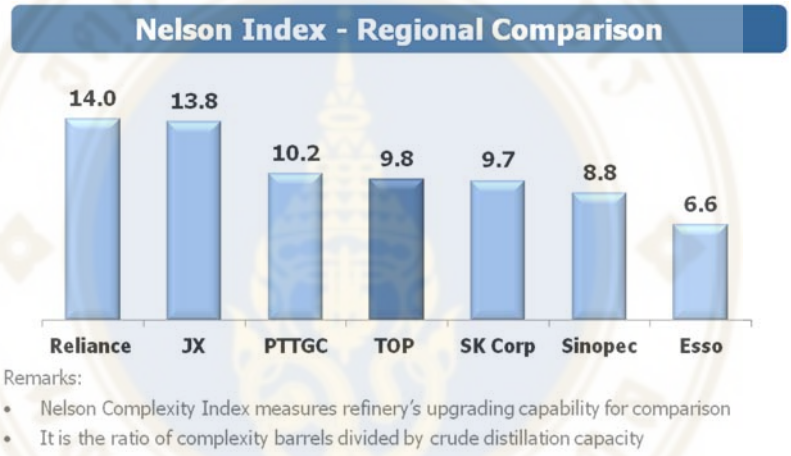

Figure 1.17 Nelson index graph-Regional comparisons

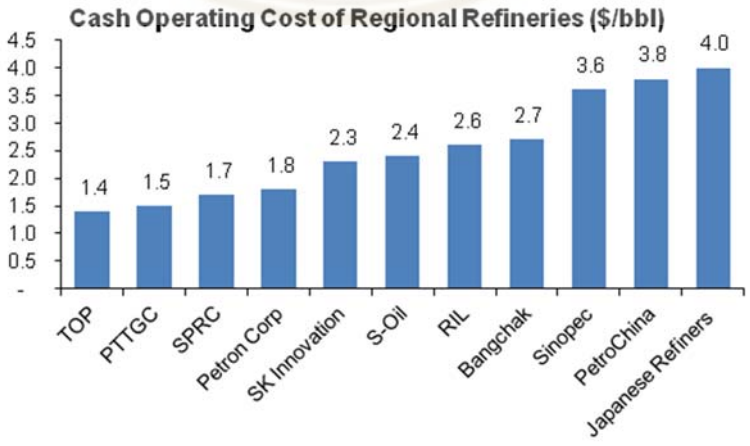

Figure 1.18 Cash Operating Cost of Regional Refineries

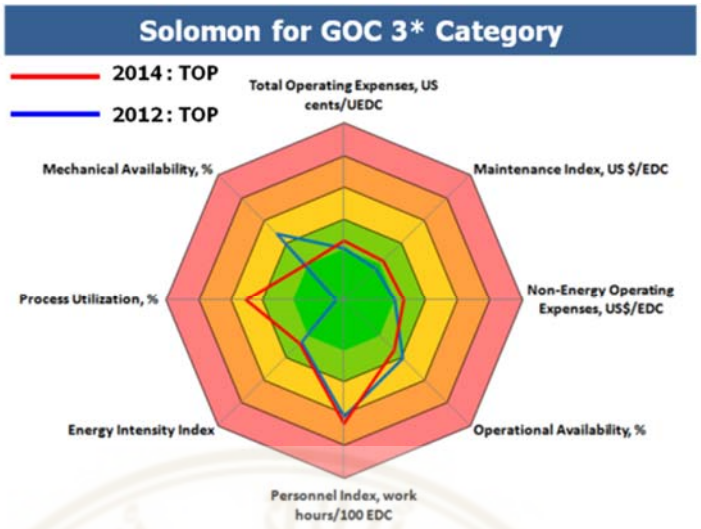

Figure 1.19 Solomon Benchmark

1.4.3 Buoyant GRM could be expected from a bright 2017 refinery outlook with pro on Middle distillate spread

Singapore GRM has recently been rising to the level of 7-8 $/bbl as of average quarter 4-to-date from the low level in the previous quarter of 5 $/bbl that mainly supported by winter demand and some plants maintenance in the region. Going forward, we still believe that refinery margin could be strong and have some improvements which could help offset softer outlook on petrochemical business as oil demand growth outpacing refinery capacity addition in Asia Pacific and Middle East. Moreover we have a positive view on middle distillate; JET and gasoil, spread supported by recovered demand in coal sector and strong recovered economy growth especially in Asia where majority of demand growth exists. Thus it would benefit TOP as a middle distillate refiner.

1.4.4 Still strong domestic & CLMV demand benefits TOP as more than 90% of sales goes to those markets

We believe in strong growth of oil demand in Thailand tracking with the GDP growth. With the GDP's growth forecast by BOT of 3.2% growth in 2017 driven mainly by private consumption, public spending and expansion in tourism thus company expect the oil demand growth of 2.3% which is quite conservative to us. The domestic

oil demand growth will be mainly led by middle distillate products; JET and Diesel which is majority consumption in Thailand. (Figure1.20). Therefore, we think that TOP as a leading domestic refining player will definitely gain benefit from the strong domestic demand as TOP normally sales to domestic market more than 80%. Moreover with the strong oil demand growth in CLMV forecasted to be 6.5% in 2017 (Figure1.21), that would also an additional benefits to TOP as they sells to CLMV market around 7-9% which is more or less the price is as same as what TOP sale in domestic market.

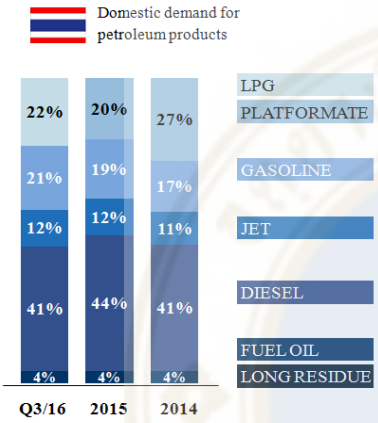

Figure 1.20 Thailand petroleum product demand

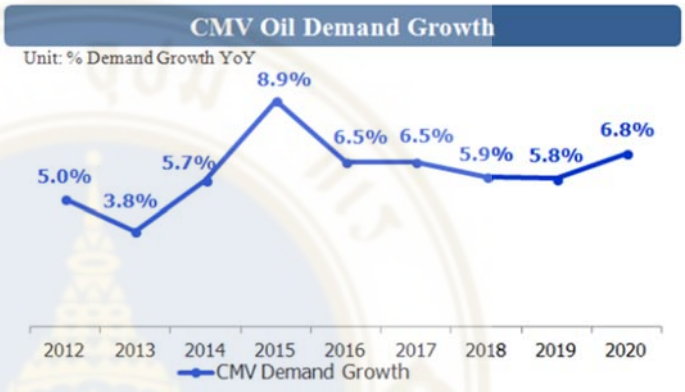

Figure 1.21 CMV oil demand growth

1.4.5 Discipline in attractive dividend payment on top of its potential capital gain

We like TOP as one of companies who has discipline on dividend payment to shareholders. Referring to TOP's historical dividend payment although the policy set a dividend payout is not less than 25%, T OP paid around 40-45% dividend payout ratio or equivalent around 4-5% yield

1.5 Valuation (Multiples Method)

1.5.1 Valuation of TOP derives from FCFF

We evaluated TOP by using Discounted Cash Flow method, we are confident that the most appropriated method for TOP are the Free Cash Flow to Firm(FCFF) which incorporate with the long term growth prospects and concrete cost of debt from its corporate bond.

1.5.2 Discounted Cash Flow Model: Free Cash Flow to Firm (FCFF)

This technique is appropriate for TOP as the company has high growth prospects and it takes in consideration the time value of money. TOP has the long term and relative and stable debt structure. The model also accounted for future growth and long term prospective. The target price based on this model is THB 83.0.

The primary components of our FCFF model are (1) 5-year forecasted cash flow, (2) terminal value (3) capital expenditure, and (4) weighted average cost of capital.

1.5.3 5-year forecasted cash flow assumptions

The 5-year projected cash flows are obtained by increasing sale revenue, which mainly derived from continuously increasing on price level. Economic growth is the key driver of products demand while the supply side expected to be increase in smaller level. This leads to a rise in product price, especially TOP's three main businesses, which are refinery, aromatic and lube base.

1.5.4 Maintain strong margin

TOP is able to diversify its type of crude intake and product outputs to maximize demand and margin. Flexibility in crude intake allows diversification of crude types to source cheaper crude and flexibility in product outputs by maximizing middle distillates (jet and diesel) by adjusting production mode to capture domestic demand and price premium. These support our confident that the firm is able to maintain the margin at higher level

1.5.5 SG&A growth steady

Trend and historical data suggest steady growth of SG&A. Due to continuously improvement of plant reliability and the fact that the firm has ability to control its cost effectively, supports our belief that SG&A will be increased steadily. Apart from

the year of major turnaround (major turnaround every 5- 6 year, latest 2014, the next is in 2019), the cost will be higher approximately 0.2$/bbl

1.5.6 Terminal value, discounted at 9.3%

We set stable growth rate to be less than the growth rate of the economy in which a firm operates. 2017's world GDP and Thailand GDP are expected to be 3.4% and 3.2%, respectively while, the head line inflation rate is projected to be at 2%. We apply the inflation rate at 2% as the stable growth rate which we believe that is appropriate.

1.5.7 Capital expenditure, CAPEX

The CAPEX is provided by the company with explicit plan on capital expenditure. TOP's CAPEX investments will cover improvements in plants reliability, efficiency and flexibility, environment and fuel efficiency improvement as well as value chain enhancement. TOP has sufficient internal cash flow to fund their investment plans, such as Jetty 7&8 improvements, lorry expansion and Benzene derivatives-LAB including annual maintenance approximately 40 M$/year per year.

1.5.8 Weighted average cost of capital, WACC

For the cost of equity (Figure22), was calculated by CAPM model. We assume risk-free rate of 2.57% from the 10-year government bond, the market return was calculated by averaging monthly return of SET index. Finally, the beta of 0.90 which we estimated by regressing monthly returns on stock against SET index. Accordingly, we come across cost of equity at 12.31% along with 4.54% cost of debt and 20% tax rate. The debt: equity weight is 34.6%:65.4%, WACC is 9.30%

1.5.9 Conclusion

We believe FCFF will reflect the intrinsic value of the company base on gradual consistent growth. The fair price for TOP is THB 83.0. There is a clear signal to BUY with 13.7% upside gain from the quote of THB 73.0, as at December 8,2016

1.6 Financial Analysis

1.6.1 Slightly soften market GIM plus stock losses but sustainable growth to continue

The highlight of 3Q16 was stock losses of Baht 625m from stock gains totaling Baht 4,362m posted in 2Q16. Stable-to-soft refining margin and lube base margin has weakened the market GIM (Gross integrated margin). Moreover, the major turnaround of TLB plant not only reduces utilization from 84% to 62%, but also raised the firm's OPEX by US$0.1/bbl. However, aromatic business has relieved the downside in total firm's margin as a result of better PX margin and a newly LAB plant that help added margin on aromatic business.

We expect the tighter supply and colder weather from La Nina effect in 4Q16 would strengthen GRM. The mega refineries have planned shutdowns (Yasref with 400KBD and Ras Tanura with 550KBD), leading to tight supply. Meanwhile, refined-product spreads would be higher, especially gas oil which has supported by strong demand during winter. In addition, lube base utilization will be normalized after shutdown in 3Q16. The demand growth outpacing refinery capacity addition is expected to higher refinery margins in 2017.

1.6.2 Strong financial position and financial ratios

The company liquidity is supported by solid cash flow generation and good access to capital markets and banks. It can generate EBITDA of THB 22,590 million and THB 19,144 million for the nine-month period of the year 2016 and 2015, respectively. As of 30 Sep 2016, 84% of total debt was in the form of debentured with an outstanding principal amount of THB 62,647 million. Meanwhile, 16% was in the form of long-term borrowings with an outstanding principal amount of THB 11,727 million.

Short-term borrowings of THB 988 million accounted for 1.3% of total debt, while about 49.3% or THB 37,228 million had a maturity beyond five years as of 30 Sep 2016. TOP held cash and current investment of THB56, 425million. As of 30September 2016, interest coverage ratio stood at 7.8 time, net debt per equity stood at 0.2 times

1.6.3 Increasing cash flow along with revenues and margins

During nine-month period, the company generated positive cash flow from operation and invested residual cash in short term investment. The CAPEX investments were financed by long-term debt, the average debt life was 11.8 years. Dividend was paid regularly based on annually performance. Finally, ending cash on hand demonstrated its liquidity and availability of future investment.

1.6.4 Common size analysis

1.6.4.1 Income Statement: based on latest published financial statement of 3Q16, it indicated that from 100% of total revenue, cost of goods sold is the major proportion of TOP. Others expenses include depreciation, SG&A, tax account for only 4%. Finally, the left portion is the net profit which was only 4.4% of total revenue.

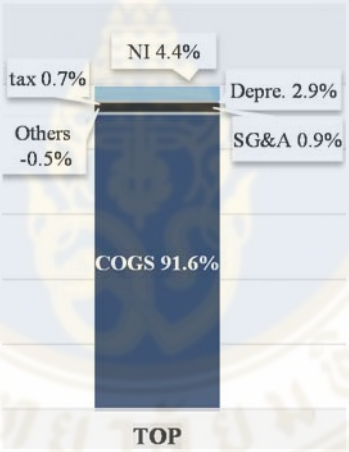

Figure 1.22 Common size analysis (Income Statement)

1.6.4.2 Balance Sheet: asset, since refinery is in capital intensive industry, from 100% of total assets, TOP has highest proportion of property, plant and equipment. However, approximately 50% of total asset was current asset which were 12.7%of inventories, 7.8%of account receivable, 11.4% of cash and 17.3% of other current asset mainly was short term investment.

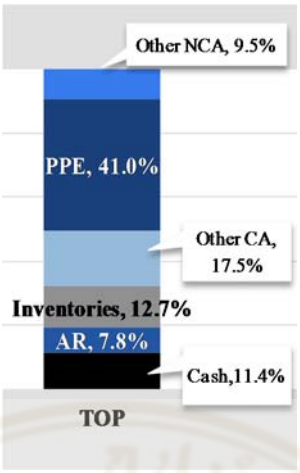

Figure 1.23 Common size analysis (Balance Sheet: Asset)

Liabilities and Equity: for capital structure, 100% of source of fund, TOP has slightly higher portion of equity than debt. Long term debt of TOP has up to 49.3% had a maturity beyond five years. This allow firm to secure its fund for operation and future investment. Moreover, having debt benefits the company from tax-shield as TOP has effective tax rate approximately 13%.

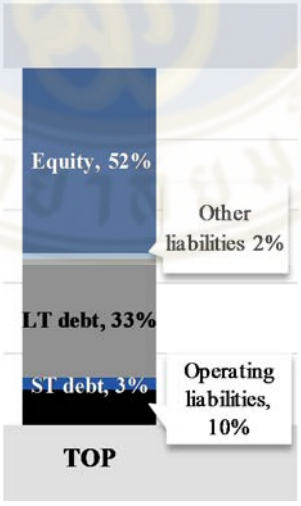

Figure 1.24 Common size analysis (Balance Sheet: Liabilities)

1.6.5 Trend analysis

The trend of total sale is declining in the same direction of crude oil price. This is because product prices level moves along with the oil price which directly link to cost of production.

Overall gross profit margin demonstrated that TOP could maintain a relatively good margin, especially when crude oil price declined. This is due to the fact that they benefit from cheaper cost. However, in 2014, TOP had a negative gross margin which mainly due to inventory loss and net realizable value marked down. This is attributable to a dramatically dropped in oil price that lead to a lower inventory price than market price.

The trend of net profit margin moves in the same direction of gross margin. The main expenses are depreciation and selling and general administrative expenses.

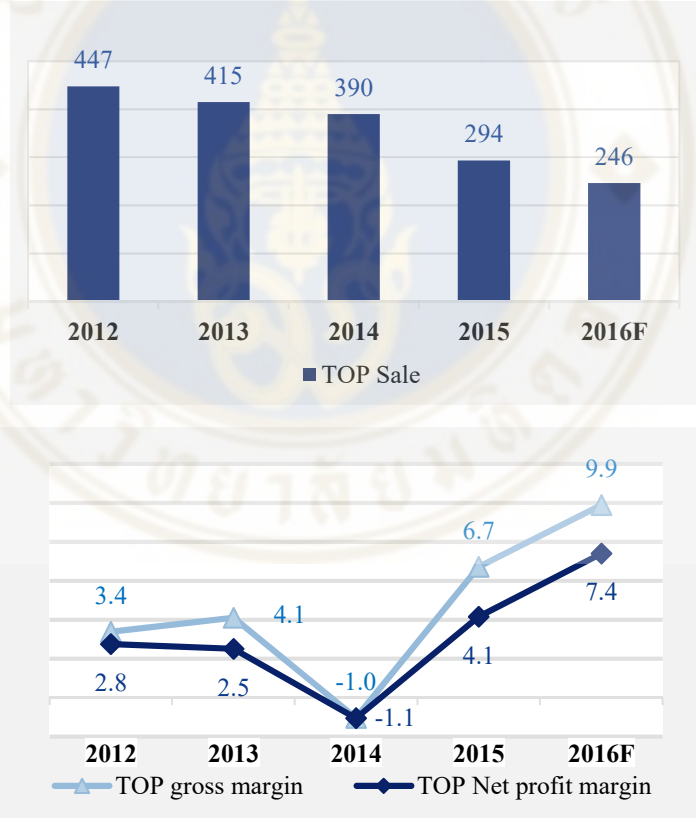

Figure 1.25 Trend analysis

1.6.6 DuPont analysis

Return on equity (ROE) of TOP has increased since 2014. It is indicated that TOP could generate more return to equity which affected by three things:

1.6.6.1 Profit margin: indicated operating efficiency, TOP performed relatively high profit margin, especially 2015-2016, after crude oil price dropped. This is because it can enjoy benefit from lower cost of production e.g. crude oil cost, fuel and loss and utility cost.

1.6.6.2 Asset turnover: indicated asset use efficiency, asset turnover number tend to declined. It is mainly due to overall products price level decreased tracking crude oil price. However, TOP could maintain its efficiency to use asset as indicated in high level of production and sale volume.

1.6.6.3 Equity multiplier: indicated financial leverage, TOP has asset 1.9-2.2 times of equity. It is because TOP financed by debt more than equity. However, TOP can control debt levels and has ability to meet financial obligation. The interest coverage ratio during 2012-2016 is around 4-7 times.

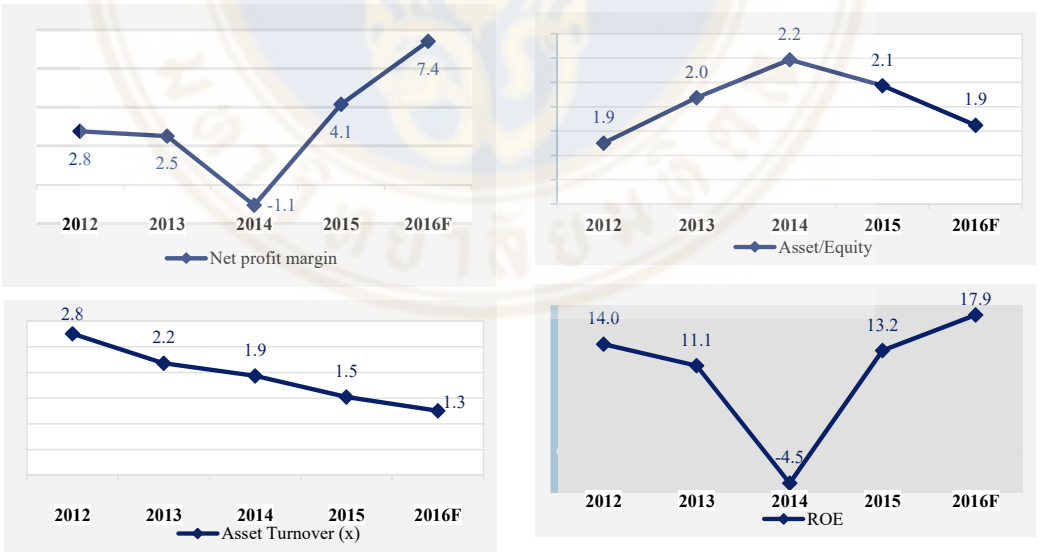

Figure 1.26 DuPont analysis

1.7 Investment Risk

1.7.1 Risks

1.7.1.1 Fluctuations in prices of refinery and petrochemical products or feedstock: the market prices of crude oil and other feedstock have been and volatile and subjected to a variety of factors that are beyond control. These factors include 1) global and regional events and circumstances, as well as political developments and instability in petroleum producing regions, such as the Middle East and Asia 2) the ability of the Organization of Petroleum Exporting Countries ("OPEC") and other petroleum-producing nations to set and maintain production levels and influence market prices 3) market prices and supply and demand of crude oil, feedstock, natural gas, refined petroleum products and substitute energy sources

1.7.1.2 Cyclical and highly competitive nature of business: historically, the refining and petrochemical industries have experienced alternating periods of tight supply, resulting in increased prices and profit margins, followed by periods of substantial capacity addition, resulting in oversupply and reduced prices and profit margins. The refining industry is highly competitive with respect to the sale of refined petroleum products in the Thai domestic, regional and global markets. TOP principal competitors include other major domestic petroleum refiners as well as other global refiners who export products into the regional and domestic markets in the refined petroleum products business.

1.7.1.3 Fluctuations in the value of the Baht against foreign currencies: substantially all of revenues and crude oil and feedstock costs are denominated in U.S.dollars and translated into Baht for inclusion in our financial statements. As a result, fluctuations in the value of the Baht against the U.S. dollar may adversely affect our financial condition and results of operations. Any depreciation of the Baht against foreign currencies, primarily the U.S. dollar, materially affects the results of operations because the purchase crude oil and other raw materials and equipment and services are denominated primarily in U.S. dollars as well as the interest and principal payment on U.S. currency-denominated debt.

1.7.1.4 Heavily dependent on PTT: TOP is heavily dependent on its relationship with PTT as supplier (source approximately 50% of crude oil), customer (accounting for 45% of total revenue) and major shareholder (own 49.1%of total shares). Any changes in these relationships may materially and adversely affect to the company. PTT could have the ability to control management and administration in particular, the nomination of directors to be appointed by the annual general meeting of shareholders and the nomination of certain executive officers to be appointed by the board of directors.

We have also develop risk assessment through a risk matrix defining various levels of risk which will impact to company and likelihood of such events are going to happen as well as how well company have their mitigation plan in order to narrowing chances and impacts from those risk. (Table 1.1 Risk Matrix), (Table 1.2 Key Risks Factors and Mitigations)

Table 1.1 Risk Matrix

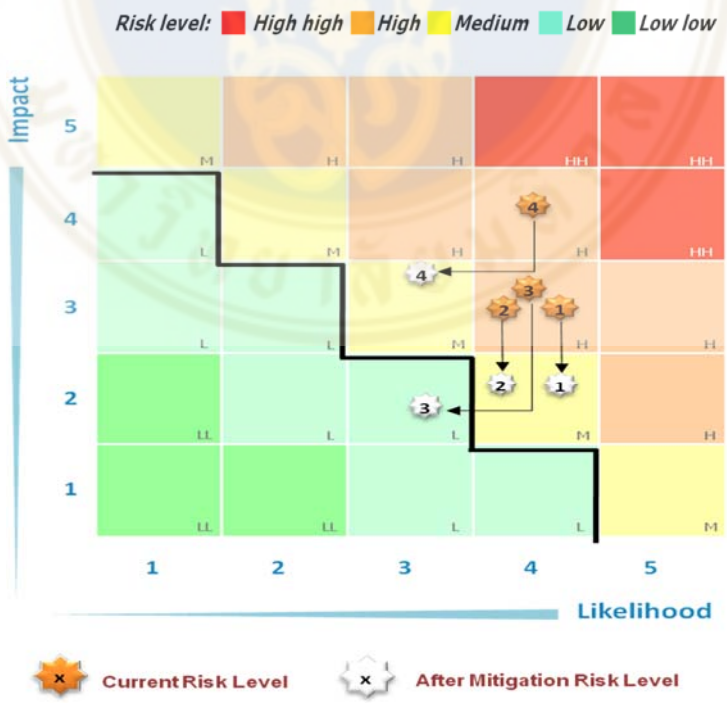

Table 1.1 Risk Matrix (cont.)

Investment Risk
1. Fluctuations in prices of refinery and petrochemical products or feedstock 2. Cyclical and highly competitive nature of business 3. Fluctuations in the value of the Baht against foreign currencies 4. Heavily dependent on PTT

Definition of Likelihood and Impact	
Likelihood	**Definition**
1	1-20% probability that such events will be happened
2	21-40% probability that such events will be happened
3	41-60% probability that such events will be happened
4	61-80% probability that such events will be happened
5	81-100% probability that such events will be happened
Impact	**Definition**
1	Negligible impact
2	Minor impact
3	Moderate impact
4	Significant impact
5	Severe impact

Table 1.2 Key Risks Factors and Mitigations

Key Risk Factors & Mitigations		
	Key Risk Factors	**Mitigation**
1	Fluctuations in prices of refinery and petrochemical products or feedstock	• Commodity hedging • Operational excellence by diversify crude types, perform flexible operation, control competitive cash cost
2	Cyclical and highly competitive nature of business	• Diversify business portfolio i.e. expand to value chain enhancement business such petrochemical and lube base oil, expand to more downstream product such LAB (Linea Alkyl Benzene), invest in less volatile business such power plants which has Power Purchase Agreement with EGAT as a earning stability segment for company's portfolio • Operational Excellence ensuring reliable operation to produce on-spec product and to avoid unplanned shutdown from accidents causing delayed shipments to customers
3	Fluctuations in the value of the Baht against foreign currencies	• Adapt natural hedge policy to minimize the effects of foreign currency fluctuations on their gross refining margins and product-to-feedstock margins by having foreign currency borrowings, entering into short term forward contracts and currency swaps to manage exposure to fluctuations in foreign currencies on short term trade payables and receivables
4	Heavily dependent on PTT	• Enter into short and long term crude oil supply contracts with other major oil companies, such as Shell Thailand and Chevron, and procure feedstock from short-term suppliers and on the spot market. • Make sales to PTT under long-term off take agreements with minimum off take commitments.

1.7.2 Sensitivity analysis

The sensitivity analysis presents the percentage change of growth rate and cost of capital (WACC) that would impact to the change of TOP's share price. The growth rate has a positive relationship with share price, while cost of capital has a negative relationship with share price. As we can see, share price tend to Increase when the growth rate is higher and cost of capital

Table 1.3: Sensitivity analysis

	Price per share (THB)					
	%Growth					
%WACC	83.0	0%	1.00%	2.00%	3.00%	4.00%
	4.3%	157.0	202.0	286.1	499.7	2,137.4
	5.3%	125.2	152.5	196.2	278.0	485.6
	6.3%	103.6	121.7	148.1	190.7	270.1
	7.3%	87.9	100.7	118.2	144.0	185.3
	8.3%	76.0	85.4	97.8	114.9	140.0
	9.3%	66.7	73.9	83.0	95.1	111.7
	10.3%	59.2	64.8	71.8	80.7	92.5
	11.3%	53.0	57.6	63.0	69.8	78.5
	12.3%	47.9	51.6	56.0	61.3	67.9
	13.3%	43.5	46.6	50.1	54.4	59.6
	14.3%	39.8	42.3	45.3	48.8	52.9

1.7.3 Scenario analysis

Discounted Cash Flow Model: Free Cash Flow to Firm (FCFF)

We believe that TOP could have upside potential from slowing global supply and TOP's gross profit will improve due to better earnings sustainability. We expect for upside potential for refining margins as crude oil premiums decline due to global oil supply glut. Moreover TOP stock is trading at the low multiples which is already discounted by the weakness from lower margins.

Price Target 83.0 THB, derived from Discounted Cash Flow Model valuation discounting 5-years free cash flow to firm.

1.7.3.1 Bull case 90.4 THB (up10%of TOP GRM2017, up5%of TOP GRM2018-2019): Improving demand, limited supply resulting in higher refining margin at US$7.4/bbl in 2017 as crude premium remains low and demand elasticity surprises. For 2018-2019, the refining margin keep rising in lower level at 5% from the base case. (Remark: TOP GRM at 7.4$/bbl was happened in Q1- Q2 in 2015 where demand was obviously strong from low oil price)

1.7.3.2 Base case 83.0 THB: refining margin could be strong at US$6.7/bbl in 2017 (we expect upside from Y2016 as the trough was behind, PX spread (PX-ULG95) of US$280/ton in 2017 as additional supply, lube oil margin is expected to be stable as lower global capacity addition.

1.7.3.3 Bear case 67.5 THB: weaker global economy leads to lower product demand hence it will impact to lower refining margin at cash cost level of US$4.0/bbl in 2017, and declined by 10% of the base case during 2018-2019.

For our scenario analysis through discounted cash flow model valuation could be concluded that in improving demand and limited supply conditions, TOP share price could have an upside 9% from our target price in Bull case since . While, in weaker global economy, the share price could be fallen by 19% from the target price in Bear case.

CHAPTER II
DATA

2.1 TOP Business Structure

Figure 2.1 TOP business structures as of 30 September 2016

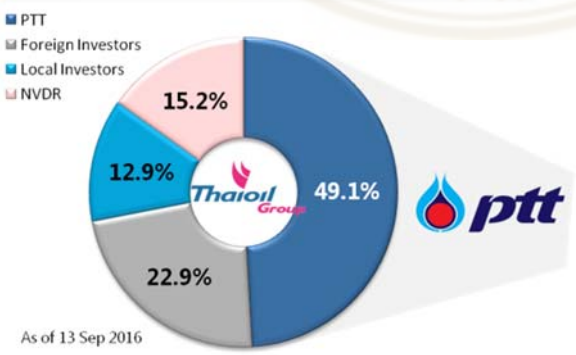

Figure 2.2 TOP Major Shareholder

Thai Oil's strong shareholder base	
Stock Quote (SET)	TOP
No. of share listed (shares)	2,040,027,873
Free float (%)	50.05%

Figure 2.3 % Free-float

Table 2.1 Board of directors

The Board of Directors as of December 31, 2015 Comprised of:

Name - Surname	Position	Appointment Date
1. Mr. Kurujit Nakornthap	Director Chairman of the Board	September 12, 2014 September 26, 2014
2. Mr. Chulasingh Vasantasingh	Independent Director Member of the Audit Committee Chairman of the Audit Committee	April 3, 2015 (Re-elected) April 24, 2015 May 11, 2015
3. Ms. Chularat Suteethorn	Independent Director Member of the Audit Committee	April 3, 2015 (Re-elected) April 24, 2015
4. Mr. Siri Jirapongphan [1]	Independent Director Member of the Audit Committee	October 30, 2015 October 30, 2015
5. Gen. Jiradej Mokkhasmit	Independent Director Member of the Nomination and Remuneration Committee Chairman of the Nomination and Remuneration Committee	April 2, 2013 (Re-elected) April 26, 2013 April 10, 2014
6. Mr. Thaworn Phanichaphan	Independent Director Member of the Nomination and Remuneration Committee Member of the Corporate Governance Committee	April 2, 2013 (Re-elected) April 25, 2014 May 29, 2015
7. Mr. Thosaporn Sirisumphand	Independent Director Member of the Nomination and Remuneration Committee Chairman of the Corporate Governance Committee	April 3, 2015 (Re-elected) April 24, 2015 July 22, 2015
8. Mr. Yongyut Jantararotai	Director Member of the Corporate Governance Committee	April 2, 2014 April 25, 2014
9. Mrs. Sriwan Eamrungroj [2]	Director	September 25, 2015
10. Mr. Tanasak Wahawisan	Independent Director	May 29, 2015
11. Mr. Nuttachat Charuchinda	Director Member of the Nomination and Remuneration Committee Member of the Risk Management Committee Chairman of the Risk Management Committee	April 2, 2013 (Re-elected) January 24, 2014 September 25, 2015 October 12, 2015
12. Mr. Thammayot Srichuai	Director Member of the Risk Management Committee	April 3, 2015 September 25, 2015
13. Mr. Noppadol Pinsupa [2]	Director Member of the Risk Management Committee	September 25, 2015 September 25, 2015
14. Mr. Atikorn Terbsiri [3]	Director Member of the Risk Management Committee Chief Executive Officer and President Secretary to the Board of Directors	April 3, 2015 (Re-elected) April 3, 2015 September 26, 2014

2.2 SWOT Analysis

2.2.1 Strengths

2.2.1.1 Thailand's largest and one of the region's most advanced and competitive refineries: Thai Oil has refining nameplate capacity of approximately 275,000 bpd of crude oil and other feedstock as of representing approximately 22% of the total refining nameplate capacity in Thailand of 1,251,500 bpd, according to the EPPO.(Largest in Thailand). Thai Oil refinery, which is integrated with petrochemical platform, is one of the most complex refineries in the Asia-Pacific region, with an average complexity of 9.8 based on our internal estimates using the methodology of the Nelson Complexity Index. The Nelson Complexity Index measures a refinery's upgrading capability, with the ratio representing the complexity of barrels divided by crude distillation nameplate capacity. Thai Oil plants have the ability to process a variety of crude and feedstock, reducing our dependence on any given type of feedstock. This allows them to achieve efficient production, thus minimizing both logistics costs and product wastage throughout the production chain.

Thai Oil also benefit from their ability to produce higher value-added petrochemical products instead of selling those products in their intermediate stage at lower margins to the market. For example, they have been able to utilize the platformate generated in the oil refinery to produce petrochemical products, including paraxylene and benzene during periods where the market prices for such products yielded higher margins than other products. While their various units and plants are integrated with each other, they can also operate independently, allowing them the ability to adjust their production proportions according to market conditions, as well as to more efficiently manage their maintenance schedules to minimize the impact to their operations. They have three CDUs, which allow them to co-ordinate the maintenance of the CDUs without needing to halt their refining process. Therefore, their plants have been able to maintain higher utilization rates than other plants in the market. For example, the capacity utilization rate of their refinery was 101.8%, 97.9%, and 107.5% for the years ended December 31, 2013, 2014, and 2015, respectively.

2.2.1.2 Diversified earnings through integration with, and significant contribution from, their subsidiaries: in order to diversify their business beyond oil petroleum refining, which is heavily affected by commodity pricing, they have expanded their operations to a broad range of downstream products including petrochemical products, lube base oil and its by-products, solvent products, surfactants and ethanol, and related derivative products which in many cases enjoy higher profit margins. The diversification enables them to reduce their dependence on any one product. This allows them to reduce earnings volatility and increase operating margins. In addition, they have also invested in support businesses, including marine and pipeline transportation, power production and energy services.

2.2.1.3 Strategic relationship and operational integration with PTT as the Group's principal refiner: PTT, a Thai state-owned entity and Thailand's national oil company, is a long-term shareholder with a 49.1% interest in the Company. PTT purchases a substantial portion of its requirements at prevailing market prices from them. Thai Oil is the PTT Group's principal refiner. PTT's dual role as their major shareholder and key business partner has resulted in a mutually beneficial business partnership covering, amongst others, crude oil production and product offtake. They also enjoy operational synergies as part of the PTT Group, including the reduction of freight costs in the purchase of larger quantities of crude oil and other feedstock and the transfer of knowledge and shared services. They are also able to take advantage of PTT's expertise and contacts. For example, they have been able to obtain crude oil that is originally derived from sources which would otherwise not be available to them.

2.2.1.4 Strategic location with competitive advantages in access to key markets: the refinery plants are located within the Sriracha Complex. Their SBM provides direct access to deep water ports, and the ability to receive crude oil and other feedstock directly from VLCC, thereby enabling them to reduce freight costs and increase feedstock offloading efficiency. This strategic location provides them with key competitive advantages as it puts them in close proximity with the key domestic markets such as Bangkok, and a number of their key suppliers and customers in other parts of Thailand. They also enjoy available connections to delivery networks such as multi-product pipelines, including Thappline, a major pipeline operator, which transports a

substantial portion of their products. This allows them to minimize feedstock and product transportation costs, enabling them to receive feedstock from their suppliers and deliver end-products to their customers in a timely and cost-effective manner.

2.2.1.5 Industry with high barriers to entry and strong market positioning: although there are no regulatory barriers preventing new entrants from entering the Thai refining market, the significant investments required in the construction of a new refinery, as well as the long lead times which would be required before the new refinery becomes operational, means that the oil refinery industry is one with high natural barriers to entry. Furthermore, they distribute their products to various long term customers under long term contracts, including PTT, with whom they have guaranteed off take arrangements. Their long-term customers and off take relationships place them in an advantageous position compared with any new competitors.

2.2.1.6 Technological superiority, logistical advantages & cost leadership: their technological superiority; actively partner with industry leaders and pursue their own research and development initiatives to improve their technologies. They have collaborated with the Petroleum and Petrochemical College ("PPC") and Chulalongkorn University to establish research and development center located in the PPC. One of their R&D initiatives helped them improve their operations. For example, they successfully improved the preheat train mechanism for their CDU-3 based on results from their R&D projects. Their logistical advantages provided by our wholly-owned subsidiary, Thaioil Marine as their marketing arm. Thaioil Marine owned four oil product and petrochemical tankers with a combined capacity of 48,850 deadweight tons. They also operate other oil and chemical transportation units through their other subsidiaries and joint ventures, such as TOP Maritime and Thaioil Marine International Pte.Ltd. It aims to become a fleet leader for PTT Group and in Asia to support the growing petroleum and petrochemical market by expanding our fleet size which will provide them with logistical advantages over their competitors. In addition, as Thai Oil is fully integrated refinery with petrochemical and lube base, they can operate as an optimization among each unit. Their feedstock slate is more flexible than those of their competitors' that have less complex refineries and plants. Their refinery and production units are therefore able to take advantage of more cost-effective feedstock, as well as changes in market conditions, and they are able to benefit from optimization of their product mix

and incremental gross margin opportunities for their refinery and production units. While they are able to share their costs and lower their cost required to process each barrel of feedstock. Their average integrated cash costs were US$2.2/bbl as of nine month 2016.

2.2.1.7 Highly experienced management team: their senior management team is highly experienced and has a proven track record in the refining and petrochemical related industries. The most senior members of their executive management as of December 31,2015, Mr. Atikom Terbsiri, Mr. Mitri Reodacha, Mr. Somchai Wongwattanasan, Mr. Kosol Pimthanothai, Mr. Chatapong Wungtanagorn, Ms. Pattaralada Sa ngasang, Mr. Surachai Saengsamran, Mr. Bandhit Thamprajamchit and Mr. Viroj Meenaphant, have an average of over 30 years of experience in the Thai refinery and petrochemical related industries and within the PTT Group.

2.2.1.8 Strong financial profile: Thai Oil liquidity is supported by solid cash flow generation and good access to capital markets and banks. They generated EBITDA of THB25,491.7 million (US$740.2 million) and THB 22,590.2 million for the years ended December 31,2015 and nine month ended September 30, 2016 respectively. As of September 30, 2016, 84.3% of their total debt was in the form of debentures with an outstanding principal amount of THB 62,647.0 million (US$1,796.3 million) while 15.7% was in the form of long-term borrowings with an outstanding principal amount of THB11,727.0 million (US$336.3 million). Short-term borrowings of THB 1,184.0 million (US$33.9 million) accounted for 1.6% of our total debt, while about 72.3% of the debt had a maturity beyond five years as of September 30, 2016.They held cash and current investments of THB 56,425.0 million (US$1,617.7 million) as of September 30, 2016 compared with THB 7,967.2 million (US$228.0 million) of debt maturing by September 30, 2017. Their EBITDA interest coverage ratio, where interest coverage is equal to EBITDA for any period divided by finance costs during such period, stood at 8.9 times as of September 30, 2016 . Thai Oil adopt a conservative treasury policy of capping net debt divided by EBITDA at under 2.0 times and net debt divided by equity at under 1.0 times. Net debt, or total interest bearing debt net of cash and cash equivalents and current investments, divided by EBITDA stood at 0.7 times as of September 30, 2016. Net debt divided by equity stood at 0.2 times as of September 30, 2016

2.2.2 Weakness

2.2.2.1 Single-site refinery presents operating risk: Thai Oil plants as a single-site refineries are located in the same area of Sriracha. This is classified as an operating risk, if there's extremely hazardous events happened in that site, it may affect to the whole business of the refining company. However Thai Oil can partially close some risk of having 3 CDUs (Crude Distillation Unit) allowing them to take turn for shut down operation that will less effects to the company.

2.2.2.2 Volatile industry, exposure to inherent volatility in the refining and petrochemical markets: cyclicality in the refining and petrochemical industries may result in reduced volumes or operating margins, and volatile margins in the refining and petrochemical industries and uncertainty regarding the global economic recovery could have a material adverse effect on them in the future. Moreover fluctuations in market prices of crude oil and other feedstock, as well as refined petroleum products or petrochemical products, may affect their results of operations.

2.2.2.3 Limited staff competent in news business: they may not be successful in developing new businesses, including our ethanol, starch, biogas or such start-up business. The start-up and initial operations of new production plants are typically affected by adjustment and other operational challenges which can delay the commencement of full production, require production slowdown or shut downs, and result in higher than expected production costs. The risk that any of these circumstances may occur is higher where, as in our case, we have limited trained staff and management with experience in the ethanol, starch, biogas, whether on our own or together with joint venture partners.

2.2.2.4 Heavily dependent on their relationship with PTT as their supplier, customer and major shareholder: any changes in these relationships may materially and adversely affect Thai oil as PTT is their largest customer by revenue, accounting for 49.2% of total sales revenue in the nine month ended September, 2016. As a result, they will be affected by a reduction in or loss of sales to PTT or changes in its financial condition or operations. However Thai Oil have entered into the the product offtake and crude oil supply agreement (the "POCSA") with PTT. The POCSA does not contain a termination date but may be terminated after July 2024, in addition to other

causes, by either party with 12 months prior written notice of termination to the other party.

2.2.2.5 Capital intensive business and their expansion plans have significant capital expenditures and financing requirements, which are subject to a number of risks and uncertainties: the refining and petrochemical industries are capital intensive. Their ability to maintain and increase their revenues and net profits is partially dependent upon continued capital spending, including investing in, constructing, upgrading and maintaining their facilities. In addition, they continuously monitor developments in the refining and petrochemical products markets in Thailand, Southeast Asia, East Asia and elsewhere for opportunities to expand into new businesses or invest in derivative uses of their refinery and petrochemical production. Any future expansion of their business, including their planned expansion projects, will require additional capital expenditures, which may be substantial.

2.2.2.6 Feedstock supply dependency: Thai Oil is dependent on foreign sources for their supply of crude oil and other feedstock, in particular from the Middle East, and any disruption in their supply of crude oil and other feedstock could reduce their margins and materially adversely affect their results of operations. The supply of imported crude oil and other feedstock is subject to a variety of factors that are beyond their control, including the political developments and instability in petroleum producing regions, in particular in the Middle East, government regulations with respect to oil and energy industries in those regions, import tariffs and other restrictions, weather conditions and overall economic conditions in those regions.

2.2.3 Opportunities

2.2.3.1 Growing AEC and CLMV oil markets so we can enhance growth through geographic expansion to develop new markets and collaboration with our customers: according to growing oil demand in AEC and CLMV countries shown in the graph (Figure 2.4 AEC Oil Demand Growth), it's clearly seen that AEC oil demand growth is expected to grow approximately grow rate at 6% p.a. in the future while CLMV oil demand growth is expected to be approximately 2-3% p.a. It is a great opportunities for Thai oil to take advantages of the strong growth prospect in the AEC market. Moreover for the CLMV market, Thai Oil exports their petroleum products to

the market accounting for around 9% of total petroleum sales volume. Thai Oil also intend to expand the sales of their products into Indochina where they believe their geographical location provides them with an advantage over other exporters in the region, and into China and other developing markets to capture the high demand for lube base oil and solvent products.

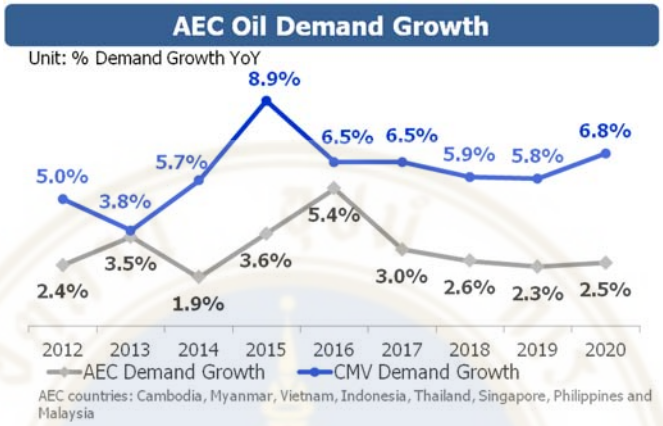

Figure 2.4 AEC Oil demand growth

2.2.3.2 Specialties/Value chain enhancement: the company seeks to expand their product offerings across their business unit to diversify their existing operations from petroleum refining which is heavily affected by commodity pricing and to introduce new products with higher margins into their product mix. This will enhance their competitiveness by improving their ability to adapt to future developments in product demand, as well as further integrating their refinery and petrochemical units, while potentially providing them with higher returns from new attractive products. Examples of such prospective products include cleaner petroleum oil products that comply with the Euro IV standards, higher-quality lube base oil, specialty lube base by-products e.g. paraffin wax, modified asphalt and TDAE which occupy niche markets etc., green solvents, specialty solvent and ethanol derivatives.

2.2.3.3 PTT group synergy & other partnership: Thai Oil always seeks opportunity to co-operate with PTT group and others such as to work with their plans to expand retail markets activity into new geographical areas such AEC and Indochina, to co-operate with the PTT Group to develop specialty solvents products to capture the rapid growth in demand for such products in Asia and opportunities of doing joint investment in a transport and logistics system development.

2.2.3.4 M&A / International investment

2.2.4 Threat

2.2.4.1 Surplus supply and pressured demand: this will deteriorate overall refining margin resulting in narrowing profit of the company. However the players who have lean operating cost will be the one who have got less impact and finally will be the last man standing in the business. Thus Thai Oil always takes it seriously to maintain their low competitive cash cost in order to remain competitive in the business. In addition, it is unable to predict with certainty future supply and demand balances, market conditions and other factors that may affect operating margins. The company may reduce production at or leave idle a facility or a particular unit at a facility for an extended period of time, discontinue a product line because of an oversupply of a particular product and/or a lack of demand for that particular product, or high feedstock prices that make production uneconomical, which may have a material adverse effect on our results of operations.

2.2.4.2 New world scale / Competitive refineries: although there's no refineries expansion in Thailand, it's not the case for regional refineries and global refineries keep upgrading and expanding refining capacities being competitive in the market. For example, regional peer refinery like S-Oil is in the process of upgrading their units; RFCC & Olefin downstream. It's on track with its original commissioning start-up in 1H18. That will deliver the company accretive growth after the structural enhancement of its earnings power via its upgrading unit. Accordingly, if Thai Oil does nothing, the company will fall behind it peers and will lose competitive advantages in the market.

2.2.4.3 Rapid technology change: Renewable/EV: rapid technology changes for example; increasing renewable energy such wind energy, hydro power, fuel from ethanol, electrical vehicle, etc. could adversely impact to oil demand; demand from fossil. However the company always takes these threats in to their consideration and put this into one of their longer term concerns rather than short term concerns in the company strategic thinking session. Referring to their study, they still believe that oil remains the primary energy in coming decades; the majority of liquid fuels is used in transportation while oil demand from industrial sector continues to show a steady growth in the next 20 years. (Figure 2.5 Long term energy demand by type and by sector)

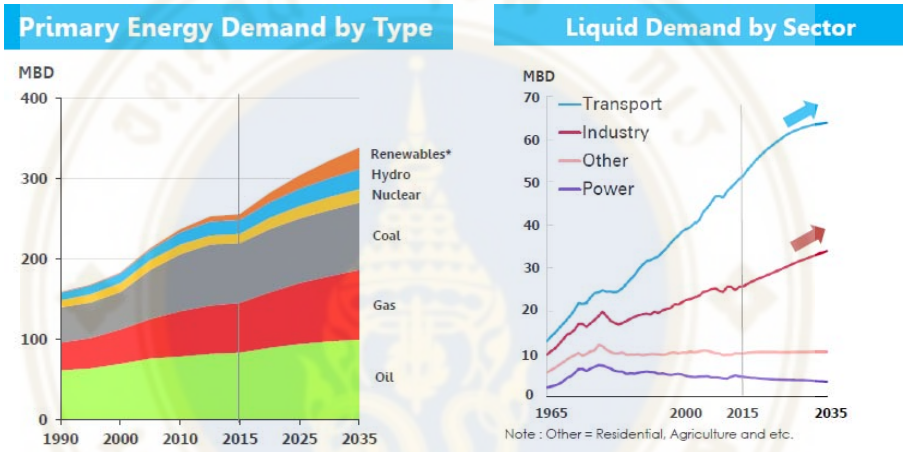

Figure 2.5 Long term energy demand by type and by sector

They see an impact of EV demand will not be adversely affected in short term as well because there will be many key success factors of EV adoption i.e. "technological readiness must happen": it's not only the battery cost but also the charging infrastructure and driving range would be the key issues, "Government must support it": governments must offer incentives to lower the costs of EV and also emission standards, and "Consumer Behavior": consumer trend for disruptive innovation. Accordingly, they expect EV adoption will displace oil around 2 MBD in 2030, while EV market shares will account for 35% of the total new car sales. Gasoline will be most displaced by EVs (87%) as the majority of light-duty passenger vehicles use gasoline engines.

2.2.4.4 Environmental and law changes: due to the nature of our business, they are subject to extensive and increasingly stringent environmental codes,

rules, laws and regulations, both domestic and international. Some of these laws and regulations require their facilities to operate under permits, licenses, authorizations or certificates that are subject to renewal or modification. Any amendments or modifications to these laws and regulations and permits may require them to install pollution control equipment and to implement changes to their operations to limit the impact or potential impact on the environment, health and safety. A violation of these laws, codes, rules and regulations or permit conditions can result in substantial fines, criminal sanctions, permit revocations and facility shutdowns.

Changes to environmental laws and regulations, their interpretations or enforcement may require them to make additional capital expenditures or incur additional operating expenses in order to maintain their current operations, curtail their production activities or take other actions that could have a material adverse effect on our financial condition, results of operations and cash flow. In addition, they may be unable to sell any refined petroleum or other products if they fail to meet new specifications. If they fail to meet environmental requirements, they may also be subject to administrative, civil and criminal proceedings by governmental authorities, as well as civil proceedings by environmental groups and other individuals, which could result in substantial fines and penalties and perhaps it could limit or halt our operations. These changes could also limit the availability of their funds for other purposes, which could adversely affect their business, financial condition, results of operations and cash flows.

2.3 Five Forces Analysis

2.3.1 Supplier Powers (High)

2.3.1.1 Feedstock supply dependency: Thai Oil is dependent on foreign sources for their supply of crude oil and other feedstock, in particular from the Middle East, and any disruption in their supply of crude oil and other feedstock could reduce their margins and materially adversely affect their results of operations. The supply of imported crude oil and other feedstock is subject to a variety of factors that are beyond their control, including the political developments and instability in petroleum producing regions, in particular in the Middle East, government regulations

with respect to oil and energy industries in those regions, import tariffs and other restrictions, weather conditions and overall economic conditions in those regions.

2.3.1.2 Volatile industry; fluctuation in market prices of crude oil and other feedstock: cyclicality in the refining and petrochemical industries may result in reduced volumes or operating margins, and volatile margins in the refining and petrochemical industries and uncertainty regarding the global economic recovery could have a material adverse effect on them in the future. Moreover fluctuations in market prices of crude oil and other feedstock, as well as refined petroleum products or petrochemical products, may affect their results of operations. Historically, the refining and petrochemical industries have experienced alternating periods of tight supply, resulting in increased prices and profit margins, followed by periods of substantial capacity addition, resulting in oversupply and reduced prices and profit margins. Their financial results are primarily dependent on factors beyond their control which affect the margins between the prices of their refined petroleum, petrochemical and lube base oil products and the cost to acquire crude oil and other feedstock. Future volatility may negatively affect their results of operations, since the margin between products and feedstock prices may decrease below the amount needed for them to generate net cash flow sufficient for their needs.

2.3.2 Buyer Power (Moderate)

2.3.2.1 Heavily dependent on their relationship with PTT: as their major customer, supplier and major shareholder but all the price are taken place at market price. Any changes in these relationships may materially and adversely affect Thai oil as PTT is their largest customer by revenue, accounting for 49.2% of total sales revenue in the nine month ended September, 2016. As a result, they will be affected by a reduction in or loss of sales to PTT or changes in its financial condition or operations, if PTT is unable to purchase their products, or otherwise ceases or suspends its purchases, and they cannot find other customers to offtake those quantities in bulk, our revenues, margins and cash flows may be adversely affected. However Thai Oil have entered into the the product offtake and crude oil supply agreement (the "POCSA") with PTT. The POCSA does not contain a termination date but may be terminated after July 2024, in addition to other causes, by either party with 12 months

prior written notice of termination to the other party. In addition all volume taken by PTT under POSCA is based on market price.

2.3.2.2 Thai Oil depends on a small number of customers for a significant portion of their net sales. However, Thai Oil is the only one refinery who could produce on-spec unleaded gasoline octane 95. They sell refined petroleum products domestically to other major oil companies, including Bangchak (BCP), Shell Thailand and Chevron, as well as other independent oil wholesalers and offtake customers such PTG Energy Public Company Limited and Susco Public Company Limited, and domestic jobbers (including independent wholesalers and petrol stations). As a result of their dependence on this small number of customers, they may be affected by changes in their financial condition or operations or their demand for their products. However they have supported the growth of other independent offtake customers to capture the growing demand in Thailand and such offtake customers continue to be a growing portion of their sales. They also seek to expand their customer base both in the domestic and international markets, including traders and end users, to accommodate sales fluctuations to their major offtake customers. However Thai Oil is the only one refiner who could produce on-spec unleaded gasoline octane 95, customers need to rely on the company's product otherwise they need to import those product to sell in their distribution channel.

2.3.3 Competitive Rivalry (High)

2.3.3.1 The refining, petrochemical and lube base oil industries are highly competitive: the refining industry is highly competitive with respect to the sale of refined petroleum products in the Thai domestic, regional and global markets. Their principal competitors include other major domestic petroleum refiners (7 major refiners in Thailand, Thai Oil is the largest one) as well as other global refiners who export products into the regional and domestic markets in the refined petroleum products business. They compete for available supplies of crude oil and other feedstock and for outlets of their refined petroleum products. Domestic petroleum refiners, including Thai Oil, increased refining capacity in the 1990s and the 2000s without a corresponding increase in demand for refined petroleum products, which has resulted in overcapacity for several major refined petroleum products. Currently, there is an excess supply in the

Thai domestic market of certain refined petroleum products, such as gasoline, diesel, jet and fuel oil, petrochemical products, such as paraxylene and benzene, and lube base oil products. Continued imbalance in the supply and demand for certain refined petroleum, petrochemical and lube base oil products in the domestic market could cause pricing pressure in the domestic market and force suppliers, including Thai Oil, to sell their excess production in the traditionally lower margin export markets, which may have a material adverse effect on their operating margins and results of operations.

Thai Oil do not have any retail business and therefore are dependent upon others to sell their refined petroleum, petrochemical and lube base oil products into the retail market. Three of Their domestic competitors have both refining and marketing operations and may be better positioned to sell their products in the domestic market. Some of thier competitors who sell into the markets to which they export may be able to drive down product prices if they have costs lower than Thai Oil and their export quantities are sufficiently large to influence market prices. Furthermore, some of thier competitors may have greater financial, technological and other resources than Thai Oil, and may be in a better position to withstand changes in market conditions.

2.3.4 Threat of Substitution (Moderate)

2.3.4.1 Rapid technology change: Renewable/EV: rapid technology changes for example; increasing renewable energy such wind energy, hydro power, fuel from ethanol, electrical vehicle, etc. could adversely impact to oil demand; demand from fossil. However the company always takes these threats in to their consideration and put this into one of their longer term concerns rather than short term concerns in the company strategic thinking session. Referring to their study, they still believe that oil remains the primary energy in coming decades; the majority of liquid fuels is used in transportation while oil demand from industrial sector continues to show a steady growth in the next 20 years. They see an impact of EV demand will not be adversely affected in short term as well because there will be many key success factors of EV adoption i.e. “technological readiness must happen”: it’s not only the battery cost but also the charging infrastructure and driving range would be the key issues, “Government must support it”: governments must offer incentives to lower the costs of EV and also

emission standards, and “Consumer Behavior”: consumer trend for disruptive innovation. Accordingly, they expect EV adoption will displace oil around 2 MBD in 2030, while EV market shares will account for 35% of the total new car sales. Gasoline will be most displaced by EVs (87%) as the majority of light-duty passenger vehicles use gasoline engines.

2.3.5 Threat of New Entry: (Moderate)

2.3.5.1 New world scale/ Competitive refineries: although there’s no refineries expansion in Thailand, it’s not the case for regional refineries and global refineries keep upgrading and expanding refining capacities being competitive in the market. For example, regional peer refinery like S-Oil is in the process of upgrading their units; RFCC & Olefin downstream. It’s on track with its original commissioning start-up in 1H18. That will deliver the company accretive growth after the structural enhancement of its earnings power via its upgrading unit. Accordingly, if Thai Oil does nothing, the company will fall behind it peers and will lose competitive advantages in the market.

2.3.5.2 Capital intensive business and their expansion plans have significant capital expenditures and financing requirements, which are subject to a number of risks and uncertainties. The refining and petrochemical industries are capital intensive. Their ability to maintain and increase their revenues and net profits is partially dependent upon continued capital spending, including investing in, constructing, upgrading and maintaining their facilities. In addition, they continuously monitor developments in the refining and petrochemical products markets in Thailand, Southeast Asia, East Asia and elsewhere for opportunities to expand into new businesses or invest in derivative uses of their refinery and petrochemical production. Any future expansion of their business, including their planned expansion projects, will require additional capital expenditures, which may be substantial.

2.4 Corporate Governance and Management Practices

2.4.1 Corporate Governance

The company implement new principles and practices to improve corporate governance from time to time. They have corporate governance principles that apply to directors and employees. The principles of good corporate governance are generally based on the principles of good corporate governance established by the SET and the Thai SEC and address a wide range of matters, including establishing procedures and requirements relating to the following:

- Duties, responsibilities, qualifications and ethics with respect to the board of directors;
- Responsibilities to shareholders, employees, society and the environment;
- Relationships with customers, trading partners, and competitors;
- Codes of conduct for executives and employees;
- Internal controls and risk management; and
- Information disclosure and transparency.

The principles of good corporate governance also set out their policies and guidelines on matters relating to marketing communications, intellectual property, health, safety and environment, human rights, anticorruption and bribery, internal controls, conflict of interests, confidentiality, connected transactions, use of information technology system and good procurement practices.

2.4.2 Management Practices

The company have adopted a management code of conduct which outlines certain management practices, focusing on good management and responsibility to our shareholders. They have systems to implement management practices and committees at the operational level to implement and review these systems. They have also implemented an employee's code of conduct which outlines their various policies, systems and committees to fulfill responsibilities to different stakeholder groups, namely, our shareholders, business partners, competitors and creditors, employees, society and the environment and the Government and associated organizations.

2.4.3 Awards and Recognitions

The company have received numerous awards and recognitions both internationally and domestically. they were awarded, amongst others, the Strongest Adherence to CG Award at the 4th Annual Southeast Asia Institutional Investor Corporate Award event for 2014, based on a survey of investors and analysts of leading Southeast Asian companies conducted by Alpha Southeast Asia, a leading publication on international finance and investment, the Assets Excellence in Management and Corporate Governance Awards 2014 (Platinum Level) from The Assets, Asia's leading finance journal, and Asia's Outstanding Company on Corporate Governance Award for two consecutive years, from the Corporate Governance Asia. Domestically, they received the SET Award of Honor for CG and Corporate Social Responsibility with continued excellence (2012-2014) at the SET Awards 2014 event, rated "Excellent" in the category of Corporate Governance Report of Thai Listed Companies 2014 for six consecutive years, presented by the Thai Institute of Directors and we are one of the 19 Thai listed companies to undergo assessment for outstanding corporate governance practices under the ASEAN CG Scorecard criteria.

2.5 Income Statement

Table 2.2 Income Statement including projections

Year to 31 Dec (Bt mn)	2012	2013	2014	2015	2016F	2017F	2018F	2019F	2020F
Sales	**447,432**	**414,599**	**390,090**	**293,569**	**246,378**	**296,617**	**321,704**	**321,222**	**335,176**
Cost of Goods Sold	432,312	397,556	394,170	273,819	221,998	274,348	297,098	298,261	311,551
Gross Profit	**15,119**	**17,043**	**(4,080)**	**19,750**	**24,380**	**22,269**	**24,605**	**22,962**	**23,624**
Operating Expenses	2,631	2,582	2,641	3,207	2,692	3,240	3,514	4,216	3,662
Operating Profit	**12,488**	**14,461**	**(6,722)**	**16,543**	**21,689**	**19,028**	**21,091**	**18,745**	**19,962**
Interest Expense	2,343	3,786	3,966	3,435	3,219	3,354	3,026	2,930	2,694
Net Investment Income/(Loss)	963	1,825	2,848	2,201	726	741	756	771	786
Net other Non-op. Income/(Loss)	1,350	2,623	2,085	1,546	1,298	1,562	1,694	1,728	1,763
Net Extraordinaries (Incl. Minority Interests)	1,651	(3,571)	695	(3,077)	(423)	(431)	(440)	(449)	(462)
Pretax Income	14,109	11,552	(5,060)	13,779	20,071	17,546	20,075	17,866	19,356
Income Taxes	1,789	1,158	(920)	1,597	1,819	2,697	4,103	3,663	3,964
Net Profit	**12,320**	**10,394**	**(4,140)**	**12,181**	**18,252**	**14,850**	**15,972**	**14,203**	**15,392**
EBITDA	20,478	23,131	1,896	24,855	30,357	27,961	30,156	27,844	29,096
EPS (Bt)	**6.039**	**5.095**	**(2.029)**	**5.971**	**8.947**	**7.279**	**7.829**	**6.962**	**7.545**

2.6 Balance Sheet

Table 2.3 Balance Sheet including projections

Year as of 31 Dec (Bt mn)	2012	2013	2014	2015	2016F	2017F	2018F	2019F	2020F
Total Assets	**170,676**	**209,602**	**193,607**	**192,166**	**200,582**	**204,341**	**212,071**	**214,721**	**222,452**
Current Assets	100,382	126,876	95,464	90,490	96,176	102,448	114,848	121,859	134,004
Cash & ST Investments	28,322	43,815	46,483	53,129	58,621	57,478	66,389	72,877	82,929
Inventories	40,004	48,509	28,533	18,883	19,221	23,754	25,724	25,824	26,975
Accounts Receivable	27,090	28,746	16,141	14,177	12,722	15,316	16,611	16,586	17,307
Others	4,966	5,806	4,307	4,302	5,612	5,901	6,124	6,571	6,794
Non-current Assets	70,295	82,726	98,143	101,676	104,406	101,892	97,223	92,863	88,447
LT Investments	2,287	13,460	14,056	14,356	14,356	14,356	14,356	14,356	14,356
Net fixed Assets	64,864	65,609	79,120	83,258	86,112	83,061	78,535	74,009	69,482
Others	3,144	3,657	4,968	4,062	3,938	4,475	4,332	4,498	4,609
Total Liabilities	**79,953**	**113,681**	**105,763**	**95,157**	**93,534**	**89,126**	**88,072**	**82,910**	**82,175**
Current Liabilities	35,171	49,576	35,635	18,192	23,769	21,485	25,615	21,714	25,514
Accounts Payable	26,615	31,554	17,811	12,053	12,106	14,961	16,201	16,265	16,990
ST Borrowings	4,635	13,478	12,836	1,787	7,613	2,537	5,597	1,673	4,949
Others	3,921	4,543	4,988	4,352	4,050	3,987	3,816	3,775	3,575
Long-term Liabilities	44,781	64,105	70,128	76,965	69,765	67,641	62,457	61,197	56,661
Long-term Debts	42,162	61,385	67,265	73,719	66,519	64,395	59,211	57,951	53,415
Others	2,619	2,721	2,863	3,246	3,246	3,246	3,246	3,246	3,246
Shareholders' Equity	**90,724**	**95,921**	**87,844**	**97,009**	**107,047**	**115,215**	**123,999**	**131,811**	**140,277**
Common Stock	20,400	20,400	20,400	20,400	20,400	20,400	20,400	20,400	20,400
Capital Surplus	6,344	6,669	6,930	7,193	7,193	7,193	7,193	7,193	7,193
Retained Earnings	63,979	68,851	60,514	69,416	79,454	87,622	96,406	104,218	112,684

2.7 Statement of Cash Flow

Table 2.4 Statement of Cash Flow including projections

Year to 31 Dec (Bt mn)	2012	2013	2014	2015	2016F	2017F	2018F	2019F	2020F
Operating Cash Flow	**23,049**	**16,131**	**24,433**	**31,708**	**25,180**	**17,596**	**20,923**	**21,074**	**21,193**
Net Profit	12,320	10,394	(4,140)	12,181	18,252	14,850	15,972	14,203	15,392
Depreciation & Amortization	6,640	6,047	6,533	6,766	7,370	7,370	7,370	7,370	7,370
Change in Working Capital	2,392	(5,222)	18,838	5,856	1,169	(4,272)	(2,025)	(12)	(1,146)
Others	1,698	4,913	3,202	6,905	(1,612)	(352)	(394)	(488)	(423)
Investment Cash Flow	**(24,763)**	**(26,242)**	**(20,346)**	**2,530**	**(31,341)**	**(2,837)**	**(11,221)**	**(8,693)**	**(12,731)**
Net CAPEX	(3,850)	(12,330)	(18,666)	(10,830)	(10,224)	(4,320)	(2,844)	(2,844)	(2,844)
Change in LT Investment									
Change in Other Assets	(20,913)	(13,912)	(1,680)	13,360	(21,117)	1,483	(8,377)	(5,849)	(9,887)
Free Cash Flow	**19,199**	**3,801**	**5,767**	**20,878**	**14,956**	**13,276**	**18,079**	**18,230**	**18,349**
Financing Cash Flow	**(5,956)**	**14,954**	**(3,152)**	**(14,711)**	**(9,587)**	**(13,882)**	**(9,311)**	**(11,575)**	**(8,186)**
Change in Share Capital	0	0	0	0	0	0	0	0	0
Net Change in Debt	1,109	28,066	5,238	(4,595)	(1,374)	(7,200)	(2,124)	(5,184)	(1,260)
Change in Other LT Liab.	(7,065)	(13,112)	(8,390)	(10,116)	(8,213)	(6,682)	(7,187)	(6,391)	(6,926)
Net Cash Flow	**(7,670)**	**4,843**	**934**	**19,527**	**(15,748)**	**877**	**392**	**805**	**276**
Beginning Cash	18,129	10,460	15,303	16,237	35,764	20,016	20,893	21,284	22,090
Ending Cash	**10,460**	**15,303**	**16,237**	**35,764**	**20,016**	**20,893**	**21,284**	**22,090**	**22,366**

2.8 Financial Ratios

Table 2.5 Summary of key financial ratios

Year to 31 Dec (Bt mn)	2012	2013	2014	2015	2016F	2017F	2018F	2019F	2020F
Profitability (%)									
Gross Margin	3.4	4.1	(1.0)	6.7	9.9	7.5	7.6	7.1	7.0
Operating Margin	2.8	3.5	(1.7)	5.6	8.8	6.4	6.6	5.8	6.0
EBITDA Margin	4.6	5.6	0.5	8.5	12.3	9.4	9.4	8.7	8.7
Net Profit Margin	2.8	2.5	(1.1)	4.1	7.4	5.0	5.0	4.4	4.6
ROA	7.6	5.5	(2.1)	6.3	9.3	7.3	7.7	6.7	7.0
ROE	14.0	11.1	(4.5)	13.2	17.9	13.4	13.4	11.1	11.3
Stability									
Gross Debt/Equity (%)	51.6	78.0	91.2	77.8	69.3	58.1	52.3	45.2	41.6
Net Debt/Equity (%)	20.4	32.4	38.3	23.1	14.5	8.2	(1.3)	(10.1)	(17.5)
Interest Coverage (X)	7.0	4.1	(0.3)	5.0	7.2	6.2	7.6	7.1	8.2
Interest & ST Debt Coverage (X)	2.4	0.9	(0.1)	3.3	2.1	3.5	2.7	4.5	2.9
Cash Flow Interest Coverage (X)	9.8	4.3	6.2	9.2	7.8	5.2	6.9	7.2	7.9
Cash Flow/Interest & ST Debt (X)	3.3	0.9	1.5	6.1	2.3	3.0	2.4	4.6	2.8
Current Ratio (X)	2.9	2.6	2.7	5.0	4.0	4.8	4.5	5.6	5.3
Quick Ratio (X)	1.7	1.6	1.9	3.9	3.2	3.7	3.5	4.4	4.2
Net Debt (Bt mn)	18,475	31,048	33,618	22,377	15,511	9,454	(1,581)	(13,253)	(24,564)
Per Share Data (Bt)									
EPS	6.0	5.1	(2.0)	6.0	8.9	7.3	7.8	7.0	7.5
EBITDA/Share	10.0	11.3	0.9	12.2	14.9	13.7	1.5	1.4	1.4
DPS	2.7	2.3	1.2	2.7	4.0	3.3	3.5	3.1	3.4
Activity									
Asset Turnover (x)	2.8	2.2	1.9	1.5	1.3	1.5	1.5	1.5	1.5
Days Receivables	22.1	25.3	15.1	17.6	18.8	18.8	18.8	18.8	18.8
Days Inventory	33.8	44.5	26.4	25.2	31.6	31.6	31.6	31.6	31.6
Days Payable	6.2	7.9	4.5	4.4	5.5	5.5	5.5	5.5	5.5
Cash Cycle	49.7	61.9	37.0	38.4	45.0	45.0	45.0	45.0	45.0

Table 2.6 Peer's Key Financial Ratios – as of 30 September 2016

Symbol	Key Financial Ratios					
	D/E (Times)	Net Profit Margin (%)	Return on Asset+ (%)	Return on Equity+ (%)	Fixed Asset Turnover+ (Times)	Total Asset Turnover+ (Times)
BCP *	1.39	3.19	5.99	9.52	3.35	1.58
ESSO *	2.09	-1.26	10.81	29.7	5.31	2.61
IRPC *	1.1	2.85	5.47	10.96	1.58	1.09
PTTGC *	0.58	6.72	7.23	8.82	1.55	0.89
SPRC	0.51	2.99	16.03	21.78	4.03	2.49
TOP *	0.97	4.22	12.63	20.19	3.25	1.38
Industry avg.	1.11	3.12	9.69	16.83	3.18	1.67

Remark : * Consolidated
+ Annualized

2.9 Peer's Comparison-SPRC

2.9.1 Common size Analysis-TOP vs SPRC

2.9.1.1 Income Statement Comparison: based on latest published financial statement of third quarter of 2016, it indicated that from 100% of total revenue, cost of goods sold is the major proportion of refinery business. Comparing with SPRC which is competitor in the same industry, TOP performs better in control its cost of goods sold which is mainly reason for a higher proportion of net income. However, SPRC is better control in selling and general administrative expense as well as depreciation. (Figure 2.6 Income Statement Comparison-TOP vs SPRC)

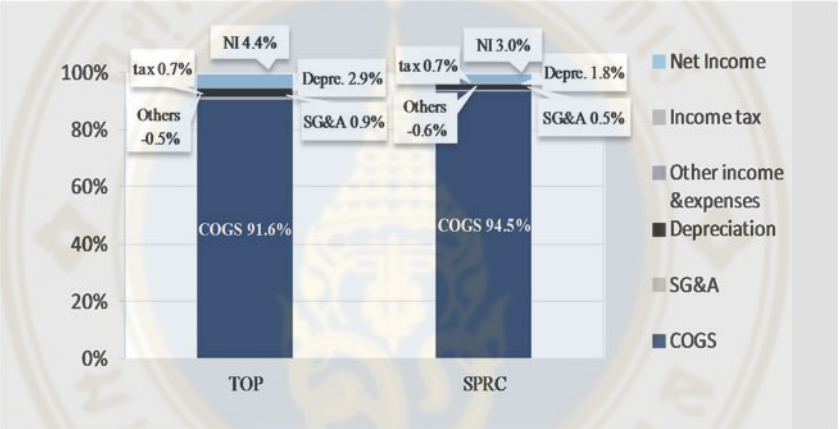

Figure 2.6 Income Statement Comparison -TOP vs SPRC

2.9.1.2 Balance Sheet, asset comparison, since refinery is in capital intensive industry, from 100% of total assets, both firms have highest proportion of property, plant and equipment. The major different is that TOP has higher other

current asset which is mainly from short term investment as well as cash. It is indicated that TOP has more liquidity than SPRC. The lower proportion of inventories and account receivable can imply that TOP is better in managing its working capital.

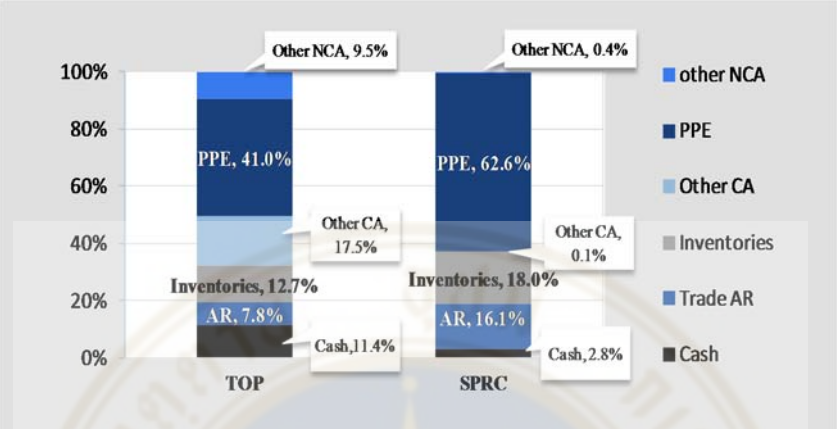

Figure 2.7 Balance Sheet: Asset Comparison-TOP vs SPRC

2.9.1.3 Balance Sheet, liabilities & equity comparison: for capital structure, 100% of source of fund, TOP has higher portion of debt than SPRC. The main different is long term debt of TOP which up to 49.3% had a maturity beyond five years. If we compared with the industries average, (Table 2.6: Peer's Key Financial Ratios – as of 30 September 2016) SPRC has the lowest debt per equity ratio. Meanwhile, TOP is closer to the industry average. However, SPRC has more operating liability which mainly from trade and other payables.

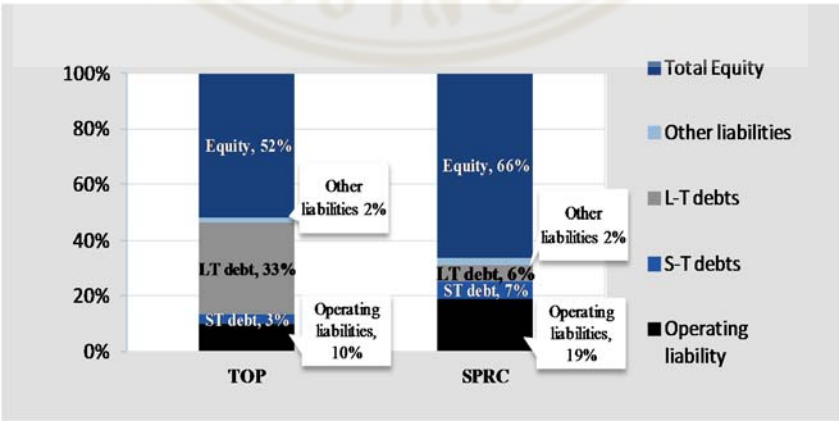

Figure 2.8 Balance Sheet: Liabilities & Equity Comparison-TOP vs SPRC

2.9.2 Trend Analysis-TOP vs SPRC

2.9.2.1 Sales Analysis: the trend of total sale of both companies is declining in the same direction of crude oil price. This is because product prices level moves along with the oil price which directly link to cost of production.

Figure 2.9 Trend Analysis; Sales -TOP vs SPRC

2.9.2.2 Gross Margin Analysis: overall gross profit margin graph demonstrated that TOP generate better gross margin compared with SPRC. However both firms could maintain a relatively good margin, especially when crude oil price declined. This is due to the fact that they benefit from cheaper cost. However, in 2014, both companies had a negative gross margin which mainly due to inventory loss and net realizable value marked down. This is attributable to a dramatically dropped in oil price that lead to a lower inventory price than market price.

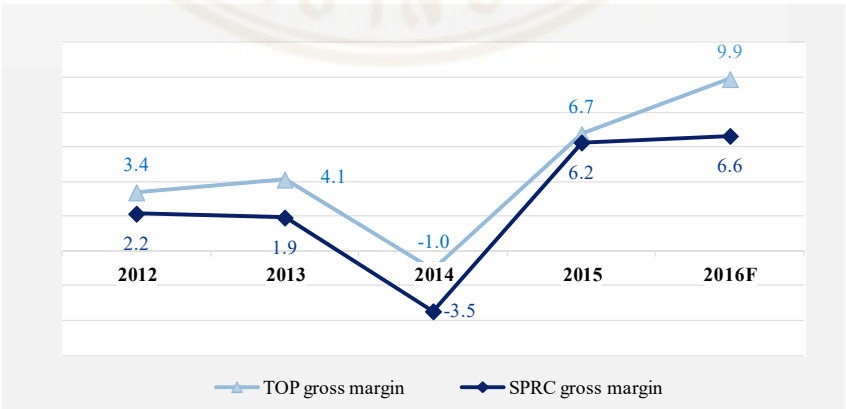

Figure 2.10 Trend Analysis; Gross Margin-TOP vs SPRC

2.9.2.3 Net Profit Margin Analysis: the trend of net profit margin moves in the same direction of gross margin. By overall TOP generate better net profit margin than SPRC. The main expenses of both companies are depreciation and selling and general administrative expenses. For income tax expense, TOP has lower income tax rate compared with SPRC because of tax privilege from investment.

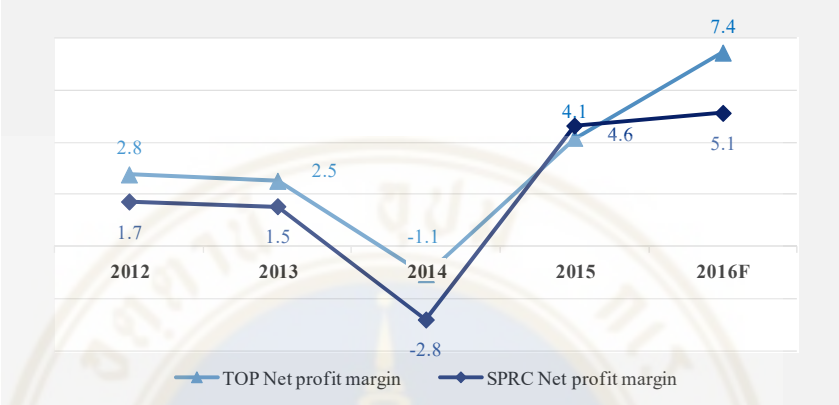

Figure 2.11 Trend Analysis; Net Profit Margin-TOP vs SPRC

2.9.2.4 Return Analysis; ROA: the graph indicated the efficient of management in using asset to generate earnings. After 2014, TOP and SPRC perform better than the past but SPRC tends to perform better than TOP. The fact that downward trend of oil price has affected in reducing product price levels which resulted in working capital, i.e. inventory; account receivable trade to reduce, caused a declining in total asset since 2014. Moreover, cheaper energy cost from lower crude oil price also supported the earnings to increase.

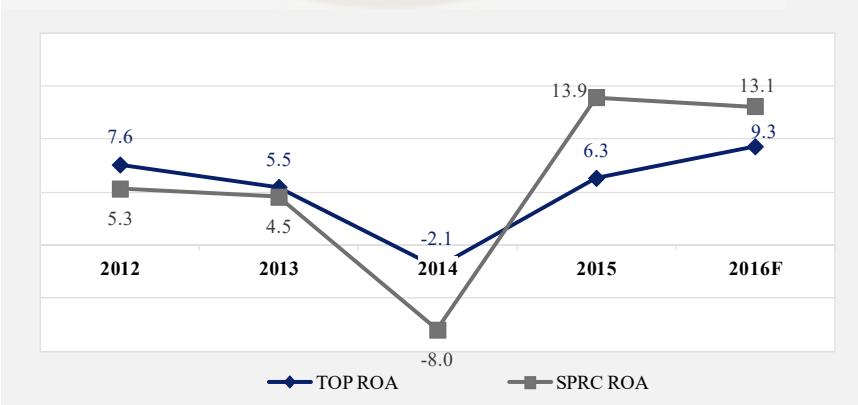

Figure 2.12 Trend Analysis; ROA-TOP vs SPRC

2.9.2.5 Return Analysis; ROE: for return on equity, TOP has higher return on equity than SPRC. This suggests s that TOP has more ability to generate profit without needing as much capital. However, after 2014, SPRC demonstrated greatly improve of its earning comparing with its shareholders' equity.

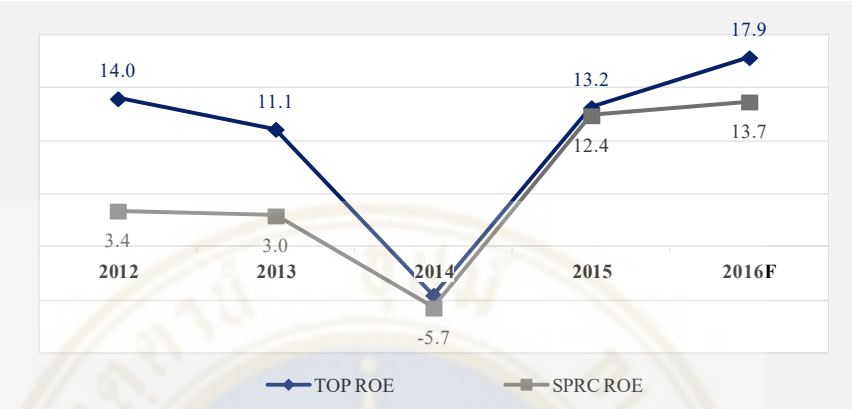

Figure 2.13 Return Analysis; ROE-TOP vs SPRC

2.9.2.6 Risk Analysis; D/E: the mixture of owners' equity and debt to finance operation of TOP and SPRC is contrast. TOP financed by debt more than equity while SPRC financed totally by equity during 2012-2014 and has increased its debt in 2016. As higher debt, TOP is considered as riskier than SPRC. However, it can control debt levels and has ability to meet financial obligation. The interest coverage ratio during 2012-2016 is around 4-7 times.

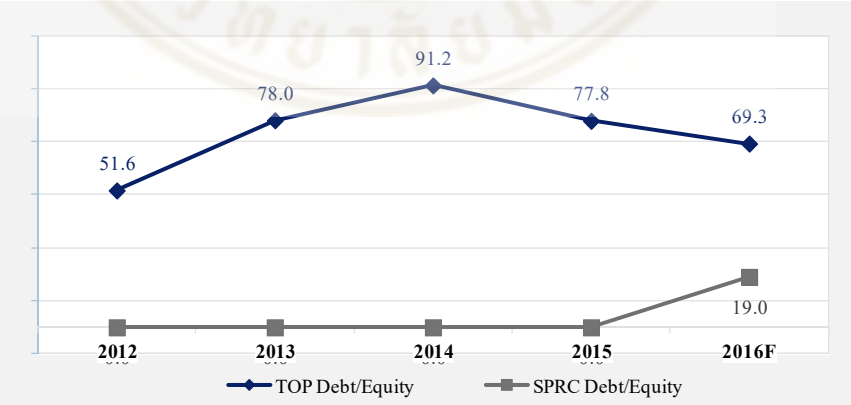

Figure 2.14 Risk Analysis; D/E-TOP vs SPRC

2.10 Regional and Global Peer's Multiples

Table 2.7 Regional and Global Peer's Multiples

Table: Global peers Relative Valuation																		
	Bloomberg	Mkt.	Cap	EV/EBITDA (x)			P/E (x)			P/B (x)			Yield			ROE		
	Ticker	Price	(US$m)	15A	16E	17E	15A	16E	17E	15A	16E	17E	15A	16E	17E	15A	16E	17E
Asia																		
SK Innovation	96770 KS	151,500.00	12,174	6.4	4.5	4.6	14	7.6	7.7	0.8	0.8	0.8	3.2%	3.3%	3.4%	6.0%	11.0%	11.0%
S-Oil	10950 KS	78,500.00	7,724	10.5	6.6	6.6	14.2	7.5	8.2	1.6	1.5	1.5	2.9%	3.8%	4.2%	12.0%	18.0%	20.0%
GSH	78930 KS	51,100.00	4,149	6	7.4	6.4	6.5	6.5	5.7	0.6	0.4	0.5	2.3%	2.3%	2.3%	9.0%	8.0%	8.0%
Caltex Australia	CTX AU	30.73	6,099	7.6	7.5	7.4	12.6	7.4	7.3	2.9	2.9	2.7	3.8%	3.3%	3.5%	24.0%	19.0%	20.0%
FPCC	6505 TT	105.5	31,846	16.4	15.8	16.1	21.2	23.4	24.4	3.8	4.3	3.1	0.8%	3.4%	3.3%	19.0%	17.0%	15.0%
Petron Corp	PCOR PM	10.38	2,010	12.1	7.4	7.2	71.3	14.2	11.4	2.3	2	1.7	0.5%	0.5%	0.5%	3.0%	17.0%	17.0%
BPCL	BPCL IN	669.25	14,492	13.2	6.5	6.2	20.1	11.9	10.9	4.3	3.5	3.1	1.7%	2.3%	2.5%	23.0%	32.0%	25.0%
Hindustan Petro.	HPCL IN	467.25	7,107	18.3	6.9	6.8	31.7	9.7	9.5	3.4	2.7	2.3	1.7%	2.5%	2.5%	11.0%	31.0%	25.0%
Reliance Inds	RIL IN	1,051.20	51,035	13.5	12.1	10.8	14.4	13.5	12.2	1.6	1.4	1.3	1.0%	1.0%	1.1%	11.0%	11.0%	11.0%
IOC	IOCL IN	323.65	23,532	19.8	9.8	7.3	32.0	13.7	9.2	2.3	2.1	1.8	1.0%	2.2%	3.3%	7.0%	15.0%	21.0%
Sinopec Kantons	934 HK	3.65	1,170	11.3	18.9	18.4	8.8	9.8	8.6	1	0.9	0.8	1.4%	1.9%	1.9%	10.0%	9.0%	10.0%
SPC	338 HK	3.96	1,785	2	1.5	1.8	10.9	7.3	8.5	0.6	0.5	0.5	3.0%	4.5%	3.9%	18.0%	24.0%	18.0%
PTT pcl	PTT TB	346	28,229	6.3	6.0	5.5	49.6	10.9	9.0	1.4	1.3	1.2	2.9%	3.2%	3.9%	13.0%	12.0%	14.0%
Thai Oil-L	TOP TB	70	4,079	6.5	5.9	6.0	11.7	8.7	9.8	1.5	1.4	1.2	3.9%	4.8%	4.9%	14.0%	18.0%	16.0%
Star Petroleum	SPRC TB	12.6	1,561	4.8	5.3	5.3	6.3	7.8	9.3	1.5	1.3	1.3	15.3%	8.4%	6.5%	20.0%	20.0%	14.0%
IRPC PCL	IRPC TB	4.78	2,790	9.2	7.8	7.8	10.4	9.2	9.1	1.3	1.2	1.1	4.6%	5.1%	4.7%	10.0%	15.0%	13.0%
Bangchak Petroleum	BCP TB	30.25	1,190	5.6	5.3	5.3	10.0	9.2	8.4	1.2	1.1	1	6.6%	5.3%	6.0%	24.0%	14.0%	15.0%
Asia Average				**10.0**	**8.0**	**7.6**	**20.3**	**10.5**	**10.0**	**1.9**	**1.7**	**1.5**	**3.3%**	**3.4%**	**3.4%**	**13.8%**	**17.1%**	**16.1%**
Europe																		
MOL	MOL HB	18,095.00	6,568	4.4	5.3	5.4	6.5	8.7	11.2	1.1	1.1	1.1	3.1%	3.3%	3.5%	18.0%	14.0%	10.0%
PKN Orlen	PKN PW	77.8	8,455	4.2	5.1	5.2	6.4	7.5	8.1	1.5	1.3	1.2	2.1%	2.1%	2.1%	25.0%	16.0%	11.0%
Tupras	TUPRS TI	63.05	5,099	4.5	6.5	6.4	6.2	9.9	8.2	1.9	1.9	1.8	10.3%	6.3%	9.3%	35.0%	16.0%	21.0%
Europe	**Average**			**4.4**	**5.6**	**5.7**	**6.4**	**8.7**	**9.2**	**1.5**	**1.4**	**1.4**	**5.2%**	**3.9%**	**5.0%**	**26.0%**	**15.3%**	**14.0%**
US																		
Calumet	CLMT US	3.5	266	19.2	12.1	7.1	2.9	NM	NM	0.4	0.9	1	78.3%	19.6%	0.0%	13.0%	-30.0%	-6.0%
Delek	DK US	16.9	1,045	7.8	11.9	6.3	9.9	NM	16.9	0.9	1	0.9	3.6%	3.6%	3.6%	10.0%	-8.0%	6.0%
Marathon Petrol	MPC US	43.59	23,146	5.3	7.6	5	7.3	22.4	10.4	1.2	1.2	1.1	2.6%	3.1%	3.3%	21.0%	5.0%	11.0%
PBF Energy	PBF US	21.8	2,251	3.3	14.2	3	5.1	NM	5.2	1.1	1	0.9	5.5%	5.5%	5.5%	21.0%	-4.0%	17.0%
Phillips 66	PSX US	81.15	43,151	6.7	12.8	7	10.7	24.9	11	1.9	1.9	1.7	2.7%	2.9%	3.3%	19.0%	7.0%	16.0%
Tesoro	TSO US	84.97	10,196	4.5	7	5.2	6	19.1	8.8	2	1.9	1.7	2.0%	2.5%	2.6%	36.0%	10.0%	20.0%
Valero	VLO	59.24	27,902	3.8	6.4	4.6	6.5	15.4	8.7	1.4	1.4	1.4	2.9%	4.1%	4.1%	22.0%	9.0%	15.0%
US	**Average**			**7.2**	**10.3**	**5.5**	**6.9**	**20.5**	**10.2**	**1.3**	**1.3**	**1.2**	**13.9%**	**5.9%**	**3.2%**	**20.3%**	**-1.6%**	**11.3%**
Global	average			**8.6**	**8.3**	**6.8**	**15.3**	**11.9**	**9.9**	**1.7**	**1.6**	**1.4**	**6.3%**	**4.1%**	**3.5%**	**16.8%**	**12.1%**	**14.6%**

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