

# Chapter 1

## The Meaning of Oil Vega

**T**here is unprecedented volatility entering the oil market, transforming pricing and increasing instability. It will place a premium on setting prices via futures contracts without due regard for the actual market value of the underlying crude oil consignments. Increasing usage of synthetic derivatives will augment the problem in a manner reminiscent of the subprime mortgage disaster, but having an even more pronounced impact. Neither the way in which oil companies are structured or operate will temper this oncoming wave, while governmental action worldwide will only exacerbate the crisis.

In short, there is a perfect storm developing in the energy sector and it's going to be a nasty one.

The pages to follow detail what that storm looks like. This book results from years of analysis, consulting and practice in a very changing oil sector. Often such activity has ended being more about broader

political, economic, or financial matters than directly related to the underlying raw material itself. Such a focus is hardly surprising, given the endemic position of crude oil, the impact its supply and pricing has on modern ideas of technology and lifestyle, and the new world of regarding oil as both a commodity and an asset. In addition, based on holding a doctorate in political science, having personally experienced the economic transitions in what suddenly became a post-Soviet area, and spending some three decades teaching about the relationships between theory and practice, my view is that the transitions may have come about more easily than I first realized.

One conclusion has clearly emerged from these experiences. The ongoing situation surrounding oil will encompass an increasingly volatile mixture (no pun intended) of market, investment, and political ramifications. For several years, it has been my intention to write down some extended thoughts about this tripartite connection and the volatility emerging as a consequence. I had always intended that the product would bring a broad variety of studies to bear on an accelerating problem in a way that would allow both the interested general reader and the specialist to gain some benefit from the treatment.

Such an idea has been an ongoing work in progress for the past five years. As both an academic and a consultant, I had observed the rising concerns on the oil question expressed by researchers and practitioners. The nature of oil volatility provided the focus for what I intended to write. Only recently, however, has my project also obtained an immediacy of purpose.

That immediacy resulted from two occasions some five weeks apart. Both confirmed my analysis but also telegraphed that the threat was advancing much faster than I had anticipated. The first was an early August 2009 meeting held in The City, London's financial center. In attendance was a select group of hedge-fund directors, investment bankers, market analysts, and risk managers, along with the usual support coterie of numbers crunchers and model builders. The subject was oil and the prognosis was both unanimous and extraordinary.

The assembled were not there to announce the demise of the oil age—at least, not yet. But they were holding a wake of sorts. Crude oil would remain a commodity bought and sold on exchanges worldwide, with the benchmark prices issued each trading day from

New York and London largely determining the price. The catch was this. Sketched in their facial expressions and couched in carefully chosen words that morning was a startling revelation. Nobody in the room still believed they could either control oil volatility or, for that matter, provide adequate estimates of it. Oil was their lifeblood, a main source of their revenue and influence, the asset around which they had constructed a mighty edifice of financial power. And they no longer had a clue where it was headed.

That the gathering occurred in London, rather than Vienna (where OPEC, the preeminent producers' group meets) or New York (the location of most daily trades in the product), tells one much about how oil investment has changed. More money is raised for international oil projects within a three-mile radius of the Liverpool Street rail station than any other single place on earth. Wells may be spud in the Saudi desert, the Russian tundra, the Nigerian delta, or the jungles of New Guinea. Futures may trade the extracted product on stock exchanges throughout the world. However, funding for the drilling, service, and wellhead operations, and the pipelines and processing facilities, progressively comes from the London Stock Exchange (LSE) or, in particular for the companies emerging in response to the rapidly changing market, the LSE's Alternative Investment Market (AIM).

In late September 2009, the second meeting took place. This time the location was the new convention center in Pittsburgh and the venue was a meeting of the G20 heads of state—the 19 dominant global economies with the European Union as an organizational entity thrown in for good measure. The public usually receives only two views of such meetings—the staged press conferences and the unrest in the streets. Neither actually says much about what is really going on. In far less public sessions agendas are set, consensus is forged, and common statements of purpose are developed. These may be multilateral exercises or bilateral agreements. Either way, the gathering facilitates, but hardly concludes, the process. The success of the meetings is determined at sessions taking place elsewhere after it has ended. The G20 in Pittsburgh followed such a format.

The formal proceedings in Pittsburgh lasted less than two days. The agenda-setting meetings away from public view, however, transpired over a five-day period. At one of those sessions, advisors attached to

various national delegations discussed the state of the oil market. They reflected the same concerns addressed by the London bankers five weeks earlier. Only this time, in dialogue that intended to set an ongoing agenda for future meetings, they reached a quick agreement on two matters. First, they anticipated a return of the oil market volatility that resulted in a high of \$147.27 a barrel by July 11, 2008, doubling prices in less than a year. Second, this time more pronounced international political consequences would emerge as a direct result of the oil swings.

These meetings in London and Pittsburgh are the most recent indications that we have a major problem developing, one involving financial and political consequences directly resulting from what takes place in the oil market. Volatility remains the catalyst. However, one aspect has changed. We can no longer regard it as something likely to occur in the remote future. It is fast approaching.

This book is not a call to arms on energy security, a demand for a renewed commitment to alternative energy, or an argument for resurgence in international oil dialogue. All of these are certainly necessary, but not the primary focus of this treatment. None of these will realize much success unless we come to grips with the underlying issue. As we progressively remove ourselves from the worst financial crisis in three generations, as this long slow process of recovery unfolds, a fundamentally different, less stable, and far less predictable oil market will be there to greet us. It is toward an understanding of this altered state of affairs that the following analysis directs attention. Make no mistake. While the changes will first manifest themselves in the trading markets, it will be the political playing field that will ultimately decide matters.

What I call *oil vega* will be the single most pervasive and disturbing element of the energy market moving forward. It speaks of rising volatility, an inability to predict pricing changes or impact, deteriorating policy alternatives, and the probable global political consequences. Instability in both the market and governmental responses to it will likely result in intensified and repetitive cycles of crises, producing increasingly dangerous political consequences.

I have borrowed the concept of *vega* from option<sup>1</sup> traders to label this new environment. As traders use it, vega relates to the way in which the price of an option changes with the change in volatility.

Of course, things are never quite that easy. Traders need to determine a value for the option and be able to revise their estimates on that value as market changes take place in the futures contract on which it is based. For that they need a pricing model. The volatility component in their pricing model, from which one determines a theoretical value for the option against which a trader calculates the option's market price, is called *implied volatility*. Vega represents the rate of change in the theoretical value of an option as it relates to a change in implied volatility.

Vega is, therefore, a “second order” or derivative concept to the actual change in the value of a security. It measures the amount by which the price of an option changes when volatility changes.<sup>2</sup> Volatility is simply the measurement of how often and by what amount a market factor revises. Usually, that factor is price, and is represented by another “Greek”—*delta*.<sup>3</sup> Now this translates into the presence of a higher vega, indicating greater fluctuations in the underlying prices of actual contracts.

Volatility is often regarded as a general measure of the risk in an option (or security, stock share, tradable asset, etc.). It measures anticipated fluctuations over a period of time. One expects that price will change more often for an instrument with higher volatility. The greater the price swing, the greater the volatility. Options for underlying securities having high volatility will cost more than those with low volatility. Several measures are used to gauge volatility. One of the most common is calculating a standard deviation. If the measurement is against a known common index, such as determining stock volatility against the S&P index, the result is a security's *beta*. While not included in the usual “Greeks” applied by option traders, beta obviously does have some use as a measure of the market (nondiversifiable) risk associated with any security. Options, however, do not have a readily available common index against which to gauge changes in price. Also, this may begin with a consideration of price changes, but notice that vega describes the *rate* of the change, not simply the change itself.

This will be important in our usage, since the essential thesis of this book is that the increasing rate (along with the range) of changes will generate instability. This will have a pervasive and serious impact. Simply put, *oil vega will result in the increasing inability to determine the genuine value of crude oil based on its market price.*

That inability will erode the ability to predict, plan and compensate. This will be problem enough for the market. However, given the interconnection between the public and private sectors when it comes to energy policy, the consequences of oil vega will impact most visibly and seriously on the global intergovernmental stage.

This new environment is certain to raise the political heat, shorten international tempers, and make global oil a much more volatile and less predictable commodity. Unless we come to grips with the changes now emerging, none of the moves to make nations more secure, uncover new energy sources, or bring about a global oil consensus will make much difference. A rising tide of uncertainty will engulf the first. The second, while certainly the essential solution in the long term, will not have time to develop before the crisis hits. The volatile nature of crude oil will already have significantly damaged the market well before a weaning from primary dependence upon oil is possible. The third will fall victim to the competing policies of rentier nations, transit states, and end-consuming countries.

We have developing market (dis)order—a pervasive and endemic disequilibrium masquerading as the “new order” in the oil market. It is not that we will suddenly run out of crude oil, although that day is approaching.<sup>4</sup> The gravamen of the situation involves the increasing inability to develop adequate market remedies for expanding volatility. An even more unsettling shortcoming will develop: It will become progressively more difficult to predict the volatility itself.

Supply meeting demand is, of course, a fundamental ingredient in the instability, especially in how participants regard the cycle of volatility as it unfolds. However, it is not the supply-demand relationship itself that causes the problem. Available supply is less the sole driving issue in this new (dis)order. Price fluctuations will result from more than simply the perception of how much crude oil is left.

A simple review of predictions presented prior to the (usually) Wednesday morning release of Energy Information Administration (EIA)<sup>5</sup> weekly figures on oil and oil product inventories indicates current predictive abilities are already suspect. The “actual”<sup>6</sup> figures provided are often quite at variance to the predictions. We also are becoming increasingly concerned about the ability of EIA or the International Energy Agency (IEA)<sup>7</sup> to provide meaningful worldwide demand figures.

Significant demand pressures are underestimated or not considered at all. The IEA has acknowledged this problem, essentially resulting from continued overreliance on demand from developed countries and selected developing markets (e.g., China, India, East Asia) and underestimation of significant demand pressures in producing countries and other less-developed regions of the world.<sup>8</sup>

A clear signal that what I call oil vega is becoming a rising concern was issued by the EIA on October 7, 2009. It has found it necessary to follow a new reporting format.

Energy prices are volatile. They change as market participants adjust their expectations to new information from physical energy markets and markets for energy-related financial derivatives. Futures and options markets are a valuable source of information regarding these changing expectations.

Starting with the October 2009 issue [released October 6, 2009], Energy Information Administration's (EIA) *Short-Term Energy Outlook (STEO)* began tracking crude oil and natural gas futures prices and the market's assessment of the range in which prices are expected to trade. We do this using a measure of risk derived from the New York Mercantile Exchange (NYMEX) Light Sweet Crude Oil Options and Natural Gas Options markets known as "implied volatility." Implied volatility is nothing more than a standard deviation for the expected futures returns embedded in the option's price.<sup>9</sup>

The commodity option-pricing model is derived directly from the Black-Scholes option pricing model, based upon the Black-Scholes equation—the most famous single formula ever articulated for trading options.<sup>10</sup>

The equation itself produces a model that is often quite restrictive in application, given that it involves six major assumptions: (1) there are no dividends on the underlying security during the life of the option, (2) European-style exercise (that is, only at expiry) is followed, (3) markets are efficient, (4) there are no commissions charged, (5) interest rates are constant and known, and (6) returns exhibit lognormal distribution (i.e., providing a normal distribution, allowing thereby the use of standard statistical techniques on the resulting data). This last assumption is very

significant in the estimation of option premiums since a lognormal distribution is usually a better indication of anticipated price movements than the direct usage of variables because the log of returns is bounded downside at zero. Despite its shortcomings, however, the model still provides the ability to make approximations useful in a wide range of applications. As is often the case, the devil remains in the details!

In turn, the Black-Scholes option pricing model includes as variables the spot price (market price of the underlying asset on the valuation date), the strike price (the price at which the holder of the option has the right to buy or sell the underlying contract), the time until the option expires, the risk-free interest rate until expiry (typically a zero coupon government bond yield), volatility, and the average yield of the underlying asset for the life of the option.

The EIA goes on to explain:

The NYMEX employs Fischer Black's commodity option-pricing model,<sup>11</sup> to calculate the implied volatility, which the NYMEX publishes nightly. EIA recognizes some assumptions made for the model used by the Black model are controversial—e.g., futures prices are lognormally distributed with constant volatility—and will be conducting ongoing research into the price-formation process. However, EIA believes this approach—widely used by market participants, investment banks, and central banks—has been demonstrated to be sound. EIA uses the implied volatilities to create confidence intervals, which are forward-looking expected values resulting from the trading and risk transfer of market participants.<sup>12</sup>

The range of the confidence interval is determined by the *confidence level* specified for the interval. The confidence level represents the probability that the final market price for a particular futures contract, such as December 2010 crude oil, will fall somewhere within the lower and upper range of prices. For example, for a 95 percent confidence level, we calculate a range of prices within which there is a 95 percent likelihood the delivered price for the commodity will fall (for the month the commodity goes to physical delivery). In other words, there is a 5 percent chance the price for that specific month will fall



outside of the 95 percent confidence interval. The higher the confidence level, the wider the range between lower and upper limits.<sup>13</sup>

Yet the problem is actually worse than currently recognized. As we shall see, neither oil vega nor, for that matter, the traditional oil pricing patterns, always follow normal market expectations. Oil is a commodity able to defy those expectations, a tendency accelerating over the past several years, despite the global economic downturn.

What makes it such a stubborn and resilient market deviant is its central position in economies. Energy usage is certainly the pervasive element in the structure of markets and, despite recent concerns to the contrary, crude oil remains the dominant energy source. It defines industrial and commercial development and productivity in a wide range of ways from transport to petrochemicals. It even largely determines the pricing of natural gas, its primary hydrocarbon energy exchange equivalent. As such, normal changes in usage in response to price fluctuations (price and demand elasticity/inelasticity) are not applied to oil as readily as to other market products.

A transition from oil to natural gas, or further on to genuine new sources of energy, is hampered by over a century of infrastructure development and, until recently, the belief that oil supply is plentiful and prices will remain low. The transition will occur only when two things happen: first, when average prices rise to levels at which economic expansion starts to contract and, second, when delivery and usage systems are no longer able to structure sufficient forward planning. Both of these trigger mechanisms are on the horizon. They are accentuating an already difficult market situation and intensifying the problems.

I have said on several occasions that we have about thirty years left of a sustainable crude-oil-based economy.<sup>14</sup> Crude oil will certainly remain an element in the energy mix well into the twenty-first century—extracted, sold, processed, and used. However, the levels of volatility experienced, spot shortages, the increasing cost of processing inferior grades of crude oil or of upgrading heavy oil, bitumen, and oil sands to synthetic oil, declines in supply, regional market imbalances, and a number of other problems will progressively render crude

unacceptably costly, inefficient, and prone to accelerating instability. The dynamics of essential market expansion and diversification will necessitate a change.

This is especially significant for the U.S. market, where the economy base has historically depended upon the availability of cheap and plentiful energy (timber, then coal, and, until recently, oil). There were clear indications in the dramatic rise of oil prices through early July 2008 that the cost of resulting energy flows had become a major impediment to economic development and even market stability in developed economies. Similar restraining indicators resulted from the combined dramatic decline in oil prices and the credit crunch experienced in late 2008.<sup>15</sup> It is important to remember that the ultimate impact of oil vega results from the rate of volatility, not simply from price movements in only one direction.<sup>16</sup> The situation has been even more apparent (and immediate) in those nations where advancing industrialization holds the key to further economic expansion.<sup>17</sup>

Nonetheless, irrespective of price or ease of availability, crude will remain a primary energy source in parts of the developing world, where the absence of either a genuine alternative resource base or adequate levels of investment will require its continued use. In addition, the rising competition for available supply over the next decade will drive prices higher. This will increase political pressures in several vulnerable regions and contribute to the volatility in the market as a whole. A grand global zero-sum game is developing, where we are already witnessing diversions of supply to areas prepared to pay a higher premium for product.<sup>18</sup>

In response, the most developed states can hardly select a go-it-alone policy. This is especially true of the United States. It is important to emphasize at the outset that adopting a “fortress America” planning approach will avail the nation of little in this situation. The chimera of any argument to make the United States self-sufficient in oil is fallacious on its face value. The oil market has become globally integrated, with the United States dependent on imports for the bulk of what is used daily.<sup>19</sup> That import total includes a rising amount of imported refined oil products. Data and analysis supplement recent experience, indicating that domestic markets cannot insulate themselves from global energy volatility, whether those nations are net exporters or importers of oil.<sup>20</sup>

Much has been written about the cycles of oil pricing.<sup>21</sup> From early 2008 on, we have certainly experienced significant movement in both directions—to almost \$150 a barrel in early July 2008 on the New York Mercantile Exchange (NYMEX)<sup>22</sup> and then down to a low of less than \$33 in late December of the same year. However, while the upward pressure on prices through the midsummer resulted largely from concern over spikes in demand and trading fueled by the declining exchange value of the U.S. dollar,<sup>23</sup> the rapid decline in prices following the widening credit and liquidity drain-off experienced in the third quarter of 2008 did result in appreciable declines in demand, reflecting the result anticipated from a traditional market trigger—declining demand results in declining price, the reverse of the rise experienced six months earlier.<sup>24</sup>

The important point, however, is this. The pressures prompting a decline in oil prices were exogenous to the oil supply-demand cycle. Put simply—and we shall have much more to say on this subject later—the protracted credit-liquidity-finance crisis and the corresponding worldwide recession resulting from it has masked a continuing deterioration in the ability of oil supplies to meet demand. We have not seen that shortfall reemerge for the simple reason that there have been other economic matters that were even more pressing. The resurgence of that demand, which without doubt will quickly occur as overall financial equilibrium returns to the broader markets, will create another upward spiral in both prices and volatility. Once the “outside” factors are removed, oil vega will intensify along with the market instabilities associated with it. It is hardly a question of *whether*, but rather *when*.

Normally, cuts in oil prices will occasion a greater demand for crude and refined products. This has resulted in an ongoing debate over the actual meaning of efficiency and the nature of the relationship between cost and oil usage.<sup>25</sup> However, the declines in pricing on this occasion resulted from demand reductions for broader economic reasons. As productivity, consumption, real estate prices, and commercial investment declined, while unemployment, bankruptcies, and defaults increased, demand for oil products was cut appreciably. The destruction of wealth and purchasing power led to a concomitant destruction of oil demand.

Certainly by the first quarter of 2010, we were witnessing an initial stabilizing of oil pricing, along with signals that demand is returning. It is well known that increasing levels of energy demand regularly precede major upward corrections in markets as a whole. That does not happen merely because people wake up one morning feeling more confident about their consumption rates or lifestyles. It is because energy usage is a front-end support requirement for a rise in leading indicators,<sup>26</sup> with the recovery taking place well before it registers in lagging indicators.<sup>27</sup> In other words, energy in general and its dominant constituent—oil—in particular, will experience an increase in demand at an early stage of a recovery process, before that recovery is recognized in wider economic sectors.

As oil vega intensifies, increasing price instability (the assumption here is of *rising* prices, although rapid movements in either direction would be troubling), escalating supply-demand concerns, and a widening inability of markets to predict and compensate without engendering disproportionate consequences, the public sector will step in to deal with the problem. I shall suggest in the analysis to follow that oil vega will revise the playing field of world politics—threatening to add thereby another level of concern. This book will suggest that it will be the political arena, rather than the market, that will ultimately decide the matter. Unless there is a genuine global strategy in place, a protracted crisis will ensue. An extreme result would be conflict over resources, but the more likely outcome would be recurring oil-based domestic and regional legislative and regulatory decisions impeding free trade, cross-border capital flows, and access to assets. That could be as damaging and as disruptive.

This book is also not a history of either the oil market or the players within it. The academic within me is always tempted to explain the nuances of how we end up at a juncture at which significant policy decisions are required. In fact, my initial approach to this book attempted to do just that. Ultimately, the size of the resulting manuscript (about three times the current one), combined with the difficulty of unfolding a number of disparate “plot lines” in a single commentary, gravitated against that effort. I shall provide some of the historical writing originally intended for this work in other venues directed to audiences primarily interested in such matters. For those desiring to

augment the treatment in the current volume with more historically oriented approaches, there are several works I would recommend.<sup>28</sup>

What results is a more focused and immediate emphasis upon the contemporary issues at hand: a rapidly accelerating crisis in the contemporary oil sector, resulting from rising volatility and the impact of the vega factor.

Finally, most treatments of oil spend considerable time discussing Middle Eastern instability, geopolitical concerns, and possible conflicts over available resources, along with national security considerations and related strategic applications. These are certainly major concerns. As a political scientist by training, having experience in global risk management policy development and execution, I recognize the importance of such matters.<sup>29</sup> We shall touch on some of them during the course of this book. However, this is neither the primary focus nor the intention of what follows.

I wish to emphasize at the outset that, while rising instability and uncertainty in such quarters will add to the acceleration of the vega factor, they are not the causes. Even if we should enter a period of expanding international good will and understanding, while experiencing a significant decline in geopolitical tensions (admittedly, an unlikely prospect), we shall still experience the crisis in oil. This is not one initiated by OPEC, Iran, Chavez, the European Union, Russia, resource nationalism, sovereign wealth funds, or a host of other political variables. These factors can only intensify the problems.

The oncoming crisis, the onset of oil vega, is a product of the oil market itself. It is not thrust upon it from the outside. It emerges from how oil is now extracted, processed, traded, priced, and hedged.

That makes it far more dangerous and difficult to control.

