Price war on the polish petrol market

Dariusz Karaś
Department of Management, The Cardinal Wyszynski University in Warsaw, Poland
E-mail address: dariusz.karas@uksw.edu.pl

ABSTRACT

Petrol market is very peculiar sector of economy. In Poland the biggest refineries are under control of government. This paper is first stage of analysis polish petrol market. By petrol market in this case we understand retail sale of fuel. The main purpose of this research is to analyze if cooperation between two biggest companies on market is possible and what type of cooperation should they choose. The direction of this analysis is to build a model that will explain which strategies are the best for the market and for those refineries. In this paper is showed only introduction and assumes to procedure of building this model.

Keywords: Price war, petrol market, prisoner’s dilemma, game theory, metagame, orlen, lotos

1. INTRODUCTION

On polish petrol market we have two huge firm: Polski Koncern Naftowy Orlen Spółka Akcyjna (short name: PKN Orlen) and Grupa Lotos Holding Group – consists of: Grupa Lotos S.A. (parent company, manages Gdańsk refinery), Lotos Czechowice, Lotos Jaslo, E&P company Petrobaltic, as well as several subsidiaries bearing Lotos sign. Both companies have shares in petrol market over 60%. But polish petrol market is not only this two firms. We have here also: BP, Shell, Statoil, Neste and Lukoil. However, we can say that polish petrol market is duopoly. Orlen and Lotos are leaders in this area and the main competition on the market is between this two companies. Lotos is almost three times smaller than Orlen, but have similar to Orlen financial statistics.
Let us look on factors that effect on fuel price. In petrol sector are unique phenomenas that effect on supply or demand and also on prices. This phenomenas are: wars, terrorism, weather anomalies, and possibly the most – political factor. Polish Goverment have In Orlen 27,52% shares and in Lotos 53,18% shares (but in 2008 is was 63,97% shares). On price of polish fuel first of all such effect factors as: taxes (VAT, excise), petroleum price on global market, dollar and euro rate, competition on domestic market.

PKN Orlen is a Polish company and one of Central Europe’s largest refiners of crude oil. They specialize in processing crude oil into world-class unleaded petrol, diesel, heating oil, and aviation fuel as well as plastics and other petroleum related products. Orlen operates 7 refineries, of which 3 are located in Plock, Trzebinia and Jedlicze (Poland), another 3 in Litvinov, Kralupy and Pardubice (the Czech Republic) and 1 in Mazeikiu (Lithuania). The total deep processing capacity of the refineries reaches 31.7 million tonnes per annum. Orlen’s retail network comprises approximately 2,700 outlets offering services in Poland, Germany, the Czech Republic and Lithuania. In Poland petrol stations operate under three brands: Orlen (premium brand), Petrochemia Plock (the brand is extinguished) and Bliska (economy brand). Clients in Germany are served at stations branded Orlen and Star, and in the Czech Republic at outlets bearing standard Benzina and premium Benzina Plus logos. Petrol stations in Lithuania operate under the Orlen Lietuva and Ventus logos.

Figure 1. Map of refineries in Central Europe (www.orlen.pl).

Grupa Lotos is vertically integrated oil concern which main activity branches are crude oil production and refining as well as oil products distribution. The company provides market with such high quality goods as unleaded gasoline, diesel fuel, jet fuel and lubricants.
Furthermore Lotos owns leading position in motor oils, bitumens and paraffins trade in Poland. Gdansk refinery throughput capacity reaches 6 million tons of crude oil per year. Company’s wholesale fuel market share in Poland reached 25.4%. Lotos consolidated sales revenues for 2008 financial year exceeded 4.6 billions euro.

2. PRICE WAR

Both refineries have about 60% of polish petrol market. This is the reason why the price competition is lead by Orlen and Lotos. Price is the first weapon for them to compete with other refiners, but also to compete with each other. The market is dominated by this two companies, so the price competition is mostly between them. The remaining refiners have to adjust their prices to them, but they are very elastic (they only waiting what decision will make Orlen and Lotos), so can make this decision very quickly. Price war is type game prisoner’s dilemma (Straffin, 1993). In the classic form of this game, cooperating is strictly dominated by defecting, so that the only possible equilibrium for the game is for all players to defect. No matter what the other player does, one player will always gain a greater payoff by playing defect (Myerson, 1991). Since in any situation playing defect is more beneficial than cooperating, all rational players will play defect, all things being equal. In this case cooperation means to establish prices on high level and defection means to establish prices below minimal acceptable level. The payoff is income and the dominating strategy is to establish low price. When we look on this who will lose and who will win, it looks like this:

<table>
<thead>
<tr>
<th>player 1</th>
<th>player 2</th>
<th>cooperation</th>
<th>defection</th>
</tr>
</thead>
<tbody>
<tr>
<td>cooperation</td>
<td>win - win</td>
<td>lose much - win much</td>
<td></td>
</tr>
<tr>
<td>defection</td>
<td>win much - lose much</td>
<td>lose - lose</td>
<td></td>
</tr>
</tbody>
</table>

When both companies will establish low prices, both will lose, because their shares in market will stay the same. If they will establish high prices, both will win, in spite of that their shares in market also will stay the same, their income will be higher. The share in market will always stay the same, because other companies acting on petrol market will establish prices on approximated level. If they lower the prices they won’t get new client from second player.

So if both firm want to win they have to cooperate and establish prices on high level in spite of that the dominating strategy is to choose low price. It is known that in one time played game “defection” is the best strategy. But not in the long duration. This equilibrium in long time is not Pareto optimal. Profile of strategy (c,c) is more efficient than profile (d,d). Moreover profiles (c,c), (c,d), and (d,c) are efficient in Pareto sense (Watson, 2002).
War price between Orlen and Lotos in fact doesn’t exist. What would happened if, for example Orlen – leader on polish petrol market, would lower prices about 10% of average price on the market? Then this refinery would have very low level of increment and efficiency, even below the marginal cost level. It’s a matter of time when the enterprise would bankrupt. So no one would defect and choose even lower price than second player. That the reason why Orlen is leader on the market in price establish. Lotos is waiting to react on Orlen’s decisions about price. On this market this game has version of iterated prisoner’s dilemma. In this version are more beneficial equilibriums than choosing “defection”. They start with high prices and set low prices only when other player will do this. In result no one will defect – no one will increment on defection. There is a threat of “tit for tat” strategy. In the iterated prisoner’s dilemma, the game is played repeatedly. Thus each player has an opportunity to punish the other player for previous non-cooperative play. Only when the players play an indefinite or random number of times can cooperation be an equilibrium (Kahneman and Tversky, 1979). In this case, the incentive to defect can be overcome by the threat of punishment. Also other companies want give prices below average – they are afraid that in this situation Orlen and Lotos could lower their prices.

Assuming that the war price in not effective for everyone the competition instrument is develop strategy. In the result, firms move between cooperative and punishment periods (price wars) as a way to enforce collusive outcomes (Abreu, Pierce and Stacchetti, 1986). For the market leader this strategy is to look for new sources of supply, for other companies this strategy is to develop new chains of distributions with low prices. Only then they can be competitive to Orlen and Lotos.

2. 1. Strategy on petrol market

Both refineries are thinking about expansion. The main strategic aim for Lotos is to increase mining of petroleum on Baltic Sea and later Norwegian Sea and North Sea. They also want to enter on Scandinavia market. Lotos is planning to be the most efficient refinery in Baltic Sea Region. The main strategic aim for Orlen is to concentrate on increase of efficiency and develop chain of distribution and alternative source of supplies, going on new markets (Ukraine) and cooperation with new partners (Belarus). They also want to keep leading on market in Poland, Czech Republic and Lithuania. Orlen is also planning to develop petroleum mining on Baltic Sea. Both strategies result from location. On the other hand Orlen’s strategy is more risky because they are planning to invest more money at one time.

Let see what would happen if both refineries will invest to develop petroleum mining on Baltic Sea. Below are presented payoffs which are income levels in billion zlotys (prediction based on last 5 years).

<table>
<thead>
<tr>
<th>Orlen</th>
<th>Lotos</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>invest</td>
</tr>
<tr>
<td>invest</td>
<td>12</td>
</tr>
<tr>
<td>no invest</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 2. Matrix of payoffs from investments.
As we see Lotos will invest anyway. That is very important information for Orlen –
they can expect what Lotos will decide. By the way we have to say that the reason of this
investment is location of Lotos – changing strategy in other direction would be expensive and
unprofitable. Lotos is realizing investment program 10+ which providing looking for
petroleum supplies on Baltic Sea. How this situation can be solved? We should remember that
Lotos is smaller company than Orlen who is leader on the market. This implicate that Lotos is
waiting for Orlen’s decision about strategy – they don’t make decision at the same time.

Let’s analyze this case. In this situation Lotos who is reacting on Orlen’s decisions have
not two but four strategies. Here they are: I. to invest anyway on Baltic Sea, II. do the same
what Orlen, III. do on the contrary to Orlen, IV. to invest in others areas. We assume that the
main strategy for Orlen is to invest in south areas of Poland, on Ukraine, Belarus, Czech
Republik. Cooperation would be in situation where Orlen is not investing on Baltic Sea and
Lotos is investing only in Scandinavia area.

This leads us to metagame (Howard, 1971). Metagame theory was developed by Nigel
Howard in the 1960s as a reconstruction of mathematical game theory on a non-quantitative
basis, hoping that it would thereby make more practical and intuitive sense (Howard, 1976).
In general - player 2 depend his decision from player 1. This way player 2 has four strategies:
I. cooperate whatever player 1 will do, II. choose the same like player 1, III. choose opposite
to player 1, IV. choose defection whatever player 1 will do.

Table 3. Matrix of payoffs in metagame (general).

<table>
<thead>
<tr>
<th>player 2</th>
<th>I: CC</th>
<th>II: CZ</th>
<th>III: ZC</th>
<th>IV: ZZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>(0,0)</td>
<td>(0,0)</td>
<td>(-2,1)</td>
<td>(-2,1)</td>
</tr>
<tr>
<td>Z</td>
<td>(1,-2)</td>
<td>(-1,-1)</td>
<td>(1,-2)</td>
<td>(-1,-1)</td>
</tr>
</tbody>
</table>

In this situation strategy IV is dominating all others. But this non-cooperative
equilibrium. However we can notice that the right way to choose is to cooperate only when
we are sure that second player will do the same. In other way better is to defect.

Getting back to our situation on polish petrol market, we know that Lotos will make
predictable decision. Cooperation in this case will mean that Orlen and Lotos are looking
(investing) for sources of petroleum supply in different areas. Defection in this case will mean
that Orlen investing to search source of petroleum supply on Baltic Sea. Remembering about
that Lotos is waiting for Orlen’s decision about strategy and about that Lotos’s decision is
predictable, we can say that situation is opposite – in fact Orlen is making decision after
Lotos. According to matrix showed above their dominating strategy is to defect, that means
they should invest in the same area where Lotos. Metagame explain why Orlen in investing
on Baltic Sea. It also leads to that Lotos have less possibility to approach to Orlen.

However, when we have situation of economy crisis, Orlen have to reconsider its
strategy and cut investment costs. Now they have only two strategies: do the same what Lotos
(defect), do opposite to Lotos (cooperative). Then we back to situation invest in the same area
what Lotos or invest in other area. Better choice is second decision. It is also the best way for
the market – two biggest refineries are investing in petroleum mining in different areas, that means they will have more sources of petroleum supplies.

3. CONCLUSIONS

We have to notice that when Orlen will be making investment decision after Lotos, the best choice is to defect – that means they will decide to invest to petroleum mining on Baltic Sea. When crisis in economy is limiting investment spending, the best choice is to cooperative.

But in the opposite situation – when Lotos will make investment decision after Orlen, the case is more complicated. Lotos’s decision is predictable but not definite. We have two scenarios. First scenario assume that they cooperate, second scenario assume that they choose the same area to make investment. When Orlen will decide not to invest to mining on Baltic Sea, Lotos’s choice is very simple. But when Orlen will decide also to invest to mining on Baltic Sea, Lotos have to choose – lower incomes from mining on Baltic Sea or entering on other areas where Orlen is also investing. That will force Orlen to increase investment spending, in result chosen strategy will increase costs for them. In this case the best choice for Orlen is to predict how Lotos will behave and choose cooperation strategy.

We should mention that there is also new factor in game not taken into consideration – petrol station close to supermarkets. Orlen and Lotos are not able to competitive with such stations, so they need to open new cheaper chains of distribution. That means new investments in new areas of market.

Prisoner’s dilemma on this market is strategic dilemma. Whatever Lotos will be doing and how fast will developing, Orlen will always be biggest in polish market conditions, but Lotos can closer to Orlen step by step. The next stage of polish petrol market research is to analyze iterate PD and metagame to build a model for both refineries behavior.

To resume the best way for smaller company is to wait for the strategy that will take the market leader and observe. Than all sector is more efficient.

References


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