



THE SCHOOL OF PUBLIC POLICY

SPP Research Papers

Volume 8 • Issue 39 • November 2015

A COMPARATIVE ANATOMY OF OIL PRICE ROUTS: A REVIEW OF FOUR PRICE ROUTS BETWEEN 1985 AND 2014

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SUMMARY

With layoffs and cutbacks in the oilpatch and the ripple effects spreading out through Canada's economy, it may seem as though the latest drop in oil prices could stall the economic engine in Alberta for a long time. This paper argues, however, that the current rout is unlike the other three major ones (when the price of oil dropped 60 per cent or more) experienced in the last 30 years. The factors affecting the oil price drop and its potential for rebound differ significantly.

The routs of 2008 and 1997 were mostly demand-driven, triggered by credit crises in key markets. Both 2014 and 1985 started as demand-driven, too, but significantly, they changed to supply-driven crashes. There, however, the similarities end between today and 30 years ago. Fears that we may be in for a long-term rout, similar to that of 1985, which lasted more than a decade, may be allayed by examining the very different circumstances surrounding the contemporary situation. Given an uninspiring macroeconomic outlook, a supply-side solution will be imperative.

A critical difference lies in the security of spare productive capacity. In 1985, OPEC's spare capacity approached twenty per cent of world demand. Today, it is closer to two per cent. Moreover, today's producer of the disruptive non-OPEC barrels in the shale oil industry in particular is far more reliant on external financing than were companies developing, for example, the North Sea 30 years ago. Then, with much higher prime rates, firms largely self-generated their financing. In addition, there was considerable room for cost-cutting, enabling increased production and therefore prolongation of the crash.

If any silver lining can be found in the roiling storm clouds of the current rout, it is that the pendulum could swing sharply back by decade's end. Natural production declines in old fields and investment cutbacks and cancellations around the world will eventually register in market balances once record inventories are drawn down. However we are likely to see a bumpy rise in prices rather than a steady recovery such as after 2009.

The effects in Canada of the current rout are not Alberta's alone to suffer, largely owing to the dominance of the resource, labour and technology-intensive oil sands business. Unlike 30 years ago, the oil sands industry is far more enmeshed with a broad spectrum of ancillary industries and activities across the country. Back then, the oil sands made up just 17 per cent of Canada's total production of crude oil; today, that figure is over 62 per cent. The impacts of the oil sands industry thus are pan-Canadian.

The lesson for Alberta and Canada is to rely less on oil-price projections from the seers in the U.S. financial business, who are transfixed by the shale oil industry. Shale oil's already weak financial viability is even more precarious as the U.S. Federal Reserve ponders a rate hike. This crash was triggered by the over-supply from U.S. shale and Canadian oil sands and the response by Saudi Arabia to hold its market share and to not cut its production. It behoves Canada and Alberta to be more pro-active and pay closer and critical attention to OPEC and in particular to signals from the Gulf producers.

[†] I wish to thank Bev Dalby, Herb Emery, Jack Mintz, Dan McFadyen and Rick Simonton as well as two anonymous referees for helpful comments and suggestions.

“The more sand has escaped from the hourglass of our life, the clearer we should see through it.”

Niccolo Machiavelli

There has been great interest in the causes of the precipitous drop in the world price of oil since 2014, including how long before prices might revert to, and persist at, some higher if not former level.¹ The refrain of “we have been here before” is often bravely asserted by producers and investors, who have seen the value of their oil assets dramatically reduced. But, have we been here before? Is the past necessarily informative for predicting the aftermath of the recent oil price rout? Can policy makers assume that the price recovery will be long term and gradual, as it was after 1986, or that it will bounce back quickly, as it did after 2009?

What is remarkable about the 2014 price rout is not that it happened, but that it seemed largely unexpected by market commentators and financial institutions. With a sagging global economy, weakening demand and burgeoning output from non-OPEC producers (principally North America) —increasing faster than the annual growth in world oil demand — it was almost universally assumed and expected (and supported by theory²) that OPEC, and Saudi Arabia in particular, would again³ adjust supply to hold prices where they had been since 2011, a period of almost unprecedented price stability that also fed assumptions about the future. The market totally discounted history and relied on continued disruptions in the Middle East and North Africa to make room, if not actually to trigger physical reductions in output, at least to continue to signal a “geopolitical risk premium”⁴ — something devoid of any analytical basis but assigned to that part of the price not otherwise supported by fundamentals. On the demand side, the market expected China to support continued growth even though its economic outlook was weakening. This market sentiment to the upside was reinforced by the belief that OPEC countries’ fiscal break-even price would compel them to do what it takes to maintain the price and therefore their revenues. Macroeconomic demand and supply fundamentals were surprisingly discounted over this period. But history should have suggested this was an unwise strategy.

Oil price cycles are the product of the macroeconomic setting, the fundamentals of demand and supply, productive capacity and geopolitical developments. It is the last, specifically the role of key players (countries, organizations and individuals that animate the geopolitics of oil) that tends to receive most attention from the media and commentators. While important, much of this commentary is subjective, based on misconceptions, in particular

¹ For example, see World Bank, “Understanding the Plunge in Oil Prices: Sources and Implications,” in *Global Economic Prospects*, January 2015, pp. 155-168.

² “Specifically, we expect some ‘exploitation of the large by the small,’ the burden of output restriction being borne disproportionately by the moderates, but with much of the benefits going to the others,” Dermot Gately, “OPEC Pricing and Output Decisions — A Partition Function Approach to OPEC Stability,” 1978. (Gately identified the moderates to be Saudi Arabia, Kuwait, UAE, Qatar and Libya); <http://econ.as.nyu.edu/docs/IO/9405/RR78-09.pdf>

³ OPEC, led by Saudi Arabia, reduced output to support prices after 9/11 and with the financial crash and drop in demand in 2008/2009.

⁴ See <http://www.ojg.com/articles/2013/09/market-watch-geopolitical-risk-premium-repriced-in-global-oil-markets.html>

about Middle East suppliers, especially Saudi Arabia,⁵ and repeats dated views informed by events over four decades ago, in particular the Arab oil embargo, following the Yom Kippur War of 1973. This geopolitical focus of oil price commentary largely defies quantitative or theoretical analysis and thus will always remain at best food for much, but intriguing, subjective speculation and historical interpretation. Yet, central to most geopolitical commentary are the policies and actions of Saudi Arabia, which need to be analyzed in the particular context at any time. They are rational, so should be predictable, provided one correctly interprets the signals from their leaders.

This paper compares and contrasts the current with three previous significant drops in the price of oil: 1985-1986, 1997-1999, 2008-2009 and 2014 (referred to hereafter as 1985, 1997, 2008 and 2014) to assess whether there are policy lessons to be learned from previous routs or whether 2014 is fundamentally different.

This report is a review of history rather than an analysis based on economic models and theory. It starts with a comparison of the magnitudes and rates of the four price routs. This is followed by a review of the fundamentals in the period leading up to the beginning of each price rout — oil demand and supply, major sources of net new supply, spare capacity, commercial crude stocks and rig counts. As well, the trends of these fundamentals after the price crashed are compared. This review of the physical features of the market is followed by a necessarily brief description of the main geopolitical contexts, forces and factors, important events, key players, and how they influenced market sentiment. Finally, lessons learned from these previous price routs that might be applicable to the current one are summarized and what might be a plausible outcome for the market.

The current price crash differs markedly from the 1997 and 2008 crashes, which were demand-driven crashes due to credit crises (the Asian financial crisis and the U.S. housing bubble, which triggered the global financial crisis respectively). There are financial and credit tightness elements today, but these rest more with certain oil producers rather than consumers. While there are parallels between today's and the 1985 crash in that both are supply-driven/sustained crashes, there are fundamental differences; again, in terms of financing, the liquidity provided by central banks in recent years feeding highly leveraged segments of the exploration and production industry (E&P) contrasts with the tight financial conditions in the 1980s. Other fundamental differences include the effective spare productive capacity in OPEC, and the provenance and structure of the marginal supply. Moreover, the global macroeconomic context differs markedly, suggesting that we cannot count on growing demand to resolve market imbalances as it did post-1985. This is a supply crisis; the solution will have to come from the supply side.

The key message we have for companies and governments of oil-producing provinces in Canada is that a return to market conditions that tolerated poor cost discipline for intrinsically high-cost projects is not assured; new strategies will be needed. For Alberta in particular, where future natural resource revenues are expected to come mostly from the high-cost oil sands — the world's marginal barrels — a fundamental shift in fiscal policies

⁵ B. Fattouh, "The Image of GCC Oil Policy in the Western Media," 2015; B. Fattouh and A. Sen, "Saudi Arabia Oil Policy: More than Meets the Eye?" *MEP 13*, Oxford Institute for Energy Studies, 2015; B. Fattouh, R. Poudineh and A. Sen, "The Dynamics of the Revenue Maximization-Market Share Trade-Off: Saudi Arabia's Oil Policy in the 2014-2015 Price Fall," *WPM 61*, Oxford Institute for Energy Studies.

would seem in order. Governments need a more critical and careful understanding and monitoring of OPEC policies and signaling, especially from the Gulf producers. To rely on oil price projections that derive from what is ultimately a U.S.-based financial industry perspective on the market and around an inherently quirky shale oil industry in particular might just be aligning public policy too much with a collective wishful thinking.

A DESCRIPTION OF FOUR PRICE ROUTS

There have been nine notable price⁶ drops since 1985 (Table I). We focus on the four largest price drops where the price eventually decreased by nearly 60 per cent and more.⁷ Figure 1 compares the per cent declines for the four major price routs over the first 346 trading days⁸ (or 16 calendar months). The choice of the starting points for the first two is somewhat arbitrary but generally agrees with the literature; for the latter two, it starts at the date of the highest price prior to the rout, July 3, 2008 and June 20, 2014. The 1997 rout, like the 2000-2001 decline, took over a year to fall more than 50 per cent; therefore, its full drop is not fully reflected in Figure 1.⁹

⁶ Unless otherwise stated, “price” refers to the price of West Texas Intermediate (WTI) as reported by the US DOE Energy Information Administration (US DOE EIA).

⁷ Two price drops of more than 50 per cent not examined here were the short-lived 1990/1991 spike and the 2000/2001 slump. After Iraq’s invasion of Kuwait, the price spiked; then, after the launch of Operation Desert Storm on Jan. 16, 1991, the price fell to a low of \$18.12 within a month. The price decline of 2000/2001 occurred in the wake of the Asian financial crisis, the 1997/1998 oil price crash and the dotcom crash of 2000, leading to the (disputed) recession the following March. This was followed by the 9/11 attacks in 2001, an historic crash in the Wall Street stock exchange and subsequent slump in oil consumption, particularly aviation fuel. (“The Economic Effects of 9/11: A Retrospective Assessment,” Report for Congress, *Congressional Research Service*, The Library of Congress, Order Code RL31617, Sept. 27, 2002). The price fell by over 50 per cent by November 2001. This period had some parallels with the 2014 drop with Saudi Arabia leading and hectoring — but successfully then — other OPEC members into repeatedly cutting production (not all complied). The Canadian economy and its oil producers were largely shielded from this event with a Canadian dollar in the \$0.60-0.70 USD range.

⁸ Up to Oct. 30, 2015. Trading or business days generally refers to Mondays to Fridays (excepting bank holidays). Source of data: US DOE EIA.

⁹ Rather than using as the base price the price on the single day at the start of the price rout, the average price over the preceding quarter was used, then daily prices thereafter. Applying this leading quarter average reduces but doesn’t eliminate the effect of differences in the price trends before the start of the price routs. The one-day peak price before the rout had less relevance to the market and industry than did the average of the price over the three months leading up to that turning point. This approach most affects the decline curve for the 2008 crash when prices had been rapidly rising; thus, the average price over the three months prior to July 3, 2008 (when the market turned) was \$125 rather than the \$145 on that date (thus, on the graph, the price rises for three weeks relative to the average base price before declining). If the peak one-day price of \$145.29 of July 3, 2008 were used (rather than the previous three-month average of \$125.03), the nadir price of \$33.87 reached on Dec. 19, 2008 would be -76.7 per cent of the zenith price, rather than -73 per cent. For the 2014 rout to reach a comparable relative nadir, the price will have to drop to \$25.

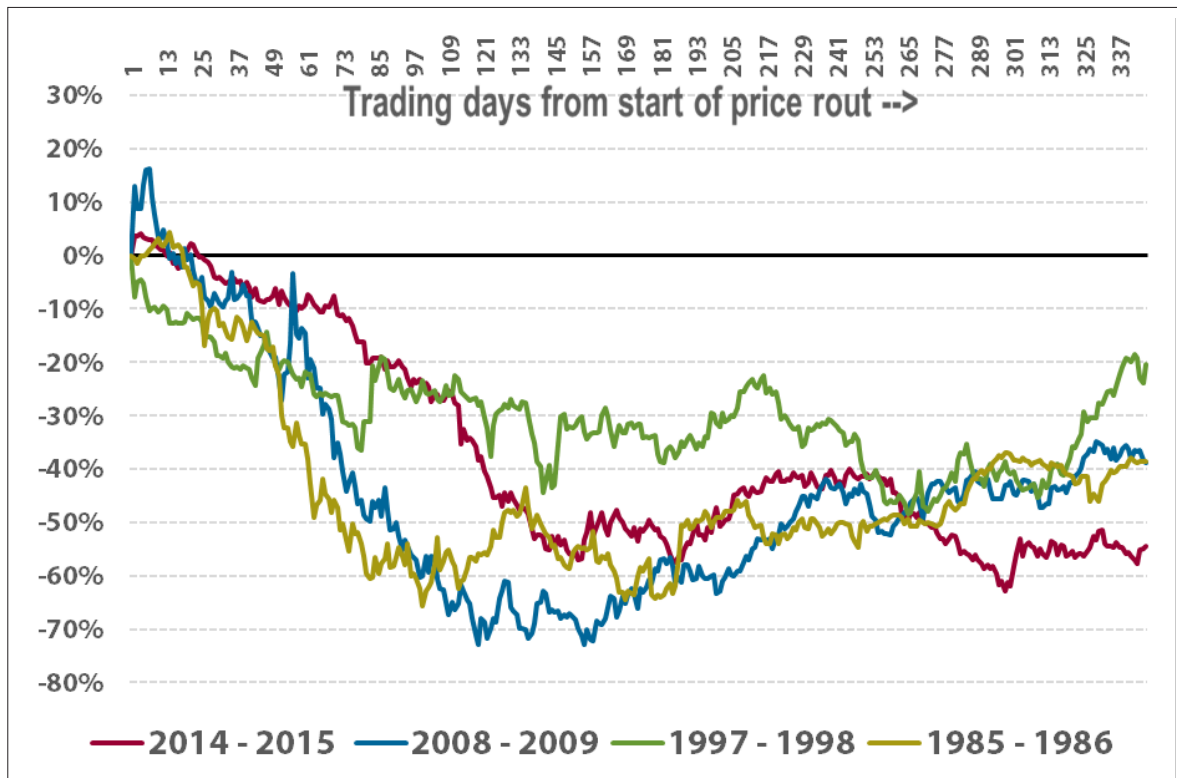
TABLE 1 CRUDE OIL PRICE ROUTS SINCE 1985

Date	% & US \$ Price Drop of WTI	Notes
1985-86	67% - \$31.31, 19/11/85 - \$10.42, 31/3/86	Massive OPEC spare capacity, price drop triggered by Saudi Arabia's policy to regain market share through a change in pricing policy to net-back pricing. ¹
1990-91	55% - \$40.42, 9/10/90 - \$18.12, 18/2/91;	Price spiked in October after Iraqi invasion of Kuwait in August 1990, followed by collapse of price after Operation Desert Storm attack and IEA announced co-ordinated release of government stocks, 16/10/91.
1997-99	59% - \$25.95, 15/1/97 - \$10.72 10/12/98	Weak price further weakened with Asian financial crisis and counter-cyclical increase in quotas by OPEC; took 18 months to reach (50%).
2000-01	52% - \$36.88, 18/09/00 - 15/11/01, \$17.45	OPEC reduced quotas twice, then signalled no further cut; economic fallout of 9/11 attack in New York, then OPEC cut quotas again.
2006-07	34% - \$76.98, 7/08/06 - \$50.48, 18/01/07	Mild winter, softening world GDP, high stocks, market in contango. ²
2008-09	77% - \$145.08, 01/07/08 - \$33.87, 19/12/08	Financial crisis triggered by U.S. banking practices.
2011	33% - \$113.52, 5/05/11 - \$75.67, 04/10/11	Dimmed economic outlook and IEA stock response to loss of Libyan output.
2012	29% - \$109.07, 24/02/12 - \$77.69, 28/06/12	Eurozone crisis, slowdown in China's oil demand growth.
2014-15	65% - \$107.26, 20/06/14 - \$38.06, 24/08/15	Weak global growth, Chinese demand less than traders' expectations, rising non-OPEC supplies, esp. USA LTO followed by Saudi resolve to hold market share.

1. Netback pricing refers to a producer price determination based on a sale price that clears into the market; so, a netback price will be the net of the sale price less all costs to move the product to market (processing/refining, transportation, financial costs and any fiscal imposts).
2. "Contango" refers to the shape of the forward price curve when the price for delivery in the future is higher than for delivery today. If the contango spread is wide enough to cover the cost of leasing storage space (plus financing costs), then traders can lock in a profit by putting crude into storage today and selling futures contracts for delivery at higher prices. When the opposite condition prevails, prices in the future being lower than today, the market is said to be in backwardation. In June 2014, the forward price of WTI on the NYMEX was in backwardation over 12 months by -\$10; in November, the market switched into contango and by March 2015, was deeply in contango by as much as \$12 over 12 months. The spread had narrowed to under \$3 in mid-June but has since increased to \$5.60 (November 6).

From Figure 1, it is interesting that the 2014-2015 oil price crash is neither the deepest nor the steepest nor yet the worst we have experienced; however, prices are still below 50 per cent a couple of months after prices in previous crashes had moved back up and remained above 50 per cent. 1985 saw the fastest decline over the first 50 days (-1.3 per cent/day versus next fastest, 2008, -0.9 per cent/day) and 2008 was the deepest over the first 150 days. 2014 declined the slowest at first; then, unlike other routs, accelerated after 100 days (when the Nov. 28 OPEC decision not to cut production confirmed a price war was on), but the rate of decline to the bottom (the first bounce) was comparable to that of 1985 and 2008. This merely underscores the importance of context; there is no or little predictive power based on the magnitude of the price drop, as these two most severe past routs had vastly different recovery times — a decade after 1985 and less than three years after 2008.

FIGURE 1 PRICE DECLINE (%) FROM START OF PRICE ROUT (HORIZONTAL AXIS IN TRADING DAYS)



The turning points for the price routs also do not suggest any consistent duration beyond saying that in the past, it took about four months at least before prices turned upwards. Far more critical is the medium-term outturn of prices — whether they return to previous levels (a V-shape or U-shape post-2008 and 1997 course), level off at a lower level (a panhandle-shaped post-1985 course) or some variant between. Thus, while the price turned in 1986 because of a change in OPEC policy, it took some 15 years (excluding the 1990/1991 spike following Iraq’s invasion of Kuwait) before prices recovered in current dollars and more than two decades in 2013 USD. The factors that drove the inflection in, and subsequent course of, prices are many and their relative weights differ among price crashes.

GENERAL CONTEXT OF PRICE ROUTS: THE FUNDAMENTALS OF DEMAND AND SUPPLY

Oil prices are rarely stable for very long. While they obviously reflect the fundamentals of demand and supply, they fluctuate in response to many factors that can be grouped into three interrelated areas: economic, technical and political. The underlying driver of price is economic — what is the state of the world economy to create demand for products derived from this important commodity, such as gasoline, diesel and petrochemicals? Price drivers include such familiar past political events as the Yom Kippur War in 1973, the Iranian revolution of 1979 and subsequent war with Iraq, Iraq’s invasion of Kuwait in 1990, and non-military developments like the recent policy decision by Saudi Arabia not to reduce output. Technological innovations such as new geological concepts, 3-D seismic, long-life drilling bits and hydraulic fracturing influence the market over longer time frames.

These fundamental drivers are further affected by market sentiment — the importance, whether justified or not, that traders place on these forces and how they interpret and react to information and misinformation. For example, the recent announcement of the nuclear deal with Iran changed market sentiment to reducing the price by more than five per cent, yet no physical change in supply was in the offing for months. Normally, a set of events or developments in all three spheres affects demand and supply eventually moving the market, rather than a single triggering event or player.¹⁰

Information is critical. Every month, key information agencies publish their outlooks on demand, production, inventories, refinery throughput and prices. The key reports are the International Energy Agency's (IEA) and OPEC's Monthly Oil Market Reports (OMR) and the U.S. EIA's Short-Term Energy Outlook (STEO). These can and do move the market by changing expectations with respect to non-OPEC supply and world demand. On a shorter term, the EIA's Weekly Petroleum Status Report released Wednesday mornings can move the forward price. Estimates of non-OPEC supply are particularly important, as are updates of crude in storage.

An important aspect of information is signaling — statements by key players such as the Saudi oil minister or the editorial leaders of the IEA's and OPEC's MOMRs, statements by these agencies' executive directors, or a policy signal from President Barack Obama that he will allow a free market for U.S. oil. All of these can affect the price of oil.

Spare production capacity within OPEC has been an important factor, notably during the run-up in prices from 2003 to 2008 when it was significantly reduced. Information on futures positions of traders and merchant traders also affects the market.

Table II summarizes the fundamentals four years prior to and after each of the four price crashes, including the macroeconomic setting, demand and supply.

Demand prior to the price routs. Most commentary about the current price situation tends to focus on the supply side and the U.S. shale oil business in particular — important because that's where analysts' financial interests lie — but this is inadequate. Moreover, as will be discussed, the supply side of the story is more than the U.S. shale oil revolution and whether or not it provides an unprecedented elasticity to global oil supply.

The starting point for analyzing the market should be the macroeconomic context, since change in global economic growth is the most significant determinant of oil demand.

¹⁰ For example, for the 1985 crash, the economic setting leading up to the price collapse was largely influenced by the U.S. Federal Reserve's high interest rate policy to fight inflation and the ensuing double-dip recession in the early 1980s; this drove a major collapse in world oil demand of 6.3 mmb/d over 1979-1983. The price had declined from its peak in 1980, then levelled off before crashing in late 1985. On the technical side, the international oil industry's pursuit of exploration ideas in offshore regions based on the new geologic model of plate tectonics led to major discoveries in, for example, the North Sea; the resulting surge in supply added to the weak demand's squeeze on the call on OPEC supply. The counter-policy factor was the Saudi decision to change its pricing policy in late 1985 aimed at restoring market share. Similarly, for the 2014 price rout, the economic setting of weak world growth, especially in China, combined with the technological supply stimulus provided by hydraulic fracturing of shale and tight oil formations in the U.S. and less so growing output from Canada's oil sands. This conflated with Libya unexpectedly (given its civil war) increasing output and Iraq and Nigeria reversing (politically induced) supply disruptions that, combined, had more or less been matching the increase in shale oil output; and, lastly and critically, accelerating the price crash, a change in Saudi policy to let the market work. Expectations are critical; for example, in summer 2015, the failure of Chinese demand to meet analysts' expectations fed bearish market sentiments. Expectations of economic growth based on IMF outlooks affect oil prices. And, of course, prices influence demand and supply but not equally or with the same speed.

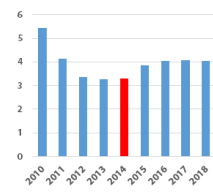
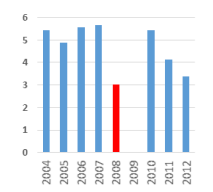
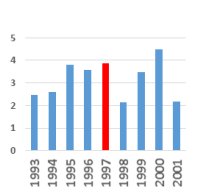
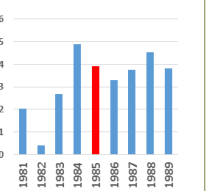
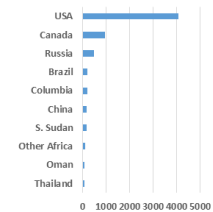
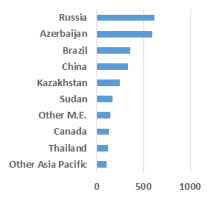
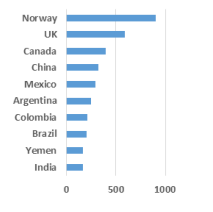
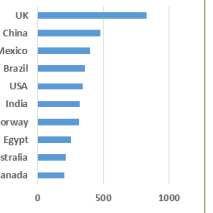
Changes in global oil demand are closely correlated with changes in GDP (Figure 2) and it follows that there should be a link between global GDP and oil prices. However, it is weak at best; not all recessions are caused by oil price spikes, nor do price spikes necessarily result in lower GDP, and price slumps do not necessarily result in acceleration of oil demand (Figure 3).¹¹ Finally, the world's economy has become less oil-intensive over the last 35 years. (Interestingly, since 1980, while Canada's oil bill has halved as a percentage of GDP, the commodity has become of greater importance to the Canadian economy).

Obviously, both demand and supply factors play in each crash; to say, for example, that the 1985 and 2014 crashes were both supply-driven crashes is simplistic; it overlooks respectively the massive oil demand destruction in the 1970s and early 1980s and the weakened global economy following the 2008 financial crisis. Also, the largely Asian-led demand growth (9.4 per cent) prior to the 1997 collapse and the modest growth in global demand pre-2008 and pre-2014, point to the importance of regional economic conditions affecting demand. This is particularly relevant to the 2014 crash, as analysts over-estimated Chinese oil demand. And the depths of recessions count; world oil consumption grew most aggressively (>10.7 per cent over four years) after the 1985 decline — it was rebounding from its low base set during the early 1980s recession; the four-year growth after the other declines was comparable (4.4 to 4.9 per cent; the IMF projects global economic growth of four per cent post-2014). A recent IMF report noted that the current price crash was demand-driven at first, then became supply-driven in late 2014.¹²

¹¹ There is a large body of literature on the relationship between oil prices and recessions. See for example, L. Kilian, "The economic effects of energy price shocks," *Journal of Economic Literature*, 2008, 46 (4); L. Kilian, "Not All Price Shocks are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market," University of Michigan, 2006; Dermot Gately and Hill Huntington, "The asymmetric effects of changes in price and income on energy and oil demand," *Energy Journal*, 2002, 213 (10); See also numerous papers on the subject by J.D. Hamilton, at <http://econweb.ucsd.edu/~jhamilton/>

¹² <http://blogs.wsj.com/economics/2015/04/14/supply-or-demand-the-imf-breaks-down-the-collapse-of-oil-prices/>

TABLE 2 DEMAND, SUPPLY AND ECONOMIC CONTEXT FOR THE OIL MARKET PRIOR TO AND AFTER THE BEGINNING OF PRICE ROUTS

FACTOR	2014 ¹	2008	1997	1985
Global Economic Growth (%) ²				
Global Consumption (mmb/d) Over Previous 4 years Over Following 4 years	92.1 + 4.8% + 4.9%	86.1 +3.7% + 4.4%	74.0 + 9.4% + 4.8%	59.2 - 0.3% + 10.7%
Non-OPEC Production (mmb/d & share) Over Previous 4 years Over Following 4 years	52.1 (58.7%) +8.2% +3.8%	46.7 (56.3%) -0.7% + 4.5%	42.6 (59.1%) +7.0% +4.5%	41.59 (72.4%) +10.5% +0.6%
OPEC Spare Capacity (% of World Demand)	3.1% ³	2-3%	4%	17-19%
North America Supply Over Previous 4 years Over Following 4 years	18.7 (20.5%) +35.2% +9.6% (projected)	13.2 (15.9%) -7.1% +18.1%	14.6 (19.8%) +2.7% -2.1%	15.3 (26.6%) +6.7% -8.4%
Net supply increases of top 10 non-OPEC producing countries over 4 years prior to price rout. (Note the horizontal scale for 2014 versus the other three graphs).				

1. Demand and production data from *BP Statistical Review 2015*; post-2014 projections sourced from IEA's *Medium Term Oil Market Report (MTOMR)*, 2015, and the March 13 *Oil Market Report*.
2. Source: IMF *World Economic Outlook Database*, projection to 2018.
3. 2.27 mmb/d of effective spare capacity; IEA *Oil Market Report*, September 2015, p. 16.

FIGURE 2 ANNUAL % CHANGES IN GLOBAL GDP (REAL) AND IN CRUDE OIL CONSUMPTION. SOURCE OF DATA: IMF AND BP STATISTICAL REVIEW 2014

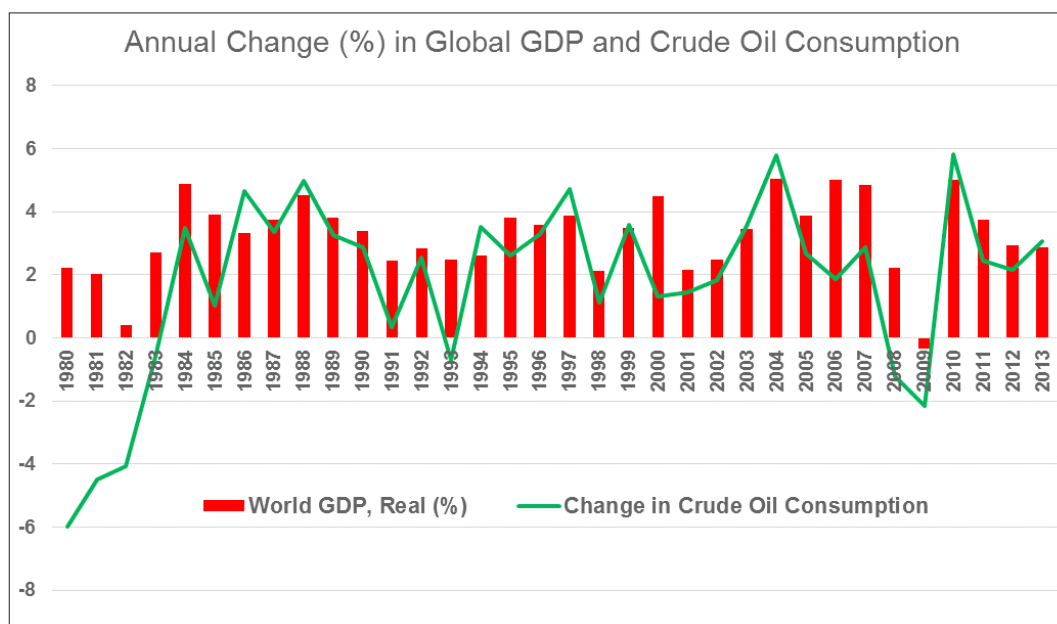
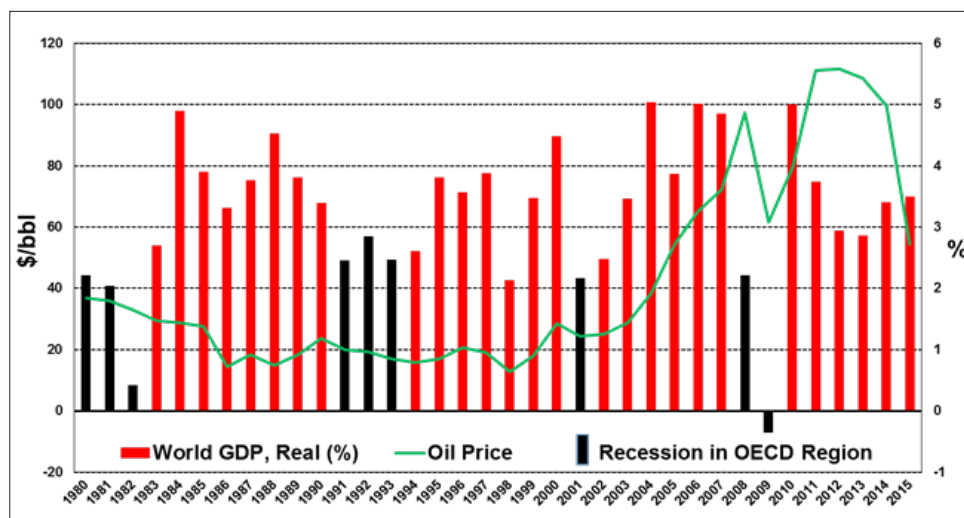


FIGURE 3 GLOBAL GDP (REAL) AND BRENT USD (CURRENT) AND RECESSIONS IN OECD REGION¹³



Responding to ever-changing economic and other information since the beginning of the current price rout, the IEA has changed its demand projection for 2015. In July 2014, it projected global demand in 2015 to grow year on year by 1.4 mmb/d. By May 2015, taking into account the IMF's more pessimistic prognosis for the world economy, the agency projected demand growth of 1.1 mmb/d.¹⁴ Yet, a month later,¹⁵ the agency reverted to 1.4 mmb/d owing to an increase in U.S. demand and adjustments to take into account a colder than normal winter in Europe and parts of North America. By September 2015, all the key agencies (IEA, OPEC and EIA) had adjusted upwards their 2015 demand growth projections — the IEA's to a five-year high of 1.7 mb/d, more than 50 per cent higher than four months earlier. But there are other factors (discussed later) that will bear on the demand/supply balance, not the least of which are stock levels, production strategies of OPEC and the response of non-OPEC producers and their sources of finance.

Supply trends prior to price routs. As was the case with demand prior to routs, supply trends prior to the four routs show important differences. Global oil supply comprises two broad sources, non-OPEC and OPEC. When the oil market is soft, headlines tend to place the blame for oversupply on non-OPEC, who normally produce as much as they can, allowing for work-overs, maintenance and the occasional unscheduled outage or constraints in take-away capacity through ports or pipelines. OPEC attempts to fill in the difference between expected world demand and non-OPEC supply. When demand is overestimated and/or non-OPEC supply is underestimated, and discipline breaks down within OPEC to adhere to their quotas, there is downward pressure on the price. Generally, however, until about mid-2014, in addition to OPEC discipline around quotas, there has always been a sufficient number of producing countries experiencing internal political turmoil or technical

¹³ Source: IMF, OECD/IEA MTOMR 2015, *BP Statistical Review* 2014, US DOE/EIA data for Brent (2014-2015).

¹⁴ *IEA Oil Market Report*, May 2015.

¹⁵ *IEA Oil Market Report*, June 2015.

challenges to accommodate increases in non-OPEC supply, and the market remained more or less balanced. However, this general picture differed for each of the four price routs.

Figure 4 illustrates the direction and weight of regional net contributions to world supply over the four years leading up to each rout. The role of OPEC in trying to accommodate non-OPEC output and the drop in demand prior to 1985 contrasts, for example, with OPEC's adding to the large net output from North America leading up to 2014. The figure belies significant differences between routs; for example, changes in and disarray among OPEC members' policies, the economics of oil supply (the changing marginal cost of supply) and evolving commercial and technological strategies of the private international oil industry.

FIGURE 4 REGIONAL CHANGES IN NET SUPPLY PROVENANCE PRIOR TO EACH PRICE ROUT (KB/D)¹⁶

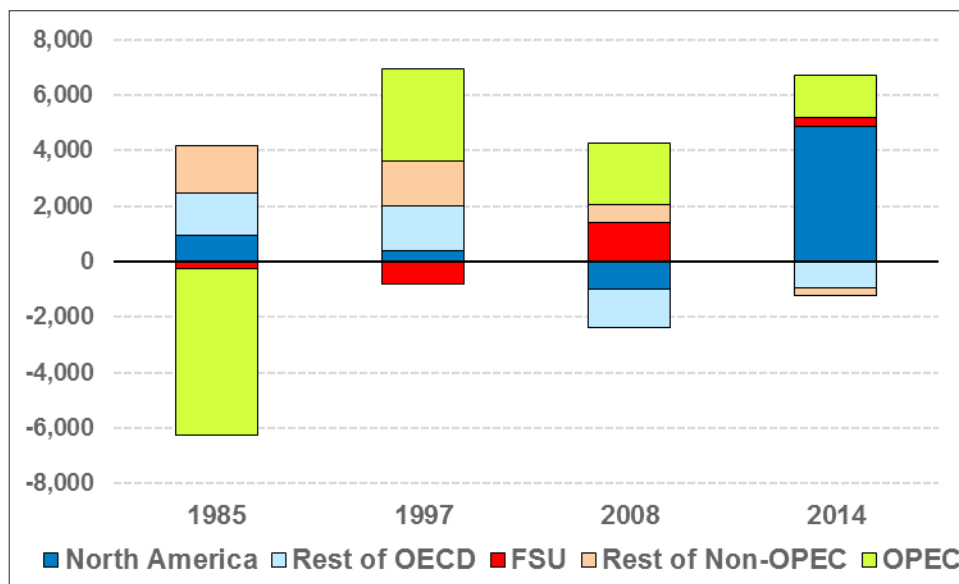


Table 2 lists the top 10 non-OPEC net contributors to net non-OPEC supply over the pre-rout periods. They have changed over the last three decades. From data supporting Table II and Figure 4, OPEC contributed to the oversupply in the last three price routs. In the period leading to the 1985 rout, some OPEC members made significant reductions in supply in an attempt to accommodate non-OPEC production increases against shrunken global demand; Saudi Arabia played the central role as swing producer (cutting production by 6.66 mmb/d) from 1981. While Venezuela, Kuwait, Qatar, UAE and Libya also reduced output, Iran and Iraq (at war with each other), Algeria, Nigeria and Angola all increased production.

North America was a net contributor to supply in all but the 1997 rout. Canada and Mexico were net contributors in 1985, but their increases before 1997 were almost entirely offset by the decline in U.S. production. By 2008, as noted above, North American supply was in decline even though Canada's production increased by nearly 130 kb/d. This changed dramatically prior to 2014, as the U.S. dominated by far the net growth in non-OPEC supply — at over 4 mmb/d, 97 per cent of the growth in world oil demand over the period.

¹⁶ Source of data: *BP Statistical Review*, 2015.

Little wonder that OPEC became concerned. Brazil and China were net contributors in all four routs and will continue as such, provided Brazil can overcome its current difficulties and find the capital to develop its massive but costly sub-salt discoveries and China can successfully develop its unconventional shale oil resources.

In the 1997 and 2008 routs, certain OPEC members contributed the larger share to the supply side of a weakening market. In 1992, Venezuela announced its Apertura program, opening the petroleum sector to private investment; by 1996, the CEO of its national oil company, PDVSA, was signaling its intent to produce 6 mmb/d by 2006 (up from about 3 mmb/d in the mid-1990s), much of which would come from the joint venture projects in the Orinoco extra-heavy oil belt. This implied that these joint ventures would not be subject to OPEC quota, thereby signaling to other OPEC countries that they would be expected to reduce output, should reductions be necessary. Between 1993 and 1997, Venezuela, Iraq and Saudi Arabia accounted for nearly 60 per cent of OPEC's net increase in output. Prior to the 2008 crash, the major Angolan offshore projects operated by IOCs had increased the new OPEC member's production by 800 kb/d, or nearly 40 per cent of OPEC's net increase, followed by Gulf producers Iraq, Qatar, Kuwait and Saudi Arabia. The only OPEC members that decreased production were Venezuela and Nigeria (owing to internal turmoil, strikes and technical problems). Figure 4 illustrates quite clearly that the battle for market share at this time was within OPEC and with the FSU, and not with OECD producers. In the four years prior to 2014, when demand grew by 4.2 mmb/d, major declines in supply from Iran (-740 kb/d), Libya (-1,158 kb/d) and Syria (-352 kb/d) were more than offset by net increases from Gulf producers, Saudi Arabia (1,430 kb/d), UAE (816 kb/d), Iraq (795 kb/d), Kuwait (560 kb/d), and Qatar (326 kb/d). However, U.S. and Canadian output of unconventional oil swamped the market with its surprising jump in net output of over 5,000 kb/d (offset slightly by a 175 kb/d decline in Mexican production).¹⁷

At the turn of the century, non-OPEC production plateaued, then fell, prompting concerns about peak oil. Even with the more than quadrupling of oil prices from January 2004, non-OPEC supply (outside the FSU) declined by 1.73 mmb/d. U.S. production in 2008 reached its lowest level since 1947. Its dramatic recovery commenced the following year as production of light tight oil began its surge. Set against sluggish world demand post-2009, the conditions were ripe for the inevitable confrontation between OPEC and non-OPEC five years later.

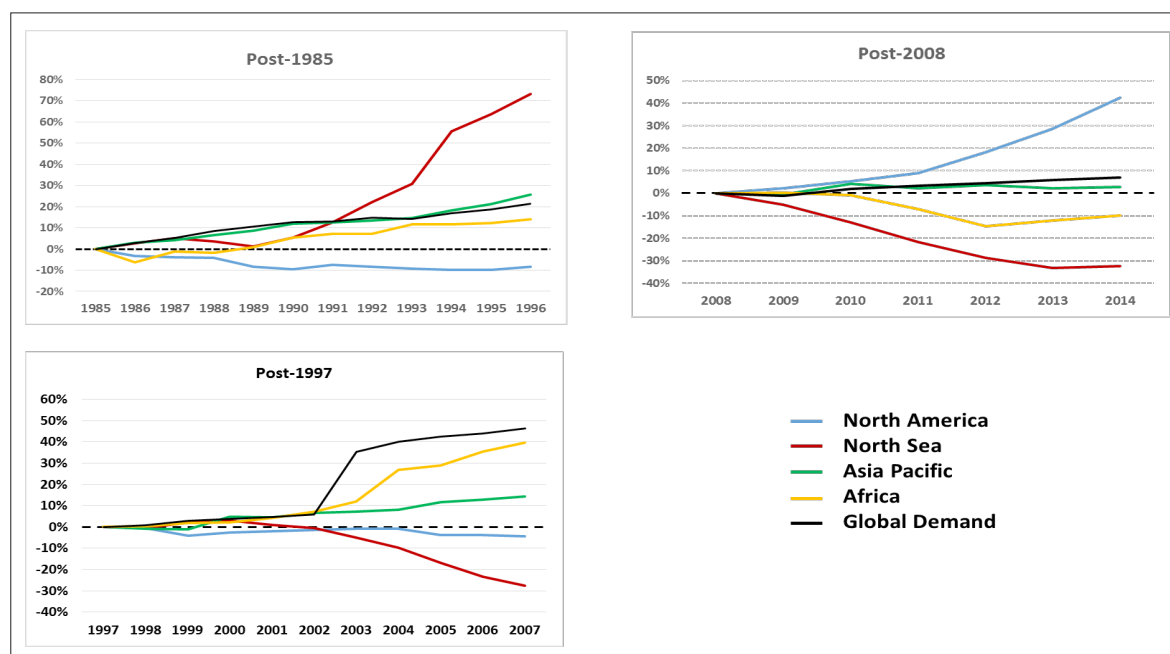
Figure 5 illustrates the relative production responses of different supply regions after the price routs. The momentum they had leading into the price routs is reflected in the shape and direction of the curves for their output after, and implicitly offer a proxy for the marginal cost of supply in the various regions.¹⁸ For example, post-1985, North Sea output continued to rise much faster than increases in world demand, while North America stagnated. Post-1997, however, the North Sea was in decline (mirrored by the later ascent of North America post-2008). The fact that all regions grew slower relative to the build in global demand reflects the lagged effect of reduced investment in non-OPEC regions,

¹⁷ Production and demand numbers from *BP Statistical Review*, 2015.

¹⁸ Without showing any analysis to support the claim, Professor Maurice Adelman declared with respect to 1980s' supply costs "... with price roughly 100 times cost in early 1985, there was plenty of room for higher output to make cost rise and price to fall ..." M. A. Adelman, "Scarcity and World Oil Prices," *The Economics of Petroleum Supply*, MIT Press, 1993, p. 160.

while OPEC filled the supply space with its ample spare capacity,¹⁹ especially after 2000, as it responded to the resurgence of global demand led by China. The region that had the strongest relative growth after 1997 was Africa, notably offshore West Africa, where serious exploration started in the mid-1990s, leading to discoveries and eventual production in the early 2000s.

FIGURE 5 CHANGES IN NON-OPEC REGION'S OUTPUT RELATIVE TO GLOBAL OIL DEMAND CHANGE POST-PRICE ROUITS



What comes through clearly in any review of the history of the interplay of supply from non-OPEC and OPEC, and which seems to have been forgotten in the run-up to the November 2014 OPEC meeting, is that Saudi Arabia, having learned a lesson in 1985, would never again assume alone the role of swing supplier and cut its production so deeply and so injuriously to its interests.

¹⁹ Attempts to discern theoretical cartel cause-and-effect relationships between OPEC decisions and the oil price tend to be misconstrued and generally not very helpful. For example, asserting that "... oil prices would not have reached \$145 per barrel (in 2008) if OPEC had not previously restricted investment in new capacity," (James L. Smith, "World Oil: Market or Mayhem?" *Journal of Economic Perspectives*, Vol. 23, No. 3, 2009, pp. 145-164) reveals an undue assumption of OPEC prescience as well as a simplistic understanding of the growing lag times between investment and production, owing to structural changes in the international industry over the previous 20 years as focus shifted out of the OECD region into the FSU, deep offshore and unconventional plays and into some OPEC countries that opened for private investment. Besides, in 2002, key OPEC members had more than 6 mmb/d of spare capacity — why would they have invested in more? The decline in production in the non-OPEC region up to 2007 was misconstrued as a reflection of peak oil (see Michael C. Lynch, "Forecasting Oil Supply: Theory and Practice," *The Quarterly Review of Economics and Finance* 42, 2002, pp. 373-389). Further underscoring how lag times and investment inertia confound projections based on theoretical supply elasticities, in 2015, the highest cost (the marginal supply) oil — from the Canadian oil sands — continues to increase, expected to add 800 kb/d — nearly 30 per cent increase in output by 2017, as large capital projects underway are completed. Thus, elasticities informed by the past are not very helpful in ascertaining future supply from such a fundamentally restructured industry.

OPEC SPARE CAPACITY: THIN EFFECTIVE SPARE CAPACITY SIGNALS UPSIDE PRICE RISK

OPEC spare capacity²⁰ signals the world oil market's resilience at any time to handle interruptions of supply and, of course, also indicates OPEC's discipline around quotas to keep upward pressure on prices. From Table II, OPEC's spare capacity varied between price routs as a percentage of world demand. In 1985, spare capacity reached 10 million b/d. Some of this capacity was in Iran and Iraq, and owing to their ongoing war, could not be called upon, so was not effective spare capacity. Spare capacity was reduced significantly through the 1990s with the collapse of the Soviet Union's production. As the FSU region subsequently increased output, spare capacity rose to over 6 million b/d by 2002.²¹ However, with increasing world demand, the sluggish response of supply (declining), spare capacity eroded to less than 1 million b/d in late 2004, signaling a significant upside risk to the market; this more or less persisted through to 2008. Thin spare capacity was an important factor in the rise in oil prices over this period. In 2014-2015, effective spare capacity continues to be thin, estimated by the IEA to be 2.27 mb/d in August 2015, with Saudi Arabia accounting for 86 per cent of the surplus.²²

STOCKS: HIGHER THAN NORMAL LEVELS SIGNAL DOWNSIDE PRICE RISK

Oil in storage constitutes another element of supply, although with the exception of floating stocks (in tankers), stocks are out of the hands of both OPEC and non-OPEC producers. Inventory builds and draw-downs do influence the relationship (the spread) between future prices versus current prices.²³ Because inventories tend to have little influence over the longer term (two or three years) price, they are not dealt with here in any detail, although the rate of inventory build in 2015 has been exceptional — 2.3 mmb/d over the first seven months.²⁴

Stocks are a critical element of short-term crude oil market fundamentals. Changes in stock levels reflect shifts in current and near-term imbalances in the market. In 2015, the market has been oversupplied by up to 3 mmb/d — it has to go somewhere, and that is into either commercial storage or government strategic petroleum storage (for example, China and India). Commercial stocks in the northern hemisphere normally increase in the autumn and again in the spring as refineries go through their maintenance and turn-around to adjust to meet changing seasonal product specs for winter and summer respectively. Thus, depending on whether stocks are above or below seasonal norms, traders perceive a change in stock

²⁰ Only Saudi Arabia purposely invests in spare capacity. Obviously, to develop fields and hold them as stand-by productive capacity is a very costly proposition. Saudi justification for this policy is to be able to back up the reductions in supply from other countries, and the record since the Iranian revolution in 1979 of Saudi Arabia filling in the gap cannot be disputed. Saudi Arabia's interests lie in a long petroleum era. It is therefore not in the interest of the kingdom to allow the extreme market volatility that results from supply disruptions; the financial rationale is that the incremental revenues earned during price run-ups, however contained, cover the cost of developing the spare capacity. Current policy is to hold 2 mmb/d of spare capacity.

²¹ <http://www.eia.gov/finance/markets/supply-opec.cfm>

²² *IEA Monthly Oil Market Report*, September 2015, p. 16.

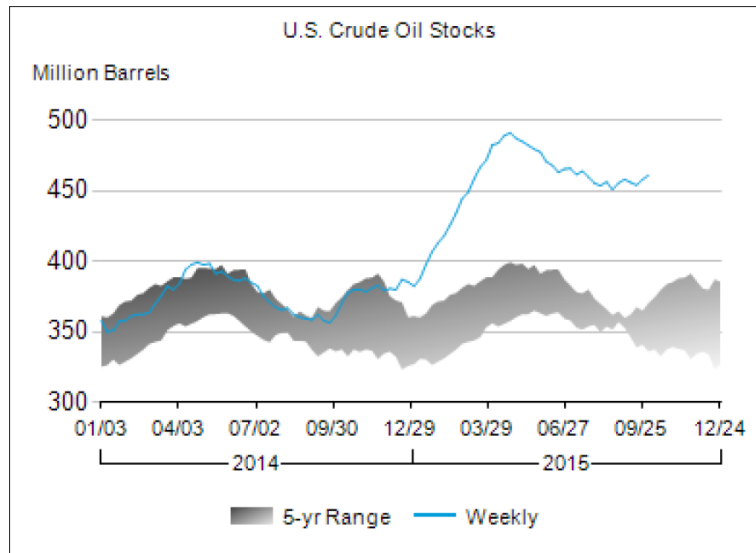
²³ http://www.eia.gov/finance/markets/spot_prices.cfm

²⁴ US DOE EIA, Aug. 24, 2015. <http://www.eia.gov/todayinenergy/detail.cfm?id=22632&src=email>

levels as an indicator of consumption trends. They speculate and trade, for example, on what the US DOE EIA publishes on U.S. stock levels in its petroleum report released every Wednesday morning.

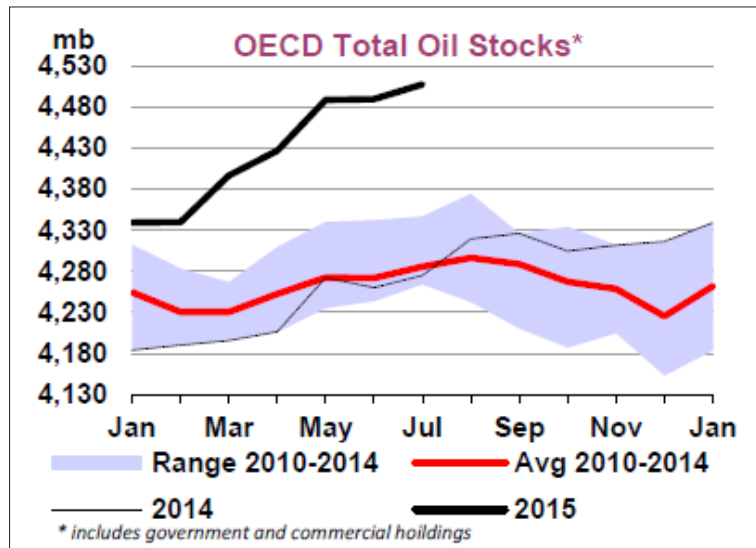
Figure 6 illustrates U.S. weekly (volume) commercial stocks and OECD monthly (commercial and government stocks in days of consumption) stocks compared with historical averages. In previous price routs, stock build never departed as dramatically from historical averages as it has in 2015.

FIGURE 6 U.S. COMMERCIAL²⁵ CRUDE OIL STOCKS AS OF OCT. 2, 2015 VERSUS FIVE-YEAR AVERAGE



Source: US DOE EIA

FIGURE 7 OECD TOTAL STOCKS AS OF JULY 2015 RELATIVE TO RECENT FIVE-YEAR AVERAGE



Source: IEA OMR September 2015.

²⁵ The stocks in the U.S. government's Strategic Petroleum Reserve are left out; they account for a much larger share of total crude stocks in the U.S. About half of the commercial stocks are in the Gulf Coast region and about a third in the Midwest, two major U.S. refining regions.

Not surprisingly, the market has been in contango since late 2014. Such a high crude inventory will require an extraordinary draw-down over the remainder of 2015 and into the first quarter of 2016 when inventories usually build. Given the relatively weak macroeconomic outlook for most of the OECD, this would seem unlikely. Thus, if the current price crash is supply-driven, it is supply, rather than demand, that will have to rebalance the market.

RIG COUNTS SIGNAL PRODUCERS' EXPECTATIONS OF FUTURE PRICES

The number of active drilling rigs in the field is an indicator of future supply and a proxy for the upstream industry's collective expectation of future prices about two months forward.²⁶ Baker Hughes has published weekly counts of U.S. and Canadian active rotary rigs since 1944²⁷ and since 1975, the database has included monthly rig counts for regions outside North America. Besides being an important business tool for suppliers to the drilling industry, rig counts are a leading indicator of the upstream industry's assessment of the near-term value and profitability of production from new wells.

Relative changes in rig counts leading up to and following the beginning of the four price collapses vary among regions of the world, and changes or the lack of, are a function of differences between exploration plays, whether onshore or offshore, the maturity or stage of development of the plays, as well as the level of state control and ownership of the industry. North America has always accounted for the largest share of the world's rig fleet (in the 1970s, close to 80 per cent).²⁸ Historically, North and South American rig counts have been more responsive to changes in oil prices than have those of Europe, Africa, Asia-Pacific and especially the Middle East. In the case of the Middle East, the vastly different field size, their maturity and critically, the dominance of government ownership (and most importantly, as members of OPEC, and therefore subject to OPEC quotas) where drilling programs are based largely on a longer-term perspective than that of private commercial firms, rig counts do not necessarily respond to oil prices as loyally as they do in, for example, North America.

Figure 8 illustrates the relative change in weekly oil rig counts in the U.S. for the four price declines. While the rate of decline, once started, is remarkably similar for all price routs (except 1997), the rig count drop-offs vary in magnitude (depth) and in the length of the lag time after the price declined before rig counts consistently fell week on week. This lag has increased from a few weeks in 1985 to five months in 2014; in fact, rig counts temporarily increased before falling in both 2008 and 2014. This lagged response reflects a growing inertia in rig utilization stemming from several factors. These include evolving obligations in lease terms and constraints in drilling contracts, progressively longer drilling times per drilling pad, and especially recently (2014) owing to the multi-well pads that operators would want to complete before releasing a rig and halting a drilling contract.

²⁶ It takes 25 to 35 days to drill, frack and complete wells in the U.S. shale plays; the best predictor of the number of new wells beginning production in a given month is the count of rigs in operation two months earlier. (<http://www.eia.gov/petroleum/drilling/pdf/dpr-full.pdf>, p. 10)

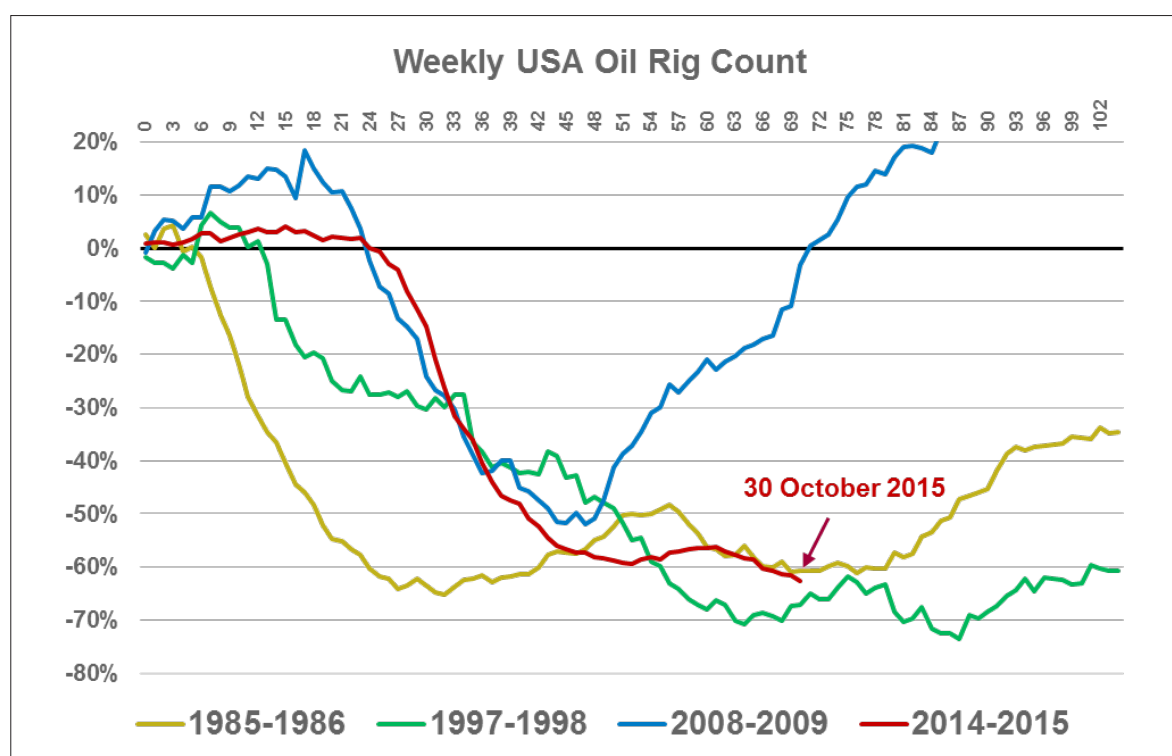
²⁷ <http://phx.corporate-ir.net/phoenix.zhtml?c=79687&p=irol-rigcountsoverview>

²⁸ Rig counts here are sourced from Baker Hughes' database. They do not include the former Soviet Union.

Also, producers' hedging strategies might have prompted some firms to drill out, frack and complete wells to capture the higher (hedged) price for the initial flush of oil in the first few months of shale oil wells. Some E&P companies have opted not to frack wells, leading to a fracklog (a backlog of drilled but not fracked wells) estimated to have exceeded 4,700 wells²⁹ as of late April 2015. Since fracking and completion represent the lion's share of costs, firms will be inclined to hold off for better prices and will refocus drilling or fracking to the richest areas in the shale plays.

Rig counts for all but the 2008-2009 price crash responded asymmetrically to price — they drop off quickly and come back slowly; the large fracklog might suggest that fracking crews will return if the promise of sustained higher oil prices is believable. The history of the U.S. industry would suggest that it will cut costs and re-focus, especially as many players need to meet their debt repayment schedules.

FIGURE 8 RELATIVE CHANGES IN WEEKLY U.S. OIL³⁰ RIG COUNTS FOR TWO YEARS AFTER START OF PRICE ROUTS (FOR 2014-2015, DATA EXTEND TO THE WEEK ENDING OCT. 30, 2015; FOR 2008-2009, CUTOFF AFTER RIGS HAD RECOVERED BY +20 PER CENT)



From the Baker Hughes database, of all regions, U.S. rig counts are the most responsive to price routs and declined at about the same rate for the 1985, 2008 and 2014 price routs. Rig counts fell slower over a longer time frame in 1997-1999. International rig counts (outside the Middle East) dropped off more or less at the same relative rate in 1985 and 2008 and appear to be doing so in 2015, but less acutely. Rig counts in the Middle East have

²⁹ <http://www.bloomberg.com/news/articles/2015-04-23/u-s-shale-fracklog-triples-as-drillers-keep-oil-out-of-market-i8u004xl>

³⁰ Up to Oct. 30, 2015. Trading or business days generally refers to Mondays to Fridays (excepting bank holidays). Source of data: US DOE EIA.

increased since 2000 from 140 to over 400 rigs in 2015, but have declined slightly since June 2015. While counts dropped after 1985 (and remained lower for several years) and also fell after 1997, unlike other regions, Middle East rig counts increased after the 2008 price crash.³¹ Saudi Arabia more than doubled its rig count between 2011 and 2014 (from 100 to 240), adding 60 rigs in 2014 alone, and was operating 212 rigs (about 50/50 oil/gas) in March 2015.³² Most of the increase related to the development of the Manifa field and to expanded production capacity in the giant Khurais and Shaybah fields to offset declines and/or to throttle down (and thereby prolong the life of) production from other, older fields. Also, ARAMCO's drilling strategy serves the kingdom's policy of maintaining its buffer capacity. Finally, ARAMCO should be in a strong position to negotiate lower prices from what amounts to a captured service industry in the kingdom, so one should not expect rig counts in the kingdom to necessarily drop with the price.

GEOPOLITICAL CONTEXTS — PLAYERS, SIGNALING AND MARKET SENTIMENT

Market fundamentals are insufficient in and of themselves to understand the dynamics of the price crashes. A rich and complex mosaic of geopolitical events, intrigue, posturing and signaling by market participants has played an important role through each crash. The following sections describe some of the principal actions and elements of major producers and compares and contrasts them with the 2014 price crash.

1985 VERSUS 2014

Some analysts believe the current downturn resembles the 1985 crash.³³ Both were seen as largely driven by non-OPEC producers flooding the market, leading to a counter-action from OPEC led by a specific policy decision by Saudi Arabia. Thus, the context included:

1. A breakdown of policy cohesion within OPEC;
2. Repeated but rebuffed appeals by the Saudi minister to non-OPEC producers for burden-sharing and co-operation;
3. Saudi policy; however, played out differently — in 1985,³⁴ the kingdom continued to cut its production and lost market share, but in 2014, it held production and as the price decreased, increased output;

³¹ Saudi Arabia accounts for about half of the region's rigs and has been increasing rig counts for the last several years, notably in 2012. Reasons include: need for more wells to sustain higher production and as fields mature; there is an increasing focus on drilling up natural gas fields to serve power generation to reduce crude and fuel oil burn for power, and more wells are needed to drill up and maintain the spare capacity margin of two million b/d (See: <http://www.oilandgas360.com/saudi-arabian-rig-counts-up/>).

³² <http://english.alarabiya.net/en/business/energy/2015/03/10/>

³³ http://www.worldbank.org/content/dam/Worldbank/GEP/GEP2015a/pdfs/GEP2015a_chapter4_report_oil.pdf; <http://oilprice.com/Energy/Oil-Prices/Current-Oil-Price-Slump-Far-From-Over.html>

³⁴ For a comprehensive review of the central figures and agents, events and geopolitics leading up to and through the 1985-1986 price crash, the reader is referred to Ian Skeet, "OPEC: Twenty-Five Years of Prices and Politics," *Cambridge Energy Studies*, 1988.

4. Major unrest³⁵ and uncertainty in the Middle East (Iran-Iraq war 1980-1988; today, post-Arab Spring, Libya, Yemen, ISIL in Syria and Iraq, the lifting of sanctions on Iran over its nuclear program and questions regarding how quickly Iran will be able to increase production).

But there are important differences. The most critical difference is spare capacity; in 1986, it was at least 10 mmb/d, while today the effective capacity is closer to 2 mmb/d. Also important are the structure and financial context of the industry producing the marginal barrel. In 1985, non-OPEC supply comprised major, multi-billion dollar production facilities owned and operated by large, internally financed firms, integrated with equally costly transportation infrastructure in the North Sea, the Bay of Campeche, Mexico and Prudhoe Bay, Alaska and to a small extent, the oil sands in Alberta. Certainly, rig counts dropped off around the world after 1985, but production continued to rise, in particular in the North Sea; after a brief lull through 1987-1988, it expanded dramatically (Figure 4). Output from these production facilities had considerable momentum; today, probably the closest analogue is the oil sands plants in Canada, which are expected to continue to add production as projects under construction are completed and brought on stream. However, unlike the North Sea post-1985, no new projects are expected at current prices. LTO production today, on the other hand, has nowhere near the same inertia given the rapid first-year decline (70 per cent or more) of wells. While it must be acknowledged that the tight oil industry has made impressive gains in efficiency, getting more oil out faster with fewer wells, especially in the Permian basin,³⁶ most of this tight oil activity is driven by U.S. independents, whose continued financing is not assured.³⁷

In 1986, there were many opportunities for cost reductions and given the nature of the initial investments, the marginal cost of production was relatively low. In recent years, the cost of production in most regions of the world has increased significantly while prices remained flat or declined. The LTO business today is under pressure to cut costs. The oil sands, unlike the North Sea in the 1980s, have some of the world's highest unit capital and operating costs; new major capital investments beyond those under construction will not be launched. This is reflected in CAPP's updated outlook³⁸ for oil sands output; compared with the 2014 outlook, projected production is down 125 kb/d by 2020 — but still more than 900 kb/d above 2014 levels — down 590 kb/d by 2025 and by more than 850 kb/d by 2030.

A second and important difference is how Saudi Arabia responded to the market.

Saudi Arabia's role. The key policy factor that ultimately led to the price drop in late 1985 was Saudi reaction to its unsustainable role of swing producer; it had cut back production

³⁵ Middle East unrest has almost become a tautology; however, the market's view of this constant is not consistent, invariably tempered by other factors. For example, during the tanker war of 1984-1987, (<http://csis.org/files/media/isis/pubs/9005lessonsiraniraqii-chap14.pdf>), with dozens of crude oil tankers damaged and sunk as Iran and Iraq took their stalemated land war to each other's oil exports on the Gulf, then escalated to attacking third-party countries' vessels, oil prices continued to slump.

³⁶ Arthur Berman, "Is This the Best Play in U.S. Oil?" Aug. 18, 2015. <http://oilprice.com/Energy/Crude-Oil/Is-This-The-Best-Play-In-US-Oil.html>

³⁷ Energy Aspects, "U.S. Production: Game of Loans," *North American Quarterly*, May 2015, p. 82.

³⁸ Canadian Association of Petroleum Producers, 2015, <http://capp.ca/publications-and-statistics/publications/264673>

from 10.2 mmb/d to 3.6 mmb/d in 1985 (to below 2.4 mmb/d in May 1985).³⁹ To restore its market share, the kingdom switched from an administered system of posting official selling prices (OSPs) to selling on a netback basis — in other words, crude prices would be determined by the prices of the products yielded from the crudes, essentially guaranteeing margins for the buyers and guaranteeing the Saudi crude would clear into the market. Netback pricing was not a new device; prior to nationalization of the industry in OPEC countries, the integrated oil majors used it to ensure positive margins in their downstream affiliates. Saudi Arabia needed to ensure its long-haul crude could compete with the surge of new shorter-haul crudes (from the North Sea) supplying Europe and the U.S. Gulf Coast (where it competed with crude from the Gulf and increasingly from Mexico). While an important development, this adoption of a pricing procedure by Saudi Arabia, followed by other OPEC members, was more a consequence of the much more important deterioration in global demand and the rising output from non-OPEC producers, rather than the cause of the price rout. The ultimate trigger of the price crash was the increase in Saudi production. By late 1986, the Saudi oil minister, Sheik Zaki Yamani, had lost his job and the kingdom was urging its OPEC partners to return to administered prices around a reference price. Meanwhile, in 1986, Mexico adopted netback pricing⁴⁰ as part of its marketing strategy for the massive offshore heavy oil Cantarell field.

In 1986, Saudi Arabia even sought the co-operation of non-OPEC producers — including Canada — as the price crash continued. In June 1985, Canada deregulated oil prices after nearly 12 years of administered pricing. With the collapse in world oil prices, Canadian producers were hit hard, especially those producing heavier grades;⁴¹ in the post-administered pricing environment, crude production in Alberta and Saskatchewan (which together host Canada's heavy oil plays), had dropped 100 kb/d (eight per cent) in 1986 versus 1984, the last full year of administered prices for new oil. However, thanks to rising production of synthetic oil, natural gas liquids and the expansion of the Norman Wells field in the Northwest Territories, total Canadian liquids production had only declined by 26 kb/d over this period.⁴² South of the border, the mom-and-pop owners of stripper wells lobbied hard in Washington, stressing their contribution to U.S. oil security.

This lobby effort led to the pivotal political event generally associated with the levelling off of oil prices in mid-1986 — the meeting in Saudi Arabia in early April 1986 between then-vice president George H. Bush and King Fahd⁴³ at which Bush urged the king to reconsider Saudi production policy. The day after Bush's meeting (in a meeting of no consequence

³⁹ Skeet, p. 206.

⁴⁰ Most of today's crude is priced on a netback basis.

⁴¹ Owing to an artefact of the sulfur/API° gravity matrix of the Alberta Petroleum Marketing Commission to determine provincial royalties at the time, which was adopted by the federal price administrators to set the prices of different grades of oil in all producing provinces designated as new and eligible for world prices, very light sweet and heavy grades of oil received higher prices than they would have in a free market. This was reflected in the prices paid for these grades exported to the United States. Producers had therefore been induced into drilling up the relatively low geological risk, heavy oil plays to get these distorted new oil reference prices (NORP). Prior to deregulation, the industry had been alerted to the prospect of lower prices; however, without the slightest irony, the then-chairman of the industry association (Canadian Petroleum Association) wrote the finance minister, noting that while the industry welcomed deregulation, they would need to continue to receive NORP for heavy oil.

⁴² Source: *CAPP Statistical Review*, www.capp.ca

⁴³ "Bush Sees Oil Glut Undermining U.S.," April 7, 1986 http://articles.chicagotribune.com/1986-04-07/news/8601250350_1_oil-prices-oil-situation-oil-production

to the world market), Joe Clark, Canada's foreign minister, met with Saudi oil minister Yamani in Dhahran where Yamani asked for Canada's support in cutting back production.⁴⁴ Three weeks earlier, Alberta premier Don Getty had called the Saudi minister and offered to make a cut in production.⁴⁵ Canada's official response was that "the government does not control production and only the market would determine production levels."⁴⁶

In the 2014 price rout, the key agent again has been Saudi Arabia and its oil minister, Ali Al Naimi. Indeed, as one might expect since it is by far the largest producer in OPEC, Saudi Arabia has been a key player in all price routs and has consistently urged co-operation from all producers.

Saudi Arabia continues to be targeted with the same uninformed and ad hominem commentary from the 1970s, with at least one columnist going so far as to suggest that the producer of the cheapest oil in the world has an obligation to make room for the most costly oil in the world. It is ironic that an energy columnist with Canada's *Financial Post*, a newspaper that advocates free and unfettered markets, recently characterized Saudi actions as "brutal, uncompromising, shocking" and harsh, and implicitly advocated a free market for non-OPEC oil, but a fettered market for Saudi Arabia's oil.⁴⁷

The kingdom and its oil-pricing policies tend to be misunderstood. While the Ministry of Minerals and Petroleum sets Saudi policy (i.e., regarding production levels, buffer capacity and contract principles, for example, destination restrictions), the setting of official selling prices is left to the competent marketing staff in Saudi ARAMCO. They determine OSPs to ensure most of the value is captured by Saudi ARAMCO and not by refiners. ARAMCO sets OSPs for the forward month each month for its oil in four markets: Asia, northwest Europe, the Mediterranean and the U.S. Gulf Coast. OSPs are set by formulas populated by estimates of Gross Product Worth (GPW) based on previous months' refinery realizations. Dynamics in the target markets determine Saudi Arabia's OSPs — not some nefarious scheming in the House of Saud.

OPEC is strongest or potentially most effective in a falling market when it can withdraw supply. It is weakest in a rising market when no member would shun the increased revenue. OPEC has adjusted its quotas from time to time, notably in the first decade of the 21st century as it tried to keep the price within a notional price band of \$22 to \$28/bbl,⁴⁸ but as the price continued to rise, OPEC chased rather than managed the market and signalled new price band targets. But in 2014, in the face of burgeoning shale oil output in the U.S., steady growth of production from Canada's oil sands, other OPEC members refusing to cut

⁴⁴ P. Martin, "Cut oil production, Canada urged; Saudi predicts disaster unless OPEC share increases," *The Globe and Mail*, April 9, 1986. Retrieved from <http://ezproxy.lib.ucalgary.ca/login?url=http://search.proquest.com/docview/386353433?accountid=9838>

⁴⁵ Arthur E. Blanchette, editor, "Canadian Foreign Policy: 1945-2000, Major Documents and Speeches," Golden Dog Press, 2000, p. 248; "Getty's call unsolicited, Yamani says," *The Globe and Mail*, April 9, 1986, p. A4.

⁴⁶ Author's notes; the author, then an official with Canada's Department of Energy, Mines and Resources, accompanied Clark for his meetings in Saudi Arabia.

⁴⁷ Claudia Cattaneo, "The Saudi strategy to quickly push prices to uneconomic levels was typical of what we have come to expect from the Middle East: brutal, uncompromising, shocking ... This latest oil shock highlighted the harshness of (the Saudis') ways, and is one reason Canada's oil will continue to be favoured at their expense." *Financial Post Magazine*, April 2015, p. 11.

⁴⁸ Press release, 122nd Extraordinary Meeting of OPEC, Dec. 12, 2002.

production, Iraq increasing output and Russia holding steady, Saudi Arabia chose short-term pain to protect its longer-term interests. In essence, Saudi Arabia deferred to market forces to sort out the price — simply what private oil firms advocate for host countries wherever they invest around the world.

1997 AND 2014

As noted earlier, the 1997 price crash was largely but not entirely self-inflicted by OPEC, if not by the whole organization, then certainly by Saudi Arabia and Venezuela. But it was the first time that some non-OPEC producers overtly co-operated in eventually reducing supply and firming up prices. Throughout the 1997-1998 crash, signaling by key market participants had a significant influence on the price.

The set of factors⁴⁹ that led to the weakening and then run on the price included the following:

- Asian demand, particularly China and the Asian tigers, was accounting for a dominant share of net growth in global demand since the beginning of the decade; with the Asian financial crisis, this demand shrank dramatically, and importantly, the expectation of demand growth faded;
- The United Nations' sanctions on Iraq after the 1991 allied invasion to get Iraq out of Kuwait established a revenue- rather than volumes-based production cap for Iraq; thus with the fall in price, Iraqi production was allowed to increase, which compounded the supply/demand imbalance. Today, sanctions on Iran related to its nuclear developments also influence the price, but not through any impact on fundamentals; rather, it is speculation as to when and how fast Iran can increase its output;⁵⁰
- Many OPEC members, anticipating an adjustment in quotas when Iraq returned to OPEC quotas, increased production or overstated their output to ensure that when reductions were agreed to, their quotas would be set on higher production bases; they thus signalled over-supply to the market, further weakening the price;
- In the early 1990s, along with many producing countries, Venezuela opened its petroleum resources to private companies under the Apertura program. Of great irritation to Saudi Arabia, the CEO of PDVSA, Venezuela's national oil company, had been boasting that PDVSA's output would increase dramatically (from 3 mmb/d to 6 mmb/d); most observers quite naturally assumed Venezuela would not include private companies' share of production, signaling quota-busting on the part of one of OPEC's founding members;
- At its meeting in Jakarta in November 1997, OPEC increased quotas at a time when all the fundamentals of the market seemed to be calling for a decrease.

⁴⁹ For a detailed review and analysis of the 1997-1998 price crash, see Robert Mabro, "The Oil Price Crisis of 1998," Oxford Institute for Energy Studies, *SP10*, 1998 <http://www.oxfordenergy.org/wpcms/wp-content/uploads/2010/11/SP10-TheOilPriceCrisisof1998-RMabro-1998.pdf>

⁵⁰ "Crude Oil Futures Retreat after Iran Nuclear Deal Reached," Bloomberg, April 1, 2015. <http://www.bloomberg.com/news/articles/2015-04-01/oil-trims-gain-after-rising-most-in-2-months-on-shrinking-output>

Following the rapid weakening in prices after November 1997, Mexico secretly sought to bring Venezuela and Saudi Arabia together, which they did in Riyadh the following March without the media or even all the other members of OPEC knowing.⁵¹ In the end, some producers backed off, including Oman, and of great significance, Mexico and Norway.⁵² Russia's co-operation was rumoured, but there was no proof they actually made a deliberate government decision to reduce production (highly unlikely in the circumstances, as it was in economic collapse and would have needed every penny of foreign exchange from oil exports, which were just beginning to recover).

Regardless, in late 1998, Brent prices fell below \$10, their lowest level (in real terms) since the early 1970s. After more than a decade of low prices, cost cutting, outsourcing, downsizing and poor returns,⁵³ the private oil industry went through an unprecedented consolidation (Figure 9). Today, while the lending side of banks might be worried about their exposure to some players in the LTO business, the investment bankers are hoping for an uptick in M&A activity.⁵⁴ So far, while there have been several deals involving small companies, the only mega-merger has been that of Shell-BG⁵⁵ while Suncor is consolidating its position in the oil sands with an increase in its share of the Fort Hills project and an unsolicited offer to purchase Syncrude's largest shareholder.

⁵¹ A candid account of the behind-the-scenes efforts by the CEO of PEMEX, Mexico's national oil company, at the time, was recently published. Adrian Lajous, "Mexican, Saudi and Venezuelan connection – a memoir," *The Oxford Energy Forum*, 100th issue, May 2015 at www.oxfordenergy.org

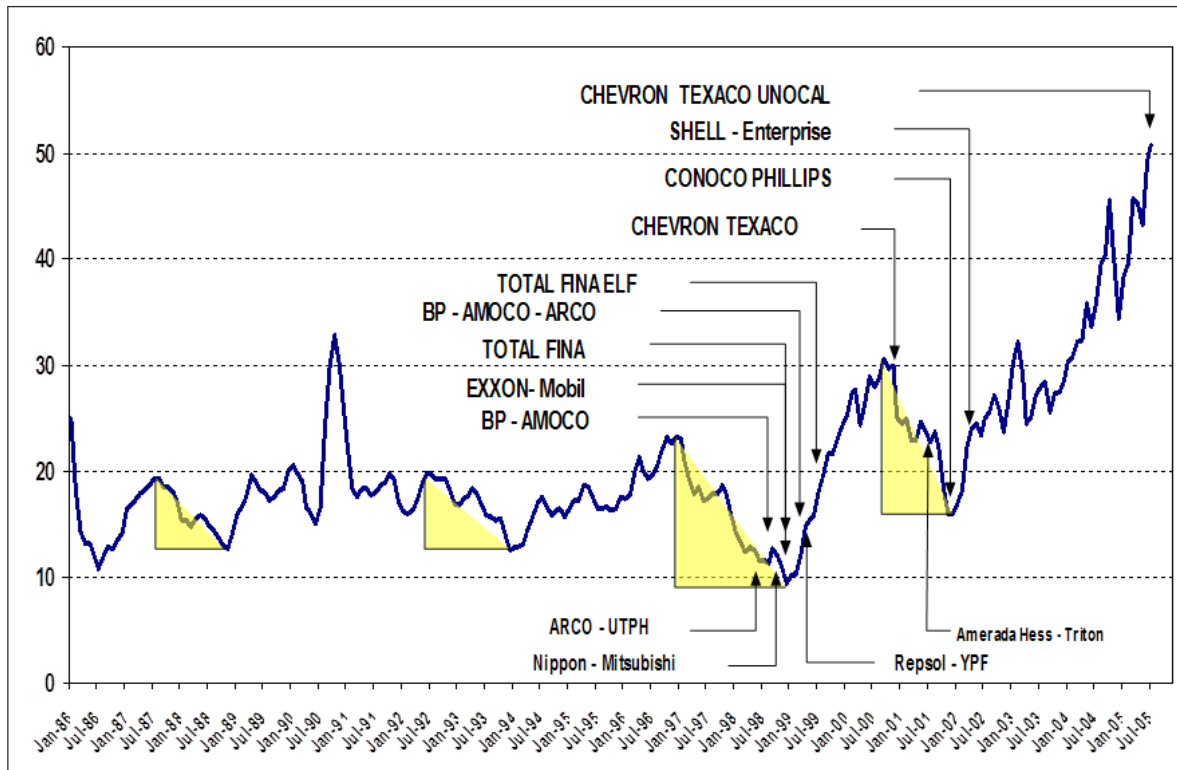
⁵² Maintenance of North Sea platforms normally occurs in the summer months, so Norway could point to production cutbacks and play its ambivalent role as a member of the IEA while maintaining its close observer status at OPEC. Norway, while a member of IEA, did not accept to be part of the agency's emergency oil-sharing program, reserving its sovereign right to play on either side of the oil game in crisis, depending on its interests.

⁵³ Through this period of low oil prices, the integrated oil companies managed to deliver much higher profitability than independents; however, it was far cheaper to grow by buying than drilling for new oil. N. Antill and R. Arnott, "Oil Company Crisis: Managing Structure, Profitability and Growth," Oxford Institute for Energy Studies, 2002, www.oies.org

⁵⁴ <http://business.financialpost.com/news/energy/oil-price-collapse-enables-buyers-to-grab-top-ma-targets>

⁵⁵ In the late 1990s' M&A flurry, Shell was re-trenching and cutting costs and continued to amass a very large cash reserve. It attempted to buy Barrett Petroleum (\$1.2 billion) but lost out to Williams Company. Shell made two minor acquisitions — Pennzoil Quaker State and U.K. Enterprise Oil (in 1982, the U.K. government privatized British Gas, and Enterprise was created to hold the oil assets; the gas assets stayed with the newly logoed BG). The total value of the acquisitions was \$6.2 billion.

FIGURE 9 MERGERS AND ACQUISITIONS AMONG LARGE OIL AND GAS COMPANIES IN THE LATE 1990S TO EARLY 2000S RELATIVE TO THE PRICE OF OIL (BRENT USD); THE YELLOW TRIANGLES EMPHASIZE THE LEAD-UP TO THIS PERIOD SINCE 1986 WHEN THE PRICE BOUNCED OFF A FLOOR AROUND \$15 AS INDUSTRY FACED MAJOR CHALLENGES IN MEETING EARNINGS EXPECTATIONS



Transparency in the market. Since 1975, when the IEA was established, there was virtually no communication between the secretariats of the IEA and OPEC. However, in the wake of the first Gulf War (1991), at the instigation of France (not yet a member of IEA) and Venezuela, an OPEC member, consumer dialogue⁵⁶ was launched at a special ministerial meeting in Paris. Some delegations from the more market-oriented consuming countries, concerned that this could head off into some kind of *dirigiste* attempt to manage the market, proposed that the IEA convene a meeting of experts from producing and consuming countries. This took place in 1992, at which experts stressed the chronic problem of the opacity and unreliability of production numbers reported by the member countries and the lack of timely and sound data on demand, particularly in non-OECD economies. The 1997 crash finally provided the impetus to address this issue seriously; the outcome was the creation of the Joint Organizations Data Initiative (JODI),⁵⁷ OPEC countries (and others) finally saw the benefits of transparency. The International Energy Forum, with its secretariat in Riyadh, eventually grew out of the dialogue.

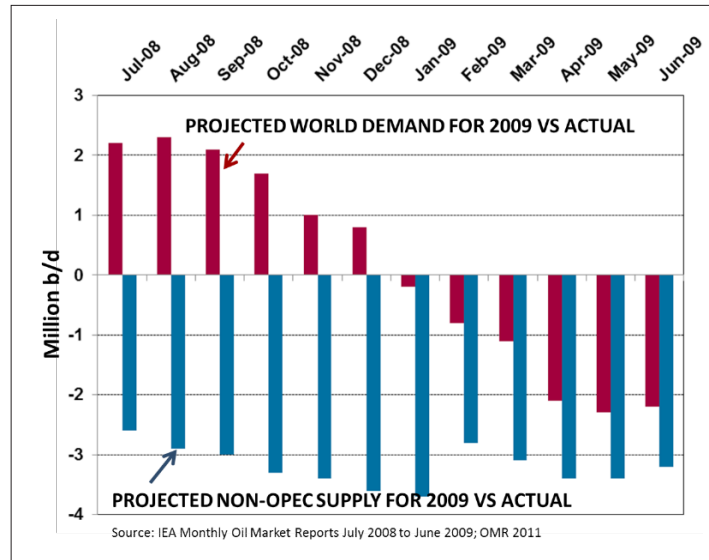
⁵⁶ Producer-consumer dialogue was not a new idea; it had been attempted in the context of other commodities in the 1970s on a formal scale, but failed. With respect to oil, Robert Mabro, the founding director of the Oxford Institute of Energy Studies, really should be credited for facilitating an informal, but highly effective dialogue through the Oxford Energy Seminar and Oxford Energy Policy Club. See *Oxford Energy Forum*, Issue 100, May 2015 www.oxfordenergy.org

⁵⁷ <https://www.jodidata.org/oil/support/history-of-jodi-oil.aspx>

2008

The dramatic, short-lived 2008 crash was demand-driven, owing to the loss of credit in financial markets. In the face of falling world demand even with central bank stimulus, OPEC cut back production (by 3.6 mmb/d),⁵⁸ which increased the cushion of spare capacity, and the private industry reacted by cutting back on drilling and investment. However, sabotage in Nigeria, rising geopolitical risks in the Middle East and North Africa, and the Iranian sanctions kept supply at risk, or perceived as such. In the U.S., by 2009, the shale oil boom began to gather momentum as prices firmed. However, from July 2008 to June 2009, the International Energy Agency's monthly projections of world demand and non-OPEC supply nurtured the market's expectation of much lower non-OPEC supply than it turned out to be (Figure 10). As the slump progressed, the IEA went from overestimating to underestimating global demand by the beginning of 2009, while consistently underestimating non-OPEC supply. While the agency underestimated U.S. shale oil output, it also underestimated output in the FSU, Latin America and other non-OECD countries. This again underscores the critical importance played by the key sources of market information — they can inform or misinform the market rather than the market informing them.

FIGURE 10 MONTHLY CHANGES IN PROJECTIONS OF WORLD OIL DEMAND AND NON-OPEC PRODUCTION FOR 2009 BY THE INTERNATIONAL ENERGY AGENCY, STARTING IN JULY 2008 THROUGH TO JUNE 2009, COMPARED WITH THE ACTUAL AS REPORTED IN 2011



There are three main official monthly oil market outlooks put out by agencies that the industry and traders monitor: those of the IEA, the US DOE EIA and the OPEC Secretariat. Major banks analyze these to come up with their own outlooks for clients. In some respect, the three feed off each other, or at least, rely on many of the same data and information sources, for example JODI. The OPEC Secretariat tends to be conservative about the

⁵⁸ Not on an annual basis; OPEC cut production over seven months from June 2008, then increased output when the market started coming back the following May.

difference between world demand and non-OPEC supply, which is the call on OPEC. The Secretariat is inclined to see a market in which its members should produce less than the IEA would signal, thus receiving higher prices. When the IEA is bearish on non-OPEC output, it signals (whether intentionally we do not know) a higher call on OPEC; thus, in the context of the price war of June 2015 when OPEC was increasing production, future prices would tend to be discounted, as happened after publication of the IEA's June Oil Market Report. It was the largest retreat in forward prices since February. To err in the direction of lower prices would be rational behaviour for the IEA — it is after all the wealthy, consumer countries' energy watchdog.⁵⁹

- A few factors are salient through these price routs.
- Size matters: the roles of the United States, Saudi Arabia and China:
 - Saudi production policies (1985, 1998, 2008 and November 2014);
 - U.S. pressure in 1986 to reverse Saudi Arabia's policy;
 - U.S. and China demand response (build-up to 2008);
 - U.S. Fed's chairman Volcker's attack on inflation in 1970s/early 1980s;
 - The Fed's chairman Greenspan's aggressive policies post-9/11;
 - The Fed's and other U.S. agencies' policy failure to address the credit crisis leading to the great recession in 2008;
 - The birth of the shale gas and oil revolution in the unique policy and mineral rights context of the U.S.;⁶⁰
 - China's demand slump in 2014 and state interventions in stock market, and;
 - A shoe yet to drop, Fed Chair Janet Yellen's signaling a rate hike with potentially serious impact on the highly leveraged shale oil industry.
- Technological change:
 - The major shift of the IOCs to new offshore and frontier plays based on plate tectonics and new seismic technology, long-reach horizontal drilling and new metallurgy;
 - The combination of long-reach horizontal drilling and hydraulic fracturing to extract oil from tight formations and shale source rocks.
- Information and signaling:
 - The impact of the monthly reports from OPEC, EIA and IEA.

What are the prospects for the oil market in late-2015, 16 months into the current price crash? And what are the policy implications for Canada and Alberta in particular? The answers will depend on at least the following key economic, technical and political forces and factors at work.

⁵⁹ <http://www.telegraph.co.uk/finance/newsbysector/energy/11289427/Opec-World-energy-watchdog-IEA-cuts-oil-demand-forecast.html>

⁶⁰ No other oil and gas jurisdiction in the world currently offers the same set of factors existing in the U.S. that facilitated the shale gas/oil boom. Besides a petroleum industry tradition and public familiarity, equipment and trained labour force, market access and vast and detailed geological knowledge of the basins, a key factor is the ownership of sub-surface mineral rights in the U.S. See for example, <https://www.google.ca/#q=paul+stevens+why+shale+oil+unlikely+in+other+countries>

THE GLOBAL ECONOMY AND OIL DEMAND

The great recession triggered by the 2008 financial crash was accompanied by a significant decline in oil demand; world economic growth was negative for the first time in decades. Since 2009, the global economy has experienced only modest growth; the most recent outlooks by the World Bank⁶¹ and the IMF⁶² are for tepid growth. Low commodity prices and the looming (but recently delayed) monetary tightening in the United States have weakened growth expectations for the emerging economies. A stronger dollar is having a dampening effect on capital flows to developing economies and on oil demand in major consuming economies, while commodity-dependent economies are seeing a fall-off in revenues and therefore investment.

The emerging markets and developing economies cannot be counted on to deliver the kind of demand growth the world experienced in the last decade because some of the principal economies where growth is expected are not all that heavily geared to oil (see Table III); lower growth in China — where oil only makes up 16 per cent of primary energy demand — implies less oil demand than has been expected. Even though higher growth is expected in India, oil accounts for 22 per cent of the country's primary energy demand and India consumes only four per cent of world oil demand. Other countries in the Asian market are expected to grow, but they cannot be expected to underpin a significant pull on oil. The IMF sees less growth in Latin and Central America, and the Middle East (except Saudi Arabia) than it did in its previous outlook.⁶³ But there are signs of potential for increased demand in some markets. For example, the U.S. has the conditions for increased demand.⁶⁴ However, the current price crash is supply-driven. The market is unlikely to be balanced by demand; correction will have to come from the supply side.

⁶¹ “Global Economic Prospects: The Global Economy in Transition,” World Bank, June 2015.

⁶² IMF *World Economic Outlook*, July 2015.

⁶³ IMF *World Economic Outlook*, April 2015.

⁶⁴ “The average U.S. household expenditure on motor gasoline in 2015 is expected to be about \$1,817, the lowest level in more than a decade,” *Today in Energy*, US DOE, April 10, 2015. This is about \$700 less than the average expenditure in 2014. The average price for gasoline is \$2.46/gallon compared with an average \$3.36 in 2014.

TABLE 3 2012 SHARE OF WORLD OIL CONSUMPTION OF SELECTED REGIONS AND ECONOMIES AND THE SHARE OF OIL IN THEIR TOTAL PRIMARY ENERGY DEMAND

	Oil Demand (mb/d)	Oil's Share of TPED	Share of World Oil Demand
World	93.97	31%	100%
OECD	46.02	36%	49%
U.S.	19.29	36%	21%
Europe	13.65	32%	15%
Asia/Oceania	8.18	41%	9%
Japan	4.27	46%	5%
Non-OECD	47.94	25%	51%
China	10.76	16%	11%
India	4.05	22%	4%
Middle East	8.28	49%	9%
Russia	3.5	21%	4%
Latin America	6.89	44%	7%

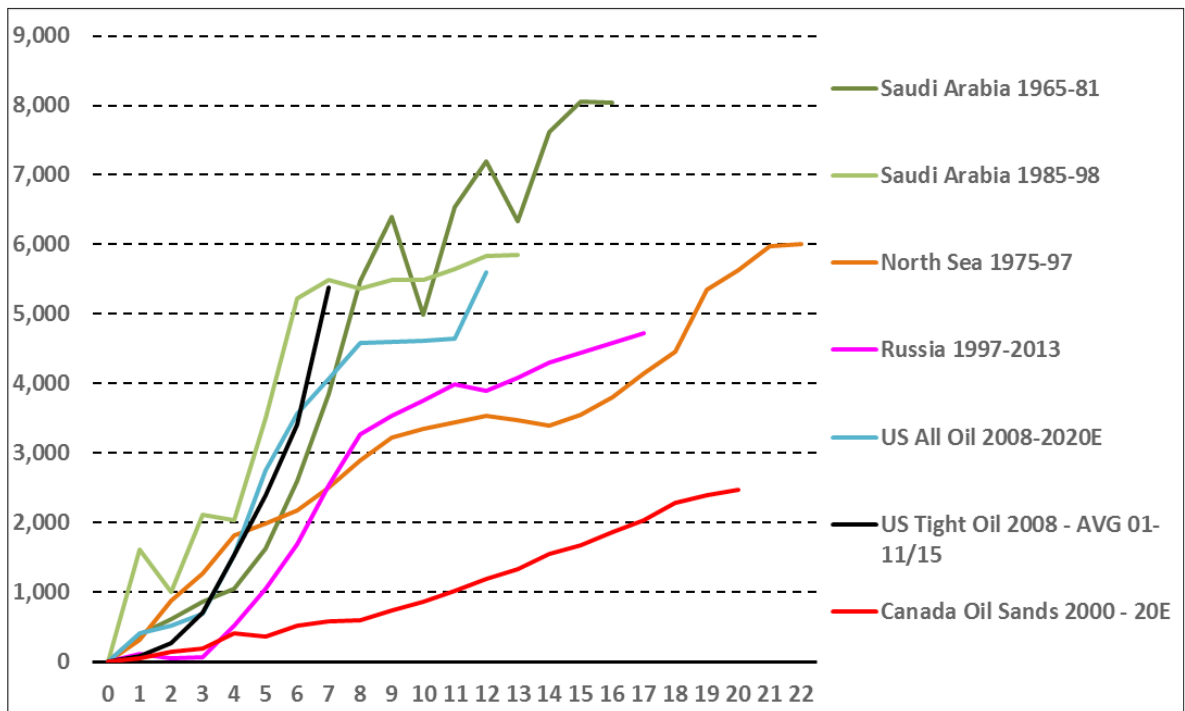
Source of data: IEA WEO 2014 and Monthly Oil Market Report, June 2015).

SUPPLY — NORTH AMERICA LTO

The central question that many analysts focus on is the future of U.S. LTO. Some commentators see the ascent of LTO as unique, unprecedented and transformative for the global oil market and even potentially spelling the end of OPEC.⁶⁵ In terms of disruptive magnitude, as illustrated in Figure 11, the build-up of U.S. shale oil or LTO production is comparable to the past performance of other oil theatres, but obviously these earlier production ramp-ups occurred under very different market contexts. The rates of build and subsequent re-build in Saudi supply post-1965 and post-1985 respectively, or even the recovery of Russian production post-1997 were comparable — and the increments constituted a larger share of world supply at the time than does LTO today. Thus, market context is critical. It remains to be seen whether and when the shale oil build achieves that of the North Sea over 22 years starting in 1975 — it certainly has an impressive start, taking only six years to get to where the North Sea was after nearly 20 years. No other oil play unfettered by state-imposed production controls has achieved LTO's build rate. The build in production from Canada's oil sands post-2000, while by far less dramatic, will differ markedly from all the others (save Saudi Arabia) in that production levels will plateau for many years before declining. What seems clear is that LTO and the oil sands, with their unique manufacturing-like production profiles, acutely different development time frames, based on immense resources, with technological upside and particular financing challenges, have flipped traditional oil trade patterns and will continue to confound market projections.

⁶⁵ Amy Myers Jaffe and Ed Morse, "The End of OPEC," *Foreign Policy*, Oct. 16, 2013; see also, <http://www.bloomberg.com/news/articles/2015-02-09/citi-oil-could-plunge-to-20-and-this-might-be-the-end-of-opec->

FIGURE 11 COMPARISON OF PRODUCTION BUILD (1,000 B/D) OVER TIME (YEARS) OF U.S. TIGHT OIL BETWEEN 2008 AND AVG TO NOVEMBER 2015 (PROJECTED)⁶⁶ VERSUS OTHER REGIONS AND SOURCES OF OIL



It is not surprising that there is a heavy bias in reporting interest in U.S. tight oil compared to its actual weight in the market (< six per cent of world liquid supply but 60 per cent of U.S. onshore production). While partly due to the tendency of North American analysts and geopolitical commentators to look at America, this surely also reflects their concern about the amount of capital that has gone into this particular part of the industry over the last decade and its financial/commercial performance, or more precisely, lack of performance for investors. The top 16 companies in hydraulic fracturing in the U.S. spent about 1/3 of a trillion dollars on tight oil wells between 2006 and 2014; for most of this period, they had negative cash flow.⁶⁷ This begs the question whether this business can be restored at lower prices. Moreover, given that much of the financing is debt-based, should U.S. interest rates increase, it is questionable whether the industry can expect the same enthusiasm from capital markets. As of mid-2015, some highly leveraged tight oil companies, unable to meet interest payments, are filing for bankruptcy as interest payments account for a growing share of revenue.⁶⁸

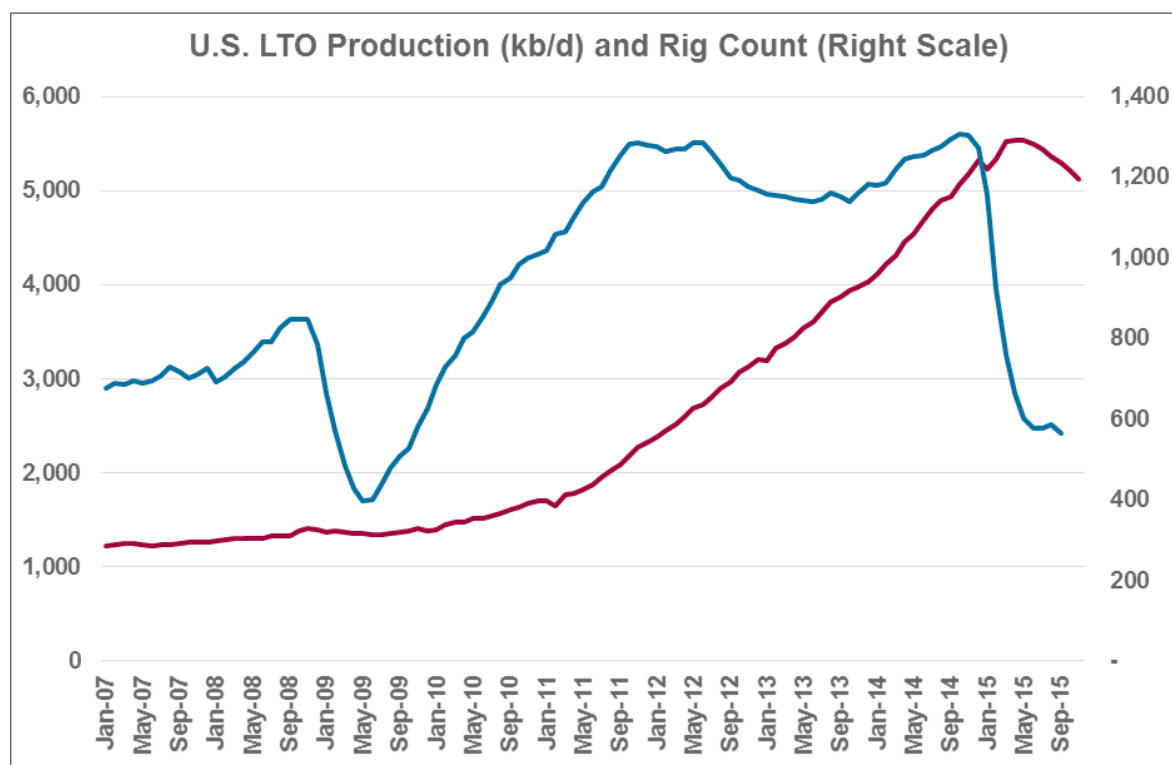
⁶⁶ Source of data for this graph includes *BP Statistical Review*, 2015; “Crude Oil and Supply Outlook,” Canadian Association of Petroleum Producers, June 2015; “Drilling Productivity Report,” US DOE EIA, October 2015, at <http://www.eia.gov/petroleum/drilling/>;

⁶⁷ David Einhorn, <http://www.insidermonkey.com/blog/david-einhorn-slams-pioneer-natural-resources-pxd-frackers-in-presentation-at-ira-sohn-conference-see-it-inside-345297/>; in October 2013, *Energy Aspects* reported that of 35 companies in the shale oil business, the average CAPEX spending had been \$50/boe while the revenue had averaged \$51.50, thus cumulative free cash flow Q2 2007 to Q2 2013 was negative \$73 billion, cumulative debt increased from \$21 billion to \$56 billion. “The other tale of shale,” *Energy Aspects*, October 2013.

⁶⁸ <http://www.bloomberg.com/news/articles/2015-06-18/next-threat-to-u-s-shale-rising-interest-payments>

There are several other factors that will determine the outcome of production from the LTO play in North America. There is no denying the fact that the industry has demonstrated an impressive improvement in productivity (oil production per rig) over the last seven years; for example, in January 2007 in the Bakken region, the initial production per rig was 112 b/d; in September 2015, it was 694 b/d.⁶⁹ Even better improvements were achieved in the Eagle Ford. So, even as the total shale oil rig count levelled off after September 2011, production continued to climb (Figure 15). However, the limit has been reached — at least until prices recover; the monthly decline of production from older wells (legacy production) now exceeds the output from new wells and the play’s net production has rolled over and is falling. This roll-over for all tight oil plays started in April 2015 (Figure 12). Finally, on a longer-term perspective, even these tight oil plays are not uniformly saturated with hydrocarbons and will reach their economic limits — they, like conventional pools, are finite.

FIGURE 12 PRODUCTION (PROJECTED TO NOVEMBER 2015) FROM THE SEVEN MAIN LTO PRODUCTION REGIONS IN THE U.S., VERSUS NUMBER OF ACTIVE RIGS IN THESE REGIONS (AS OF SEPTEMBER 2015). WITH THE DROP IN ACTIVE RIGS, NOTWITHSTANDING SIGNIFICANT PRODUCTIVITY IMPROVEMENTS, OVERALL PRODUCTION HAS STARTED TO DECLINE⁷⁰



In the shorter term, industry will focus on the better wells in their backlog of wells yet to be fracked and completed (the so-called frack-log, estimated to number above 4,700).⁷¹

⁶⁹ *Drilling Productivity Report*, US DOE EIA, October 2015.

⁷⁰ Data sourced from US DOE EIA <http://www.eia.gov/petroleum/drilling/#tabs-summary-2>

⁷¹ <http://www.bloomberg.com/news/articles/2015-04-23/u-s-shale-fracklog-triples-as-drillers-keep-oil-out-of-market-i8u004xl>

Employment in oil and natural gas has dropped off⁷² and while recent history post-2009 shows it was gradually restored, the current price rout has not run its course and it can be questioned whether crews will come back as quickly as they did then — especially if they believe the business media that the LTO sector can and will be operated on and off like a lever.

The LTO industry has been able to continue thanks to a couple of supports; the first was their hedging strategies (which have by late 2015 run their course) and the second is their continued ability to attract financing on their lines of credit⁷³ and new equity issues. In essence, the financial industry and investors have joined in a compound wager:

- That the price rout will not endure for long and/or;
- The industry will continue to make efficiency improvements and cost reductions to compensate for price reductions, and;
- Interest rates will remain low.

Access to financing is another factor unique to the current price cycle. In 1985, for example, when the U.S. prime interest rate ranged between five and seven per cent, only the major oil companies had the internally generated cash to support the high capital costs of the supply that underpinned non-OPEC output.⁷⁴ As noted by Energy Aspects, the U.S. LTO industry today (with the prime rate effectively zero per cent), mostly but not entirely comprised of independents, has sustained the flow of capital to support it by basing its economics on selected and partial metrics:

So far, these weak financials have not necessarily mattered for investors. Moreover, companies have also been creative in largely dismissing the negative cash flow situation, by stressing how cash costs have come down systematically and well productivity has increased. Indeed, we have always maintained tight oil production is costly. And yet many analysts and companies continue to talk about generating over 30 per cent IRR at \$50 crude. The difference is while we talk about full-cycle costs, most talk about cash costs alone. Worse still, even more only consider individual well-level IRRs, which exclude DD&A. Of course, using such metrics, the costs will be lower. And this is why generating large positive IRR, yet remaining cash flow negative, does not stack up; it ignores depletions and company levels costs. But for the long-term sustainability of any industry, selective cost reporting doesn't work, as they need to be repaid in some form at some point down the line. But for the mindset of the lenders to change, a trigger is needed. That trigger may well be interest rates, or a complete collapse in the bond markets, which chokes off credit availability for the producers. Until then, U.S. producers will continue to plough through and raise output opportunistically.⁷⁵

⁷² “Oil and Natural Gas Production Job Declines Tend to Lag Oil Price Declines,” *Today in Energy*, June 23, 2015.

⁷³ With the semi-annual re-determination of borrowing bases beginning in the third quarter, the tight oil industry will come under stress. Borrowing capacity is mostly based on reserves; therefore, significant write-downs are expected, jeopardizing the survivability of some firms. Banks will be loath to let their clients die, but the effect should be a dampening one on drilling and completions. Amrita Sen et al, “Borrowing bases, borrowing time,” *Energy Aspects*, Sept. 28, 2015.

⁷⁴ Tom Wallin, “Exxon’s Rex Tillerson on Oil’s Downturn,” *World Energy Opinion, Energy Intelligence*, September 2015.

⁷⁵ “U.S. Production: Game of Loans,” *Energy Aspects, North American Quarterly*, May 2015, p. 82.

CONCLUSION

The world oil market has experienced several price crashes over the past 30 years. Four have seen prices decline by more than 50 per cent over a relatively brief period. Compared with three previous significant price routs, the current rout is neither the fastest nor the deepest. The contexts and outturn differ for each; the present finds no clear analogy among the earlier crashes.

Certainly, there are common elements⁷⁶ but these are at best superficial. In the simplest terms, 2008 and 1997 were demand-driven crises, associated with the loss of credit in key markets. While 1985 and 2014 had demand-weighted origins, they ultimately became supply-driven and supply-sustained crashes.

The 1985 crash lasted for more than a decade, which begs the question, are we looking at a similar very long panhandle-shaped future price curve today? There are critical and fundamental differences between 1985 and 2014. Most important is spare productive capacity. In the late 1980s and through the 1990s, OPEC's ample spare capacity signalled security of supply for the market. As well, the nature of financial flows to the industry differed; today's is far more fragile than the self-generated financing of the major oil companies in the 1980s that eventually thinned and led to massive consolidations 15 years later.

Oil prices are not doomed to remain at current levels. While attention is all on the U.S. shale oil industry, production in other non-OPEC countries is not surging ahead.⁷⁷ Oil industry investment world-wide continues to shrink; one estimate⁷⁸ asserts that \$1.5 trillion of uncommitted spending on oil production projects is uneconomic at \$50 a barrel; another recently identified globally nearly 5 mb/d of project cancellations and deferrals.⁷⁹

According to the IEA, if investment were to stop in currently producing fields (excluding natural gas liquids) the world would need to bring on 67 million barrels of daily replacement capacity by 2035.⁸⁰ Most of the currently producing conventional oil fields were brought on at prices well below even current prices; in 2012, fully 2/3 of conventional oil was produced by national or international oil companies while 57 per cent of deep water, 95 per cent of oil sands and 96 per cent of LTO (the marginal production) was produced by private oil companies.⁸¹ In a low-price environment, private firms will and have reduced investment in these high-cost marginal sources of oil, while many NOCs (other than those of Saudi Arabia, Kuwait and Abu Dhabi) will be capital-constrained by their state owners

⁷⁶ ARC Financial has recently suggested this is reminiscent of 1998 and 2009. ARC Financial Report, *The Fiscal Pulse of Canada's Oil and Gas Industry: First Quarter 2015* at http://www.arcfinancial.com/assets/672/2015_Q1_Industry_Fiscal_Pulse_-_ARC_Financial.pdf

⁷⁷ Norway's production is expected to increase over the next couple of years as new field developments started a few years ago are due to come on stream. In this sense, they are like the oil sands in Canada. It will take a couple of years for the set of large developments under construction to be completed.

⁷⁸ "Upstream cost cuts must go deeper to save projects," Wood Mackenzie, Sept. 21, 2015. <http://www.woodmac.com/media-centre/12529325>

⁷⁹ "The element of surprise," *Energy Aspects*, Oct. 12, 2015.

⁸⁰ IEA/OECD *World Energy Outlook*, 2013.

⁸¹ "Prospects for Oil Supply," IEA/OECD *World Energy Outlook*, 2013, p. 493.

who have other social priorities for their much-reduced oil income. Although there is considerable oil with break-even prices below \$80 Brent,⁸² firms don't invest on that basis.

This is a supply crisis; given the tepid global macroeconomic outlook, the solution will have to come from the supply side. With reduced investment in the marginal sources of oil (deep offshore and unconventional), relatively thin effective spare productive capacity, and even assuming weak growth in demand, it is difficult to argue the case for a long panhandle price outrun akin to the post-1985 rout. To the contrary, even with modest or historical rates of oil demand growth (~1.2 mmb/d/year), the decline in the world's currently producing fields and major cutbacks in investment constitute a harbinger of a sharp increase in prices towards the end of the decade. The real uncertainty is whether LTO in North America will, as many believe, perform like a dial, giving oil supply an elasticity never known in the industry's history, and serve as a damper on price volatility. On the policy side, a change in Saudi Arabia's production policy can never be discounted. And then there is the perennial trigger for much historical price volatility over the last half-century — geopolitically driven upsets in oil supply, particularly in the Middle East and North Africa, and even Latin America.

If forced to offer a projection, we do not believe there will be any significant dampening of volatility. The price path is most likely to follow a stuttering but rising W-path where the amplitude between peaks and troughs will vary. To suggest otherwise would require evidence that the traditional seeds of volatility have been permanently sterilized. We find no compelling evidence for this.

For Canada in 2015, the gross revenue of the industry will drop by \$50 billion to \$60 billion compared to 2014. Cash flow will be down to the levels below those of 2000.⁸³ And with this lower cash flow, lower capital investment, layoffs, reduced repatriated wages of migrant workers from eastern Canada and the knock-on effects in related industries in the West and across Canada, government revenues⁸⁴ (corporate and income taxes and royalties) will decline. While this set of knock-on effects is not new, they have become increasingly pan-Canadian compared with earlier price crashes. The oil sands projects purchase materials, services and labour from across the country (and from the U.S.)⁸⁵ much more than did the conventional industry in the past. In 1985, the input-intensive oil sands accounted for only 17 per cent of total Canadian crude production; in 2015, it is over 62 per cent.⁸⁶ The Alberta hydrocarbons sector in general and the province's natural resource royalties in particular have become and will increasingly be dominated by the oil sands. In a low-price environment, this high cost marginal supply of oil will generate little resource rent — it will essentially resemble any other manufacturing business where the public finance benefits derive from employment, services and corporate taxes.

⁸² <http://business.financialpost.com/business-insider/here-are-the-breakeven-oil-prices-for-every-drilling-project-in-the-world>

⁸³ ARC Financial.

⁸⁴ Sarah Dobson, "Peering into Alberta's Darkening Future: How Oil Prices Impact Alberta's Royalty Revenues," University of Calgary, The School of Public Policy, *SPP Research Papers*, Vol. 8, Issue 14, March 2015.

⁸⁵ <http://www.ceri.ca/images/stories/CERI%20Study%20124.pdf>

⁸⁶ CAPP Statistics and CAPP Supply Forecast, 2015.

As recently noted by Philip Cross,⁸⁷ Canada's resource sector in general has significant impacts on the manufacturing and other sectors of the economy. Given that unconventional hydrocarbons have recently accounted for the major share of investment in resources, a drop in investment owing to the oil price drop — albeit lagged as projects under construction are completed — will increasingly impact the larger economy.⁸⁸ The U.S. economy is less geared to oil investment notwithstanding the impressive increases in investment in LTO over the last eight years.⁸⁹ A major reduction in shale oil activity in the U.S. would have little impact on its GDP, and would be more than offset by the positive impacts of lower energy prices in the rest of the economy. As happened in 1999 after the oil price dropped below \$10 (\$14.60 in 2015), SUV and small truck sales in the U.S. have increased over the third quarter of 2015 (8.2 percent compared to the average from June 2014 to June 2015)⁹⁰. Not surprising then, that the U.S. economy is showing signs of growth while Canada's growth has been sluggish.

This underscores the need more than ever for the government of Alberta to pay close attention to international developments and to monitor and critically analyze the signals from, and developments in, the key suppliers to the world's oil market — Saudi Arabia, the United States and Russia, each accounting for 10 to 12 per cent of global supply. Given the importance of the oil sands to the Canadian economy, the federal government should facilitate a closer monitoring of the market, including stepping up its and Alberta's relationship with major OPEC members, but stopping short of seeking some formal status with the organization. Canada's and Alberta's interests, if measured in oil export volumes alone, are surely no less than that of many OPEC members.

If there might be any good news from the current price rout, it should be that more Canadians come to understand that the oil industry is important, not just to the citizens of producing provinces, but to all Canadians.

⁸⁷ In 2013, natural resources accounted for \$144.5 billion or 61 per cent of all business investment in plant and equipment, up from a low of 38.2 per cent in 1999 when investment had shifted to high tech and manufacturing. In 2013, however, investment has concentrated in the energy resources, accounting for 79.3 per cent of all investment in resources. Philip Cross, "Unearthing the Full Economic Impact of Canada's Natural Resources: What Are They? How Important Are They?" Macdonald-Laurier Institute, May 2015.

⁸⁸ On a positive note, the massive production and processing equipment installed in the oil sands over the last 15 years requires a lot of investment to maintain and service, ensuring an ongoing level of activity not associated with conventional oil production.

⁸⁹ In 2013, oil and gas extraction accounted for 1.7 per cent of economy-wide value added and investment in the sector accounted for around six per cent of total investment (up from four per cent in 2006) in the United States.

⁹⁰ U.S. Department of Commerce, Bureau of Economic Analysis, Washington, D.C., seasonally adjusted Domestic Light Trucks sales, <http://www.bea.gov/>

About the Author

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ISSN

1919-112x SPP Research Papers (Print)
1919-1138 SPP Research Papers (Online)

DATE OF ISSUE

November 2015

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