Crude Oil Price Security: How Crude Oil Price is Formed?

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Abstract—**Crude oil as energy source is imperative for running economies and sustaining economic growth. The price of this commodity therefore impacts both on exporting and importing countries. The mechanism of price formation is very complex and varies in accordance with supply and demand structure for physical oil whereas paper trading activity including speculation of forwards, futures, options and swaps has also become huge part business directing price of crude oil depending on financial circumstances of the market. This paper is addressing the basic principle of crude oil price formation. It is underlined that price of crude oil is no longer simple reflection of fundamental factors of the market based on supply and demand factors, it is the outcome of intervention of big financial market players into the industry.**

Index Terms—**Crude oil pricing, paper trading, paper market**

I. Introduction

Market volatility has existed for decades and market orientation of liberal market economy perspective shall not change in Western world for a long time. The major reason of this unpredictability is caused by the energy sector considering vital dependence on this part of economy. The big share of energy production belongs to crude oil industry and the price movement observed within the last fifty years in oil sector raises the question of the extent of impact of oil prices on economic performance. This paper is reviewing the price formation mechanism separately studying paper trading as well as physical crude oil sale that occurs between actual suppliers and receivers in the market.

It shall be underlined that there is a wide gap between two principally different trading systems whereas one the one side there is trade with immense flow of finances buying and selling different contracts, such as forward, futures, etc. without connection to physical market. On the other side there is small in comparative scale physical market where actual crude oil producers are delivering crude oil to potential buyers. These companies and organizations are quite large enough running refineries since crude oil as commodity is required only by refineries.

In the beginning, the literature review part is demonstrating previous works in this field underlining certain principle positions in regards of crude oil pricing established already in the market. In the next part, the methodologies applied in studying of crude oil price settlement are revealed underlining the importance of application of new method. It will be highlighted in the main part of the paper that potential price settlement existing today in the market even though secures profit of suppliers, buyers, consumers, etc. does not truly underline market potential as over dependence on paper market has created situation where speculative activity came into the front line blocking in fact true market development.

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II. Literature Review

Among vast number of resources studied in the frame of this subject, it is worth pointing out that there is no fundamental theoretical ground learning the process from inside. The theories presented in this area are covering those issues which are mostly discussed among economists, politicians, traders, etc.

The work of Fattouh (2009) is providing some understanding of the process whereas it is referring primarily to major factors that forming the price of crude oil in the market. As per this model, the study of price settlement mechanism in the first instance might be studied from the perspective of risk transfer. It is argued that the price formation in the market is based on the fact that different parties depending on possession (either physical or paper) of the cargo passing ownership to the next party. This activity to certain extent inflates the price of the cargo logically always pushing it up whereas on the other side the deadlines set up by market regulators for selling cargo in ownership is putting pressure on sellers artificially lowering the price for crude oil barrels. Following the conception of importance of time management, it is stressed that physical barrels remaining in storage tanks in different part of the world are getting value once the demand for different reasons is rising. According to the second theory, the time spent on keeping cargo in storages is major factor driving the price of crude oil. However, there must be considered such factors as cost of storage, convenience yields, interest rates, inflation, etc. Although, the notion behind this theoretical models seems to be clear and quite logical, the major limitation is that there are only few issues are considered for price formation. It is actually omitted all other relative factors directly putting pressure on the market such as government policies, taxation of petroleum products, availability of refineries and their capability of meeting demand, subsidies widely applied by national government to sustain path of economic growth, etc.

The analysis of the price depends not only on events occurring in the market, but also on the approach studying price movement. As it mentioned by Fattouh (2009) there are two basic ways applicable in this case. In the first instance, it is pointed out that fundamental analyses of the market is conducted based on such facts as supply and demand, exploration and production volume, refining capacities, etc. On the other side, there is a technical analysis which is also popular among traders since the development of technologies

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now open opportunities for every participant of the market open position on any other part of the world and take profit from price movement. Despite existence of different ways for analyzing the price movement, there is no firm answer to the question of which of these methodologies is providing more precise information about the market.

Finally, the work of Speight (2011) seeks the answer to the question of crude oil price movement in demand for petroleum products. The notion behind this argument stands on the conception that crude oil itself has no use other than delivering it to refineries and therefore it is the demand for petroleum products which is dragging the chain of crude oil price. Considering the fact that about 50 per cent consumption in the US depends on petroleum products, it is no wonder that the role of refining capacities and available petroleum products is brought into the front line of analyses.

So, the literature review does not provide straight answer to the question why price is moving, what factors affecting this movement and what methodology should be applied in studying this process. It is not clear either how the process of sale occurs since crude oil suppliers do not reveal information about sale policy and prices. Considering these facts, this paper develops the idea that segmented study of the market such as demand for crude, price of sale or petroleum product supply are not enough to clarify the causes of price movement.

III. Methodology

The studies conducted in this field have been applying different methodologies primarily referring to global news agencies such as Platts and Argus which are providing the price of the crude oil on daily basis. The basic question therefore is coming into agenda relates to the methodology adopted by these agencies estimating price of crude oil.

It is crucial to identify the way how these organizations are calculating the price of crude oil. When the price is moving up it is said the market is in 'contango' whereas when prices are falling it is said that the market is in 'backwardation'. However, the complex condition of the market provides quite different structure where spot prices for immediate delivery and future prices covering the period from 25th day should be taken into account. As it is mentioned by Downey (2009) 'contango' market occurs when the price of future deliveries is relatively higher than for short term deliveries. In the same way, when the prices for future deliveries is lower than in the spot market, the market is said to be in 'backwardation'. It is further stressed that the price gap occurs due to number of fundamental reasons such as demand for petroleum products, supply volume, financial expectations from future deliveries, etc.

The market is not stagnant and it is always changing in all industries. The methodology of price calculation suggested by Butler (2012) offers for consideration availability of alternative energy generation resources. It is argued that that the time of vital dependence on crude oil existing in the market during 1970s has already passed and now new energy generation sources are providing alternative to crude oil. In this regard, it is pointed out that new shale gas resources found in the US and Eastern Europe (primarily in Poland) are providing alternative to crude oil and therefore the price for this commodity is falling depending on availability and cost of production. However, neither of these conceptions is making clear what precise methodology should be applied to study the causes of changing price of crude oil.

Nevertheless, the starting point for analyses as it is underlined by Salvatore (2012) should be understanding of those principles that are standing on the ground of crude oil Benchmark modelling since there are some crude oils that are used as basis for trading other crudes as their trading is very liquid. It was practised first time in the UK when Shell began production of Brent crude oil in the North Sea. The standard contractual terms prepared by seller were covering major points of contract such as delivery terms, quality, quantity, force majeure events, etc. The standard terms of the contract opened opportunity for arrangement of sale of the crude that is not even produced. Therefore, trading of so called 'forward' and 'futures' contracts became applicable paving the way for intrusion into the market those players that do not have any direct connection with production, refining nor even with final distribution of petroleum products.

Following this argument, the methodology of research applied in this paper shall be based both on qualitative and quantitative research. It shall illustrated how price of benchmark is formed on the basis of example from Brent whereas qualitative analyses shall underline those factors that impact on formation of the price for this particular benchmark.

IV. The Importance of Crude Oil Price Settlement

The discussion of crude oil business may not start without identification of several very significant factors which are impacting on price movement. It should be underlined that in the long term some important events dramatically directed the market. While the price went up from 10 US dollars per barrel in 1970s to 140 US dollars per barrel by the end of 2010, the share of the market grew proportionally and as per latest estimations the global sale of crude oil is said to be around 1,4 trillion US dollars whereas this figure is equal to 2,5 per cent of world GDP number. It is worth underlining also that it would be wrong to state that only crude oil exporting countries are biggest beneficiaries of rising price of crude oil. As it mentioned by Smil (2011) taxes on gasoline brought into the US budget alone around 1.4 trillion US dollars so far whilst the earning of crude oil exploration companies such as Exxon, Royal Dutch Shell, etc. was several times less than gaining of the government. It has been observed for several decades that rapidly rising oil price is putting pressure on financial market leading to rise in prices, inflation, unemployment, etc. At the same time, falling oil from certain level has also negative impact on the market since it is reducing stimulus for growth, lowering demand and leading to falling prices of durable and non-durable products (Leebs and Leebs, 2008).

During this period, the price settlement process has been changing significantly as it moved beyond simple seller and buyer relationship to more complicated system where market participants and traders are entering into physical and

hypothetical cargo ownership and gain advantage from price movement in both directions. According to Speight (2011) the price for physical crude or as it is called for 'wet barrels' is formed on the basis of such factors as quality of crude, loading terminal, monthly volume of delivery, availability of alternatives, the location of refinery and finally transportation cost. The rise of market players where governments also became part of the business, paper trading activity came into place which allowed producers to secure high price for crude oil whereas on the other hand refineries also took advantageous position and gained opportunity to lock low price of crude and high price of petroleum products sale through buy and sale of such paper market derivatives such as options, futures, swaps, etc.

As it was pointed out by Salvatore (2012) benchmark modelling applied in crude oil business is now the only way how physical crude oil is sold in the market. There are currently three major benchmark crude oils, Brent for Europe, WTI for American market and finally Tapis and Dubai for Asian market even though sometimes other methodologies are also applied when selling cargo and delivering it to buyer. The basic role of this benchmark modelling is that different suppliers should calculate the price of their crude depending on such factors as volume, loading terminal, etc. (Downey, 2009). For example, the price of Russian URALS crude delivered and supplied from port of Novorossiysk in Black Sea is published every day in Platts publications in reference to Brent quotation. The price fluctuates depending on market conditions moving closer to flat when demand is growing on CIF Augusta (Incoterms, 2010) conditions whilst falling to minus 4 US dollars per barrel versus Brent Dtd when due to fundamental factors the grade is coming under pressure. This formula presumes that when cargo is loaded onto the board of the vessel confirmed by Bill of Lading parties agree to apply spread to Brent Dtd. Quotations published in the following five publications after the date of loading deducting discount agreed between parties at least 10 days before the first day of two day loading date range in accordance with the guideline. The example below is demonstrating how precisely this process occurs.

1) 100 USD - Average of Brent Dtd quotations published in five publications after Bill of Lading date
2) minus 2,50 USD - Agreed price between parties for URALS
3) 100 – 2,50 = 97,5 USD per barrel multiplied to supplied volume of crude

It must be underlined that the major problem when studying crude oil pricing system is that there are far too many issues to be considered. However, there might be made attempt to look beyond usually referred principles. In this regard, it would be relevant to study the market from the time of exploration until the last moment in the chain when gasoline sale takes place. It is the rule today that price of the commodity changes everyday which creates the risk for producer, refiner, final consumer and the governments.

V. How Crude Oil Price is Formed?

The news about price movement of crude oil is announced and analysed on constant basis. The question which should be nevertheless studied is how precisely the price of crude is formed. Referring to previously underlined methodology, there are two basis conceptions where in the first case it is said that the price fluctuates because of fundamental market factors whereas on the second side there is technical market reasons that are considered as cause of price movement. As it is stated by Blas (2012) in case of technical analyses, price movement on computer screens, moving averages etc. are believed to be standing in the core of rising and falling prices whereas depending on market conditions, active participation of players in trading activity is main factor pushing the price in different directions. However, the fact of existence of two market types (physical and paper) is providing opportunity to make separation between two types of market forces. The actual supply of crude, production volume of major crude oil exporting countries and even statements of oil mister of Saudi Arabia are considered to be major fundamental factors of the market (Farchy and Blas, 2012). Technical analyses include into itself investment mood of the market, participation level, expire dates of futures contracts, activity in options trading, etc.

The dramatic price movement occurred within last several years gave ground for some speculations that the price is actually moving because of strong interlink between physical spot price of crude with paper trading market. According to Blas (2012) the rules of trading spot sale agreement means that Seller is obliged to deliver and Buyer has to take delivery. In the forward market, it is assumed that seller side has to deliver the crude this shall occur under any circumstances (except sudden disruption of production) whereas Buyer must take cargo only the time for physical supply when time is approaching for passing cargo into physical supply timeframe.

The connection of financial market to spot sale price might be revealed through overview of factors combining actual price of Brent Dtd (indicator of price on spot physical basis in European Mediterranean basin). According to the model of price calculation adopted by Platts, the price is formed depending on price agreed between partiers trading for forward contracts for a month ahead (in month of April, forward contract trading is referred to month of June) adding CFD (contract for difference) differential for the same period (in case of CFD though it is referred to particular week). The trading defining price for these two components is taking place every day within so called 'ewindow' Platts platform (Salvatore, 2012). It must also be noticed that there are roughly 10 major companies actively participating in trading of these derivatives. The noticeable fact nevertheless is that among these players only one bank Morgan Stanley and trading company Phibro that are not involved directly in crude oil production, refining and further distribution (Barret, 2012).

Thus, it might be concluded that final price depends on speculation of the market between well known to each other parties. The role of technical analysis is moving into back stage since trading of forward contracts and CFDs are taking place on the basis of desire to gain profit from trading

whereas the major driver in this instance is becoming fundamental market factors such as shortage of supply, economic performance of the US and Europe reflected in indexes such as Dow, S&P, FTSE, etc.

VI. Conclusion

The analysis of crude oil price formation principles revealed some very important details. There are different theories and arguments regarding structuring of the price. Despite availability of information concerning changes in the market referring both to fundamental factors as well as technical analyses, none of these models are providing direct answer to the question how price is formed and the extent of its reliability in prediction of future price movement.

There are only several companies actively taking part in trading activity buying and selling contracts for delivery for a few month ahead (forward contracts) and locking profit through purchases of CFD contracts for precise week of cargo loading. Thus, this study underlines several conclusions. First, Brent Dtd. quotation refers to sale of physical crude oil. Secondly, the trading forming this price is not the result of speculative activity, it is outcome of trading of actual suppliers. Thirdly, the factors impacting on this trading are primarily fundamental market features such as supply and demand balance. Finally, the structure of the market where all producers and suppliers in European region refer to the Brent Dtd. spot price establishes confusing situation. Therefore, there should be established new model which will calculate the price of each crude oil on the basis of Brent Dtd. methodology or cost plus marginal profit scheme.

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