Crude Oil Trading Using Turbo Certificates

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This paper has two objectives. The first one is to contribute to the debate regarding the validity of the Hubbert Crude Oil Peak Theory. Its acceptance should guide economic policies, especially over time. The other objective is to characterize modern investment tools for short-term investments, or more precisely for trading, which use the leverage effect significantly. They are so called Turbo Certificates and they are used to trade crude oil.

Key words: *Hubbert curve, crude oil peak, turbo certificates, trading, profit*

Introduction

The financial crisis, and especially its main consequences, namely the dramatic fall of stock markets and the subsequent economic crisis, should draw our attention to the alternatives of further development. It is also important due to the fact that within the social system we live in the decisive responsibility over the quality of life lies on each individual. Although states do and will, of course, have the responsibility over the global development, the future lives of individuals will depend on themselves more and more. However, objective regularities must be respected.

Hubbert Crude Oil Peak Theory

Geophysicist Marion King Hubbert predicted already in 1956 that the crude oil extraction in the USA would peak in the 1970s and then would start to fall. Although nobody took it seriously at the time, the truth is that the amount of extracted crude oil in the USA had grown until 1971 and since then it has really been declining continuously. America (except for Alaska) had already reached its crude oil peak. Since then 33 out of 48 oil-producing countries are said to have reached their crude oil peaks [4]. It is even more disturbing that it has been reached also by 13 out of 31 biggest producers [4]. Since the crude oil is non-renewable, it can be assumed that the topic of crude oil peak is up-to-date not so much from a country point of view, but from a global point of view. We are going to prove its existence accurately in the following text.

Scientists of various fields apply the so-called logistic curve. By using it, they describe different events, both social and scientific ones. Literature says that the logistic curve is a graph of the following function:

$$Q(t) = \frac{B}{1 + Ae^{-Bkt}},$$

where A, B, and k are positive constants.

Unfortunately, it is not clear from this relation, how scientists formulated the function as it is, how it can be applied and, especially, how this function relates to the amount of crude oil produced.

The problem will be solved if we accept the following assumptions:

- amount of existing extractable crude oil in the world is terminal and equal to B units,
- extraction growth rate is in direct proportion to the product of crude oil already exploited and crude oil not yet exploited.

If we say the amount of extracted crude oil until time t (i.e. cumulative production) is Q(t), and we respect the assumptions mentioned above, then Q(t) suits the following differential equation:

$$Q'(t) = kQ(t)\big(B - Q(t)\big). \qquad (1)$$

Its solution is (see [3]) a logistic curve:

$$Q(t) = \frac{B}{1+Ae^{-Bkt}}, \qquad (2)$$

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where B is the amount of extractable crude oil at the time t_0, k is a constant of proportion, considering especially the technical parameters, and $A = \frac{B}{Q(0)} - 1$ (see [3]).

However, we are not interested in the amount of extracted oil till time t, but in the given year, i.e. we are interested in the difference $Q(t) - Q(t-1)$. From the differential calculus we know that

$$Q(t) - Q(t-1) \doteq Q'(t). \tag{3}$$

Thus, it is clear that the first derivation of the logistic function is the so-called Hubbert curve expressing approximate amount of crude oil extracted in year t.

After deriving (2) and adjusting it, we obtain:

$$H(t) = Q'(t) = \frac{B^2 A k e^{-Bkt}}{(1+Ae^{-Bkt})^2}. \tag{4}$$

If we want to prove explicitly that the oil peak really exists, we have to prove that the function (4) has a maximum.

After deriving and adjusting the equation (4), we obtain that

$$H'(t) = \frac{B^3 A k^2 e^{-Bkt}(-1+Ae^{-Bkt})}{(1+Ae^{-Bkt})^3},$$

and from that we find out easily, that $H'(t) = 0$ is valid only if

$$-1 + Ae^{-Bkt} = 0 \tag{5}$$

By solving (5), we obtain:

$$t = \frac{\ln A}{Bk}, \tag{6}$$

which is the relation for estimating time at which the oil peak occurs. This relation can be used in further research concerning the determination of a specific time at which the oil peak occurs. It is a matter of interest for geologists, as it is necessary to determine the constants, i.e. the amount of extractable crude oil, and technical parameters. We have explicitly proven that the oil peak exists, by which we have achieved the first objective of this paper.

Use of Long Turbo and Short Turbo Certificates in Oil Trading

In a market economy the price is determined by a balance between the demand and supply of given goods.

From what was mentioned above, it is clear that in the long term the oil supply will keep decreasing.

On the other hand, its consumption continues to grow. As the consumption continues to grow more quickly than the supply, which will even decline, it is logical that the price of oil will grow in the long term. Despite this conclusion, oil trading is very "risky" and the "buy and hold" strategy can be loss-making in the long term. It is enough to remember that the price of oil in the past two years was as high as USD 140, but also as low as USD 40 per barrel.

Chart 1: Price of Brent Oil since July 1988

In the following part we are going to propose an oil trading strategy using the so called Turbo Certificates.

Turbo Certificates are an innovation on financial market and they belong to the instruments which use leverage. The leverage causes a multiplication of profit; but naturally of loss, too; by a coefficient, which means that even a slight change in asset price brings the investor a high profit, or a big loss.

Long Turbo Certificate is bought when we expect the asset price to grow. The so-called strike value and barrier are important. If S is the spot price of an underlying asset, then B barrier is under it and S_{STRIKE} value is even lower. The closer S is to B, the cheaper the Long Turbo certificate and the bigger the leverage. Should S drop to B, the certificate stops being traded and the investor suffers a big permanent loss. Approximation of S to B barrier increases the leverage, as well as potential profit, but it increases the risk of contract termination and thus of a permanent loss. For individual underlying assets, more Long Turbo certificates are emitted with different S_{STRIKE} , and this way with different barriers, and it is up to the investor to decide what risk he wants to undergo with a given contract.

Short Turbo Certificate is bought when we anticipate a decline in asset price. Here, also the B barrier is important, which in this case is above the S value, and S_{STRIKE} is even higher above B. Their meaning is analogical, just like with Long Turbo Certificates, i.e. if the spot price grows and reaches the barrier, Short Turbo certificate stops being traded and the investor suffers a permanent loss.

When trading investment certificates, the issuer is obliged to quote a price for purchase and sale and for this price it is possible to buy or sell any number of given certificates at any time within the trading time.

We are going to apply Turbo Certificates to trading Brent Oil. We will use certificates emitted by Raiffeisen Centralbank. The data is available at www.rcb.at . At the time of writing this paper, it was possible to trade Brent Oil at this issuer with 5 Long Turbo and 10 Short Turbo Certificates with various barriers.

Let us say that after a significant long-term decline, which stopped in February 2009, the subsequent moderate March increase, and the April price stabilization above USD 50 per barrel of Brent Oil, we assumed that by the end of 2009 the price would most probably be within the range of USD <50, 100> per barrel. We decided to trade this commodity actively using Long Turbo Certificate AT0000A0CU49 with a barrier of 45.95 and a Short Turbo Certificate AT0000A0BPM1 with a barrier 111.67. The purchase and sale would be intermediated by one of the Slovak banks, which charges 0.5 % of invested amount at purchase and 0.5 % of the amount when selling the certificates. Table 1 shows the results of trading with the invested amount of EUR 10,000 for 7 months, using the above mentioned Turbo certificates.

Tab. 1. Trading Brent Oil with Long and Short Turbo Certificates from 15 May 2009 to 9 December 2009.

Certificate	Date of purchase	Quotes	Number of certificates traded	Amount of money invested	Date of sell	Quotes	Gross profit	Profit after taxation	Commission	Net profit
Long Turbo	15.V.	1,35	7 407	10 000	15.VI	2,25	6 666	5 399	133	**5 266**
Short Turbo	29.VI.	2,80	5 452	15 266	8.VII	3,52	3 925	3 179	172	**3 007**
Long Turbo	10.VII.	1,55	11 789	18 273	10.VIII	2,42	10 256	8 307	233	**8 074**
Short Turbo	13.VIII.	2,59	10 172	26 347	18.VIII	2,86	2 747	2 225	277	**1 948**
Short Turbo	24.VIII.	2,60	10 882	28 295	4.IX	3,05	4 896	3 966	308	**3 658**
Short Turbo	17.IX.	2,73	11 704	31 953	23.IX	2,93	2 340	1 896	332	**1 564**
Long Turbo	25.IX.	1,70	19 715	33 517	23.X	2,45	14 786	11 976	410	**11 566**
Short Turbo	4.XII.	2,40	18 784	45 083	9.XII	2,75	6 574	5 325	484	**4 841**
TOTAL										**39 924**

As Table 1 shows, by investing a capital of EUR 10,000 in 8 performed contracts using Turbo Certificates to trade Brent Oil, we have managed, in less than 7 months, to make a net profit of EUR 39,924, which is incredible 399 %.

Conclusion

From the above proven existence of oil peak, it is clear that it is possible only to delay it. Theoretically, this can be achieved by either decreasing consumption (practically unreal), finding new oil deposits, or by using the existing ones better.

Although we have shown that the price of oil will grow over the long run, short-term drops and repeated increases are very probable. Turbo certificates are very risky, but they can ensure a significant profit, too. The certificates, which we have mentioned above, could be the tool to achieve a significant valorisation even this year.

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[6] http://www.rcb.at

[7] http://cs.wikipedia.org/wiki/Ropný vrchol