

## Commodities

12 December 2011 | 68 pages

# Oil in 2012 – A Year of Tail Risks

## OPEC may have some work to do in 2012... ...but risks to supply loom large

- Commodities
- Geopolitics
- Petroleum

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- **Citi is raising its oil price expectations for 2012.** In our base case we now expect Brent to trade in a range of \$100 to \$120 and to average \$110 for the year. This is in line with the bull case in our previous forecast, which has come about due to better than expected demand and much worse than expected supply. Going forward, our global supply and demand balances are moderately bearish for 1Q12, as is our price outlook, but from then on we expect stronger balances and prices. We are not very optimistic on oil demand growth, modeling just +0.8-mb/d in 2012 and +1-m b/d in 2013, based on Citi's GDP expectations of 3.0% and 3.6% (PPP-adjusted) respectively. We are, however, optimistic on supply, forecasting 1.1-m b/d of non-OPEC supply growth, and coupled with the return of Libya this requires a cut by OPEC of some 500-k b/d if they want to keep the market tight and prevent a return to inventory builds. We think OPEC recognizes this reality, and take recent statements from OPEC members about how high their recent production has been as posturing in preparation for the upcoming quota reallocation.
- **Beyond supply and demand, our base case expects oil prices to be supported by several other factors: geopolitical risks, Russian domestic demand, the rise of the non-OECD, higher macro correlations, and inflation tail risks.** Citi's views warrant cautious optimism on risk assets (our global equity strategists are targeting a 20% gain in the MSCI AC World equity index, which should be supportive for oil). Monetary expansion would be supportive for commodity prices in general, and Citi is expecting QE3 in the US, rate cuts in Europe and a return to an easing cycle in China. Finally, geopolitics is expected to be a dominant theme in oil markets throughout 2012 and 2013.
- **We think the world is operating with about 2.5-m b/d of spare production capacity, virtually all of which is in Saudi Arabia, with the rest scattered around other core Gulf OPEC members.** Absent any supply disruptions, we expect to see a marginal increase in spare capacity, but the margin remains so slim and the potential disruptions so numerous that we believe risks are slanted heavily to the bullish side of the ledger. Tensions between Israel and Iran top the list, but an EU embargo on Iranian oil, sanctions on Syria, succession and the possibility of strife in Saudi Arabia, elections in Venezuela and Angola and ongoing violence in Nigeria and Yemen are on the list but do not complete it.
- **Our base case is constructive for oil prices.** Our bull case, to which we assign a 25% probability, is that one of the many possible geopolitical risks to supply comes to fruition, in which case we expect oil prices to spike higher and to take a real toll on the global economy. Our bear case comes from a disintegration of the Euro (something our economists estimate is a 5% probability event), or a hard landing in China. Either of these would take oil down more than a peg or two.

See Appendix A-1 for Analyst Certification, Important Disclosures and non-US research analyst disclosures.

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## Higher Expectations

### Disappearing barrels and inventories lead the way

Brent prices should trade in a \$100-120 range, averaging \$110 in the year ahead

**Citi is raising its oil price expectations for 2012.** In our base case we now expect Brent to trade in a range of \$100 to \$120 and to average \$110 for the year. This is in line with the bull case in our previous forecast, which has come about due to better than expected demand and much worse than expected supply. Going forward, our global supply and demand balances are moderately bearish for 1Q12, as is our price outlook, but from then on we expect stronger balances and prices. We are not very optimistic on oil demand growth, modeling just +0.8-m b/d in 2012 and +1-m b/d in 2013, based on Citi's GDP expectations of 3.0% and 3.6% (PPP-adjusted) respectively. We are, however, optimistic on supply, forecasting 1.1-m b/d of non-OPEC supply growth, coupled with the return of Libya this entails a cut by OPEC of some 500k b/d if they want to keep the market tight and prevent a return to inventory builds.

We think OPEC recognizes this reality, and take recent statements from OPEC members about how high their recent production has been as posturing in preparation for the upcoming quota reallocation. We think OPEC has a strong hand and a cut of 0.5-m b/d should be manageable, though the cartel has been quite dysfunctional recently as their last June meeting amply demonstrated. The market will need convincing that the cuts are actually happening, and will be watching the physical market for evidence. 2012 should be a landmark year for the oil market, with non-OECD demand forecast to overtake OECD demand for some of the year for the first time. This will continue the trend of decreasing the relevance of the available OECD data, and will make watching the physical market and tanker tracking data even more important.

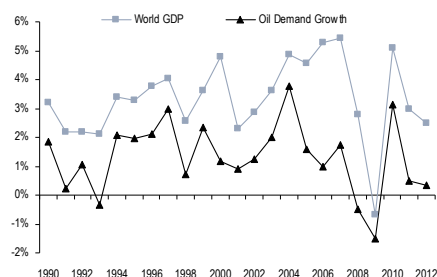
We expect prices in 2012 to be range bound in a ~10% band to current market levels...

We are expecting prices to be range bound in a \$10/bbl around the current prompt price (~10% band), a rather dull position for analysts to assume, and one which requires some justification. Simply put we think that oil supplies are constrained for the next 2-3 years, we just do not see enough liquids supplies coming to market to allow for unconstrained demand growth, and we think oil prices have to be high enough to constrain demand through oil's price elasticity (which is negligible in the short to medium term) and through its income elasticity (which is non-negligible). We think that oil supplies are constraining global GDP growth, and that this will remain the case until there is a paradigm shift — either oil demand shifts lower through a transition to more of a natural gas based transportation system in some key markets, or, more likely, shale, tight oil and deepwater production reach a scale that moves the needle on a global basis for liquids supplies, and none of these is going to happen over the next two years.

Oil demand is largely a function of GDP growth, and lower growth in 2012 should curb the pace of product requirements

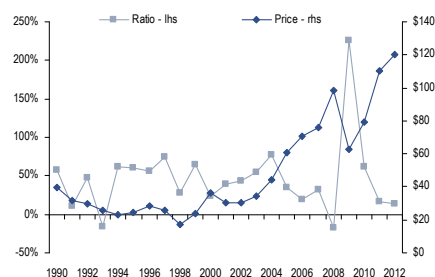
Oil demand is a function of GDP growth, the impact of prices is visible in the changing ratio between the two.

Figure 1. Oil Demand and GDP Growth



Source: Citi Investment Research and Analysis

Figure 2. Oil Prices and Demand/GDP Ratio

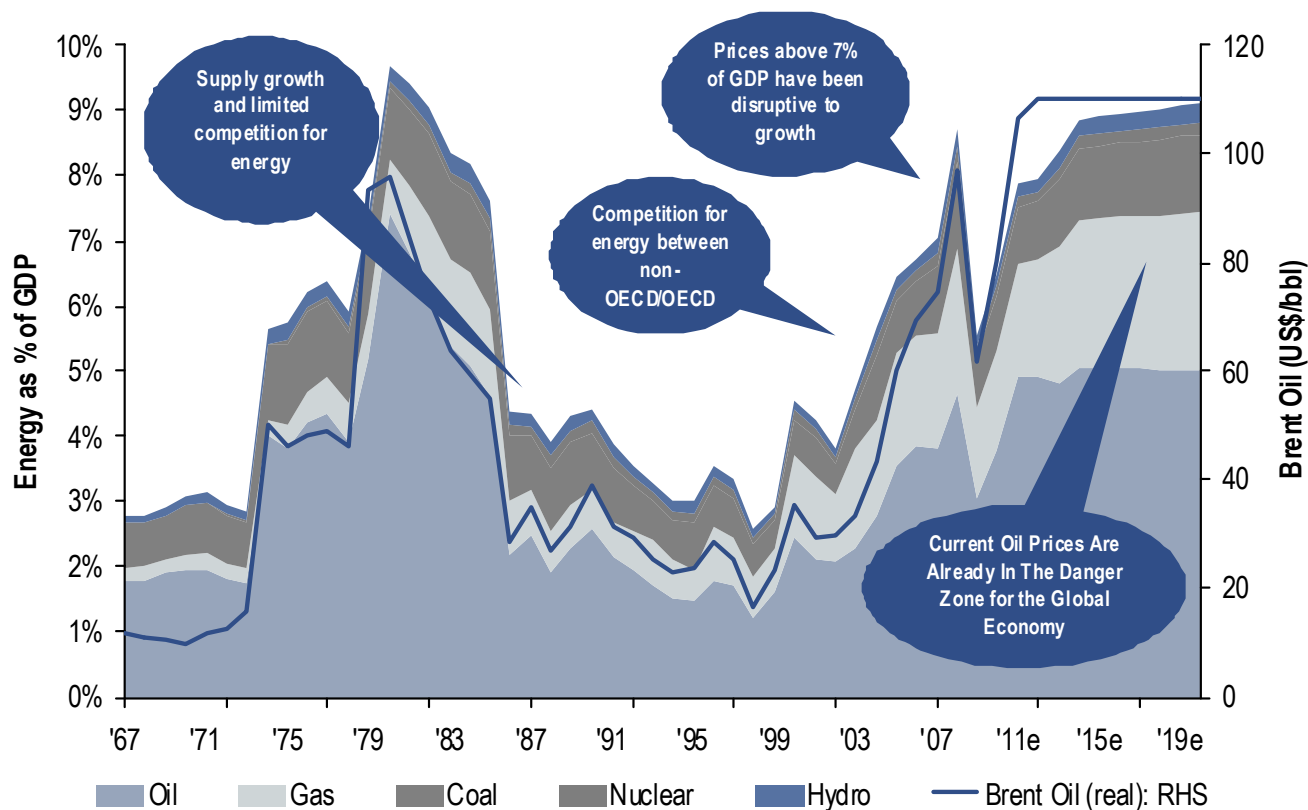


Source: Citi Investment Research and Analysis

**But crude supply constraints and prices should also curb demand growth**

We think we are for now living in a crude oil-constrained world, and oil prices have to stay close to the pain point for the global economy in order to constrain demand growth. We estimate the pain point for the global economy to be around \$120/bbl; at that price total expenditure on energy would consume about 9% of global GDP, a level that historically has been enough to cause the global economy to slow. We do recognize, however, that the pain point is a moving target, a function of the prices of other energy sources and of the general robustness of the global economy.

Figure 3. Energy Expenditure as a % of Global GDP and Oil Prices



Source: Citi Investment Research and Analysis

**US dollar appreciation could be a risk for nominal oil price gains in 2012...**

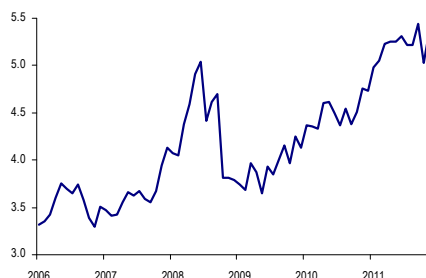
Currency movements add to the caution. Our view for a on a stronger US dollar in the next 6-12 months— especially against some its largest and most liquid G10 partners including the Euro and Sterling – could weigh on nominal oil price appreciation. Citi expects continued dollar strength with our FX strategists targeting a 1.25-1.30 level for the EURUSD cross through much of 2012. This implies that in certain local markets, where retail fuel prices are at or are close to all time highs might see some further pain in 2012; this has been compounded by the removal of subsidies in some cases.

Figure 4. German Diesel Prices in Euros



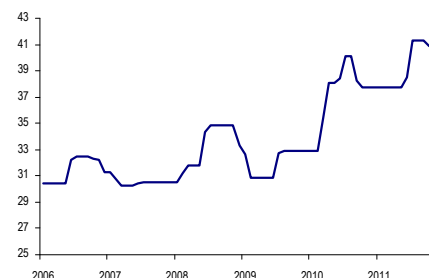
Source: Citi Investment Research and Analysis

Figure 5. Average UK Diesel Prices in £



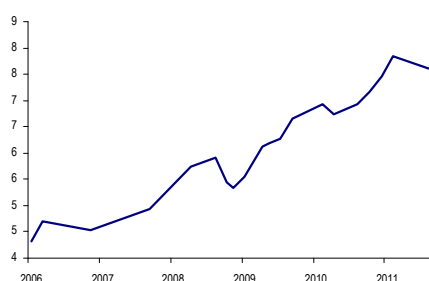
Source: Citi Investment Research and Analysis

Figure 6. India (Delhi) Diesel Price in INR



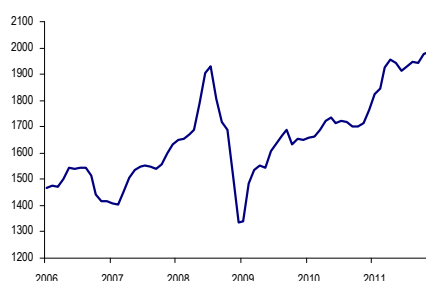
Source: Citi Investment Research and Analysis

Figure 7. Beijing 93 Ron Gasoline in CNY



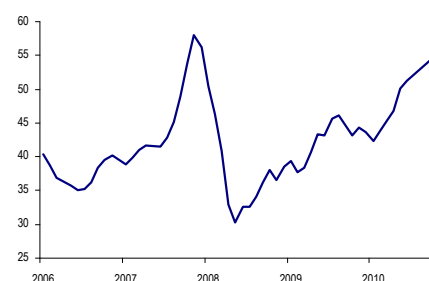
Source: Citi Investment Research and Analysis

Figure 8. S Korea Gasoline Prices in Won



Source: Citi Investment Research and Analysis

Figure 9. Philippines Gasoline Price in PHP



Source: Citi Investment Research and Analysis

### What Are the Upper and Lower Boundaries for Oil Prices in the Short Term?

And short-term spikes to as high as \$150/bbl are possible but unlikely...and unsustainable in our view...

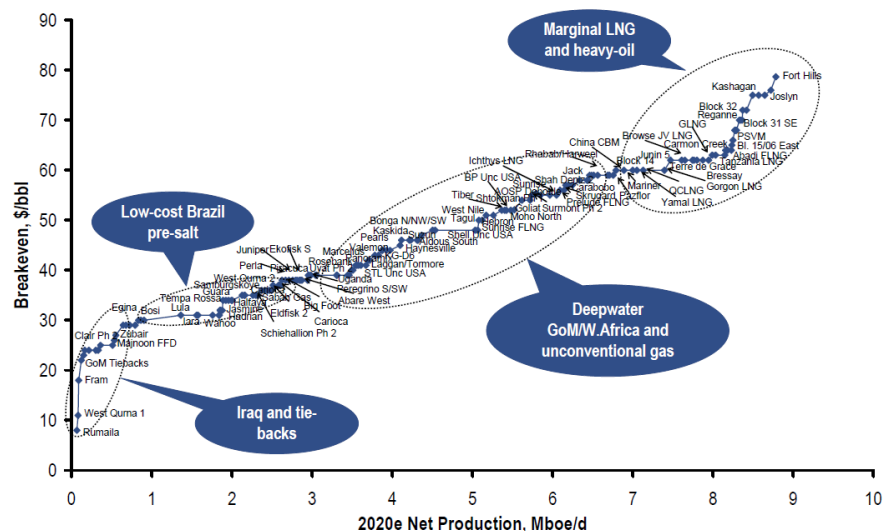
The low level of spare capacity and the numerous risks to oil supplies make the odds of an oil price spike high. If it is a major disruption that drives prices higher, for example Iran attempting to block the Straits of Hormuz<sup>1</sup> then we would expect prices to move north of \$150/bbl in very quick fashion. We do not, however, expect them to stay there for very long, as that level is simply too much of a burden for the global economy and we would expect a global recession to be the result, taking oil demand and prices much lower. Historically, oil price spikes resulting from supply disruptions have typically been followed by recessions — the 1973 OPEC embargo on the US and resulting 300% price spike saw global GDP growth drop from 6.5% in 1973 to 1.5% in 1974 and 0.9% in 1975; similarly the Iranian revolution and Iran-Iraq war from 1978 to 1981 saw oil prices double and global GDP growth drop to an average of 1.3% from 1980 to 1982, versus a 4.2% average for the previous three years. Given the already fragile state of the global economy (and the equally fragile state of investor sentiment), signs point to the possibility of strong negative feedback loops coming into play — and we would expect a similar outcome (i.e. a global recession) even if the percentage increase in oil prices was lower. Given that oil prices are already close to the pain threshold for the global economy, we think that around \$120/bbl is a reasonable estimate of a sustainable ceiling. Currency movements obviously make this a moving target, however, and the strong USD accompanied by high oil prices can make the ceiling lower, and more solid.

We assume that the rate of increase in prices is as much of an issue as the level. A spike, usually associated with a supply disruption (or investor herding behavior, as was the case in 2008), is materially different from a situation in which prices are dragged higher by a robust economy and the resulting robust growth in demand.

<sup>1</sup> Morse, Edward L. "Assessing an Iranian oil disruption" 22 November 2011

On the downside, we look to cost support. Below is a chart from our equity analysts showing their cost estimates for oil projects due to come on stream by 2020.

Figure 10. Breakeven Estimations



Source: Citi Investment Research and Analysis

Around \$70/bbl looks like a cost support price which is in line with current cost levels for Bakken shale plays

Assuming a conservative 3% decline rate for base production of 82-m bbls in 2010, implies a replacement requirement of 22-m b/d by 2020, so the full sum of the potential supply curve is required. If we assume that a combination of conservation and a substitution of other energy sources can remove the need for the most expensive final tranche of supplies, then somewhere in the \$60-70/bbl level looks like cost support. This is in line with current cost levels for Bakken shale production, and we would look to these levels as a sustainable floor for oil prices in the short to medium term, with full recognition that in the event of a banking crisis or some other confidence crushing event, this floor could be overshot to the downside, as occurred in 2008/09.

Geopolitics, increased liquidity and reduced Euro risk ahead are also price supportive

Beyond the supply and demand, in our base case we expect oil prices to be supported over \$100/bbl by several other factors: geopolitical risks, expectations of more liquidity tranches to come via monetary policy, and Citi's house views that the Euro currency union does not break up, that China manages a soft landing, and that global equities appear to be pricing in a recession that is unlikely to happen. Citi's views warrant cautious optimism on risk assets (our Global equity strategists are targeting a 20% gain in the MSCI AC World equity index, which we think would be supportive for oil). Monetary expansion would be supportive for commodity prices in general, and Citi is expecting QE3 in the US, rate cuts in Europe and a return to an easing cycle in China; and finally geopolitics, which we expect to be a dominant theme in oil markets through 2012 and 2013.

Figure 11. Equity Outlooks

		01-Dec-11	End 2012 Target	Change
US	S&P 500	1245	1375	10%
Pan Euro	DJ Stoxx	238	280	17%
UK	FTSE 100	5489	6200	13%
Japan	Topix	740	980	32%
Australia	S&P/ASX 200	4229	4900	16%
Emerging World	Emerging World	959	1225	28%
World	MSCI AC World	302	360	19%

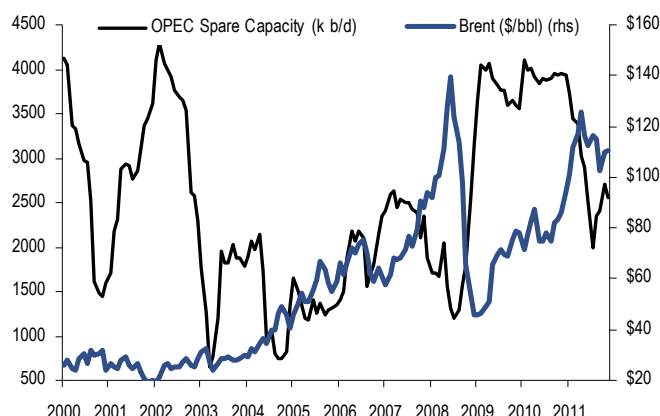
Source: Citi Investment Research and Analysis

**The world is operating with fewer cushions of inventories or spare production capacity**

Already options markets are pricing in such factors. The option-implied probability that Dec-12-dated WTI would exceed \$100/bbl by delivery has surged over 50% as of December 8, 2011, up both from the 40% low in October and up year-on-year.

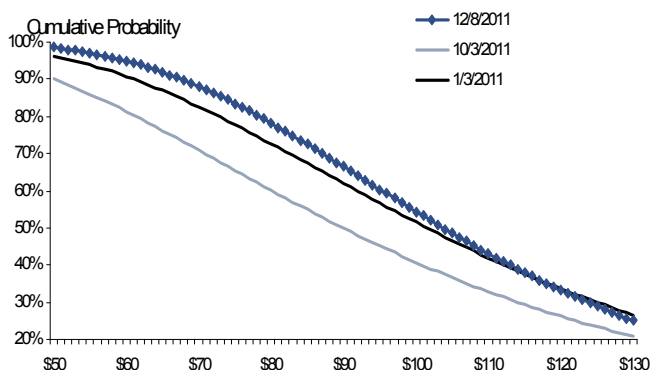
We think the world is currently operating with about 2.5-m b/d of spare production capacity. Virtually all of it is in Saudi Arabia, with the rest scattered around other core Gulf OPEC members. Absent any supply disruptions we expect to see a marginal increase in spare capacity, but the margin remains so slim and the potential disruptions so numerous that we believe risks are slanted heavily to the bullish side of the ledger. Tensions between Israel and Iran top the list, but an EU embargo on Iranian oil, sanctions on Syria, succession and the possibility of strife in Saudi Arabia, elections in Venezuela and Angola and ongoing violence in Nigeria and Yemen are on the list but do not complete it. Historically, low spare capacity is unsurprisingly correlated with higher prices.

**Figure 12. OPEC Spare Capacity and Brent Price**



Source: Bloomberg, OPEC, Citi Investment Research and Analysis

**Figure 13. Option-implied probability of Dec-12 WTI exceeding minimum price at delivery**



Source: Bloomberg, Citi Investment Research and Analysis

**Déjà vu all over again**

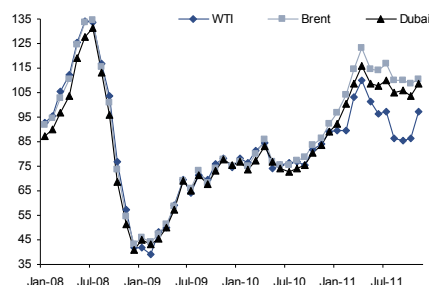
**A potential oil price spike poses a significant threat to the macro environment**

One of the persistent themes in the oil market has been that we are living through 2008 all over again and that seemingly robust oil market fundamentals are going to give way in the face of a rapidly deteriorating macro environment. We are looking at the world rather differently, and instead think that oil poses a significant threat to the macro environment. The redundancy in the system is slim, and the threats to supply are many. We examine the long list of geopolitical issues that the world will have to contend with in our geopolitical section below and think that so many of them involve significant threats to significant portions of the world's oil supply, that the risk of an oil price spike are significant in 2012.

2011 has seen several key themes in the oil market come to full fruition. WTI has been under pressure since the Spearhead pipeline pushed Cushing into regular periods of oversupply back in 2006, but only really dislocated from global oil markets this year. The announcement in November that the Seaway pipeline was getting reversed brought WTI back within \$10/bbl of Brent, given the deferred 'arbs' are narrower we think that is within the range of fair value for now, and sets a floor until robust pipeline takeaway capacity is available (see section WTI-Brent Spread Still Prone to Blow Out in 2012 for our outlook on WTI spreads and the WTI-Brent 'arb'). The removal of Libyan barrels from the market took Brent into severe backwardation, and spreads are only now easing as Libyan production returns.

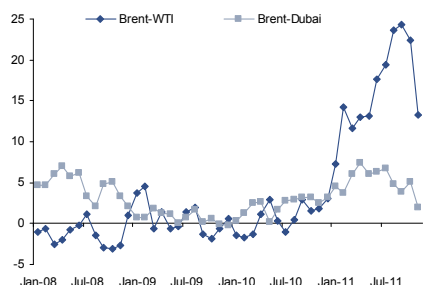


Figure 14. Crude Prices



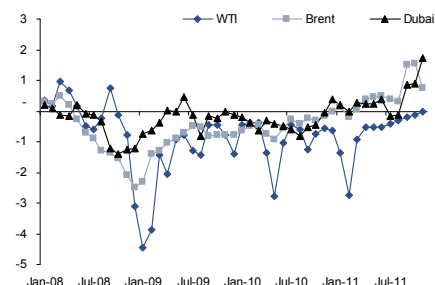
Source: Citi Investment Research and Analysis

Figure 15. Benchmark Differentials



Source: Citi Investment Research and Analysis

Figure 16. Benchmark Spreads



Source: Citi Investment Research and Analysis

**Brent spreads have been the key driver moving the oil market into backwardation**

**Dubai and Brent will likely lead the oil complex in 2012...**

**...as Libya comes back online, narrowing the Brent-Dubai spread**

**Avoiding a repeat of 2008, increasing demand for bunker fuel should keep 'resids' tight...while refining capacity should outpace demand growth**

Brent spreads have been the key driver for moving the entire oil complex into backwardation, and they remain critical to the outlook for spreads in both crude and products across all regions. Brent backwardation looks here to stay, absent a real economic meltdown as we assume that Saudi Arabia has the capacity and will to pull back on production to keep the market fairly tight and prices supported.

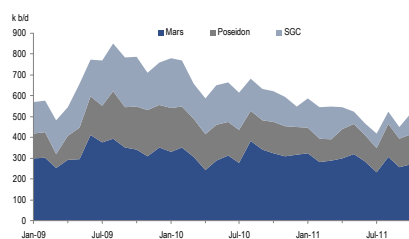
We expect Dubai and Brent to split the leadership of the crude complex in 2012 and 2013. In 2012 we expect about 1-m b/d of refining capacity to be shut in the Atlantic Basin, with a similar amount to start up in the East. (The reported possible sale, dismantling and moving of Sunoco's Eagle Point refinery from New Jersey to India's East Coast, while emblematic, is not included in the assumed expansion in Eastern capacity). This shift in regional demand augurs for a narrower Brent-Dubai 'arb', and we expect Dubai's value as a lead indicator for crude strength to increase in 2012 on this shift.

Also pointing to a narrowing of the Brent-Dubai 'arb' is the return of Libyan production, which now looks like it will hit 900-k b/d by early 2012 and could see a return of full capacity by the end of 2012. One potential obstacle to a return to stable production was the return of service company employees to manage wells and reservoirs. Another was the return of operating companies. Both are underway and all of Libya's main producing fields are already back. That leaves security as the main obstacle and while the road ahead for the organization of an effective and authoritative leadership might be bumpy, there are widespread revenue stakes in maximizing oil flows. If Libya sees most of its production stabilized and growing, this should remove much of the tightness in light sweet barrels. Dubai is both heavier and sourer (has more sulfur) than Brent so the added length in light sweet crudes points to a narrower 'arb'. The heavy aspect will also work to Dubai's advantage as we expect fuel oil to stay tight in 2012. Dubai spreads will remain a key indicator for the state of the global crude market, and we expect the pull from the East on Atlantic Basin crudes, including the North Sea which has already seen an uptick in volumes heading east in 4Q 2011, to stay strong through next year.

The prospect of residual fuel oil getting tight as new complex refiners start up while simple refiners close has also been realized in 2011. As long as the world avoids a financial crisis, and global trade does not collapse, the increasing demand for bunker fuel and the start up of 0.5-m b/d of new cokers will combine to keep residuals tight. We remain bearish on refining margins, as the expansion in refining capacity will outpace demand growth. The narrower Brent-Dubai 'arb' will add further pressure to both Asian and European refining margins.



Figure 17. US Gulf medium sour crude production has stayed low



Source: Shell, Poseidon Oil, Cameron Highway Oil, Citi Investment Research and Analysis

A different but parallel set of activities has brought Mars and other more sour and heavy Gulf of Mexico crude streams into tighter ties to LLS and WTI. The drop in drilling in the Gulf of Mexico has resulted in lower production, which should continue to slide in 2012. Combined production from Poseidon, Green Canyon and Mars has fallen from ~800-k b/d two years ago to ~500-k b/d in recent months, a loss of 300-k b/d of supply. Meanwhile, two traditional sources of sour crude for the US market, Venezuela and Ecuador, have tied up some 500-k b/d of their production in pre-export financing deals with Chinese companies, driving down liquidity for these crude streams in the largest Gulf of Mexico market, with consequences for spreads as well.

### How Did We Get To the Bull Case?

Our new price deck is in line with the bull case presented in our previous outlook<sup>2</sup>. The bull case has come about because of significantly worse supply and somewhat better demand than expected. On demand, while the y-o-y numbers have looked somewhat anemic since April, this is largely because those comparisons were against a very strong 2010. Year on year consumption growth in April-October of 2011 averaged just 500-k b/d, but from Jan 2010 to October 2011 demand growth averaged a very healthy 2-m b/d.

Figure 18. Comparisons of Global Oil Demand Estimates

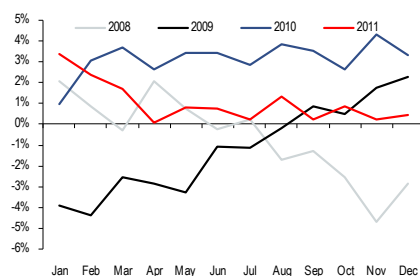
mb/d	2010	Q1'11	Q2'11	Q3'11	Q4'11	2011	Q1'12	Q2'12	Q3'12	Q4'12	2012	11v10	12v11
Citi (Base Case)	88.3	89.1	88.2	89.3	91.0	89.4	90.1	89.1	90.1	91.7	90.3	1.1	0.8
IEA	88.3	88.9	87.9	89.6	90.2	89.2	90.2	89.4	90.9	91.4	90.5	0.9	1.3
EIA	87.1	87.3	87.2	88.7	89.3	88.1	88.9	88.7	90.0	90.5	89.5	1.1	1.4
OPEC	86.9	87.5	86.3	88.3	89.1	87.8	88.7	87.4	89.5	90.3	89.0	0.9	1.2

Source: Citi Investment Research and Analysis

**We expect demand growth of 800-k b/d in 2012...lower than the latest IEA, EIA and OPEC estimations...**

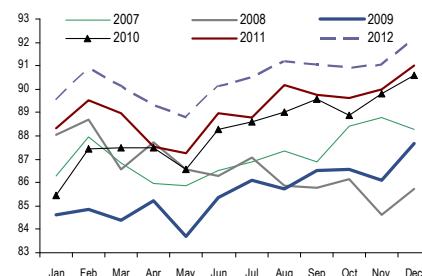
We expect demand growth of 800-k b/d in 2012, a lower number than the IEA, EIA or OPEC which are forecasting 900-k b/d, 1.39-m b/d and 870-k b/d, respectively (all official balances available in the appendix).

Figure 19. Y-o-Y Global Oil Demand Growth %



Source: Citi Investment Research and Analysis

Figure 20. Global Oil Demand



Source: Citi Investment Research and Analysis

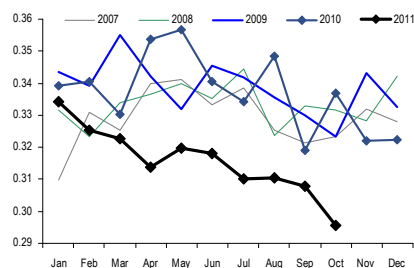
Supply came in much lower than expected after an extraordinary series of outages.

<sup>2</sup> Morse, Edward L. "Uncommon Oil Market Ahead Part II" 22 August 2011.

### The One Million Barrel per day Problem in 2011

- **Azerbaijan** – August fall of 77-k b/d y-o-y as BP carried out infrastructure upgrades over summer
- **Canada** – 3Q'11 production up +308-k b/d q-o-q and +250-k b/d y-o-y, but power outages on TCP and Enbridge led to May/June 200-k b/d lower than April's 2.8-m b/d
- **China** – the Peng Lai 19-3 field, producing ~120-k b/d, halted in Sept after oil seepages early June
- **Colombia** – Up ~180-k b/d y-o-y but lost ~2-m bbls in Sept due to strikes and protests in July
- **Mexico** – Tropical Storm Nate in early September hit offshore platforms, cut production by ~178.8-k b/d, closed two oil export ports
- **North Sea** – October loadings fell 400-k b/d m-o-m to 1.3-m b/d on continued problems at the Buzzard field; 3Q is down ~800-k b/d y-o-y
- **Russia/FSU** – combined exports fell 520-k b/d to 211-k b/d in Q3'11 y-o-y, of which ~400-k b/d from Med (and 120-k b/d of this on BTC+CPC pipelines), 250-k b/d from Baltic and Northern ports, while Far Eastern exports were up
- **Kazakhstan** – strikes at the Uzen field from April-August disrupted production of ~5.86-m bbls
- **Syria** – 110-k b/d of its total output of ~350-k b/d lost after European embargo beginning mid-Sept, mostly heavy crude
- **US**
  - Hurricane disruptions: Tropical Storm Lee and Don, 5-m bbls and 500-k bbls of oil, 13 bcf and 1.1 bcf gas respectively. First 9 days of September saw 5.5-m bbls oil lost
  - Maintenance: 3Q down 130-k b/d y-o-y, with L48 up, Alaska and offshore GoM down
  - Gulf of Mexico sour crude dropped to 420-k b/d in July, from 512-k b/d in Q2, before recovering a little in August to 525-k b/d
- **West Africa**: down -33-k b/d y-o-y, disruptions in Nigerian pipelines affected Bonny Light operations, bringing loadings down to 2.04-m b/d levels in Sept-Nov, from ~2.3-m b/d over 2Q'11
- **Yemen** - attacks on Marib region pipelines resulted in average 70-k b/d lost crude supply, 9-m bbls per quarter, since before start of Q2

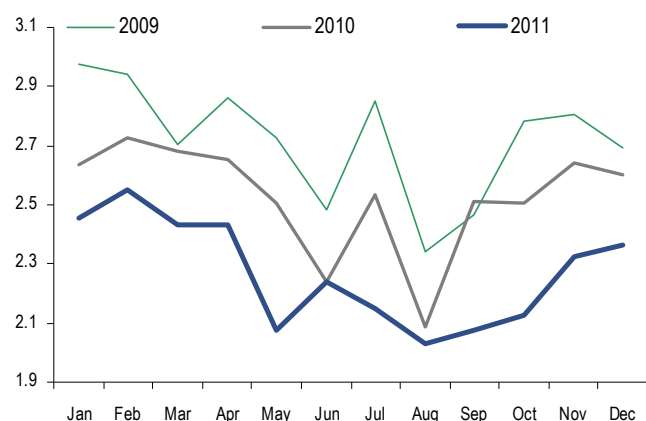
**Figure 21. OECD Europe Crude Oil Stocks – Bn bbls**



Source: IEA, Citi Investment Research and Analysis

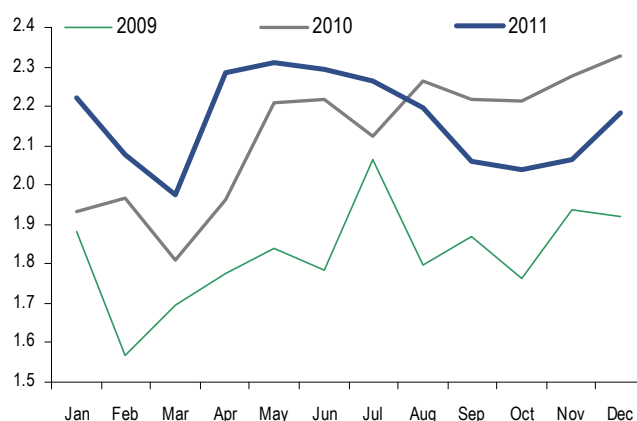
Some of these outages are visible in the loadings data displayed in the charts below. The North Sea has been in structural decline and issues with the Buzzard field contributed to the very low volumes available from September through year-end. Nigeria declared two force majeure due to pipeline damage. Azeri volumes, which are delivered through the BTC pipeline, fell to extremely low levels in part due to BP having a major global safety review post Macondo. Russian export volumes were despite record highs for crude production due to a combination of surging domestic demand and changes to the tax regime that encouraged producers to withhold crude for delivery until after October 1<sup>st</sup>. Kazakhstan had an oil workers strike, Colombia had a truckers strike, China shut in production after an offshore well leaked. The list goes on and the volumes are material: in October the sum of the available loading data indicated y-o-y declines of 930-k b/d. This y-o-y gap fell to 490-k b/d in December, but remains impressively bullish and explains how inventories were drained and Brent spreads stayed so firm.

**Figure 22. North Sea**



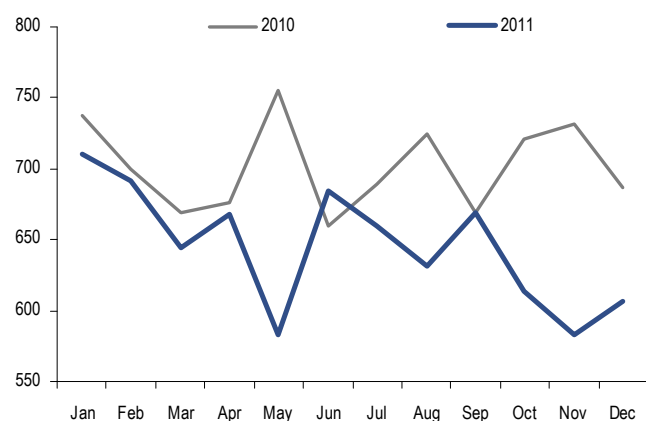
Source: Bloomberg, Citi Investment Research and Analysis

**Figure 23. Nigeria**



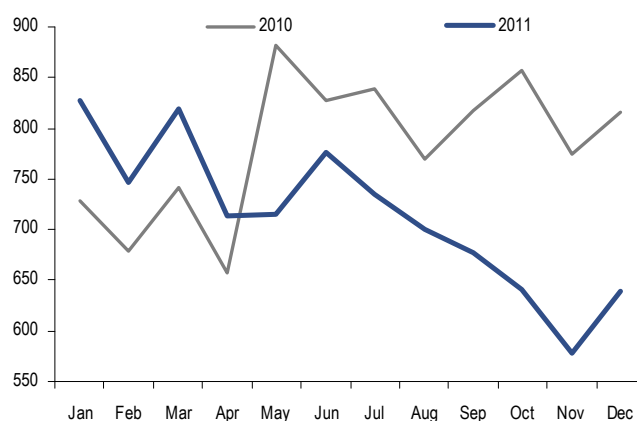
Source: Bloomberg, Citi Investment Research and Analysis

**Figure 24. CPC**



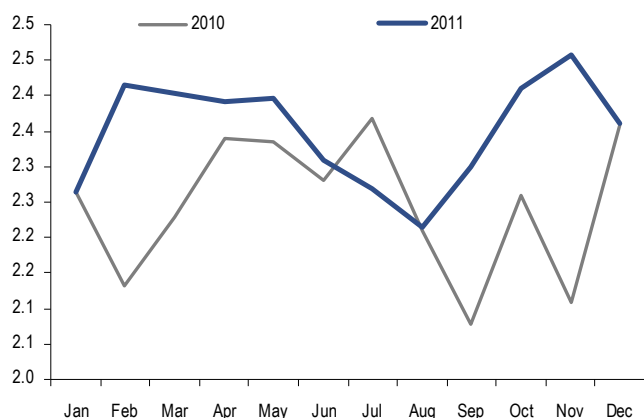
Source: Bloomberg, Citi Investment Research and Analysis

**Figure 25. BTC**



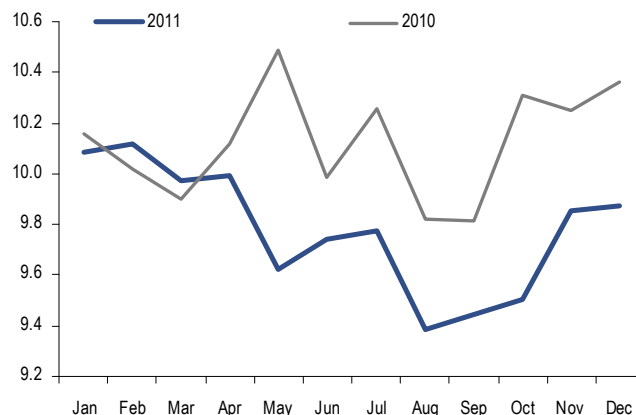
Source: Bloomberg, Citi Investment Research and Analysis

Figure 26. Russia



Source: Bloomberg, Citi Investment Research and Analysis

Figure 27. N.Sea, Nigeria, Angola, Russia, BTC+CPC Loadings



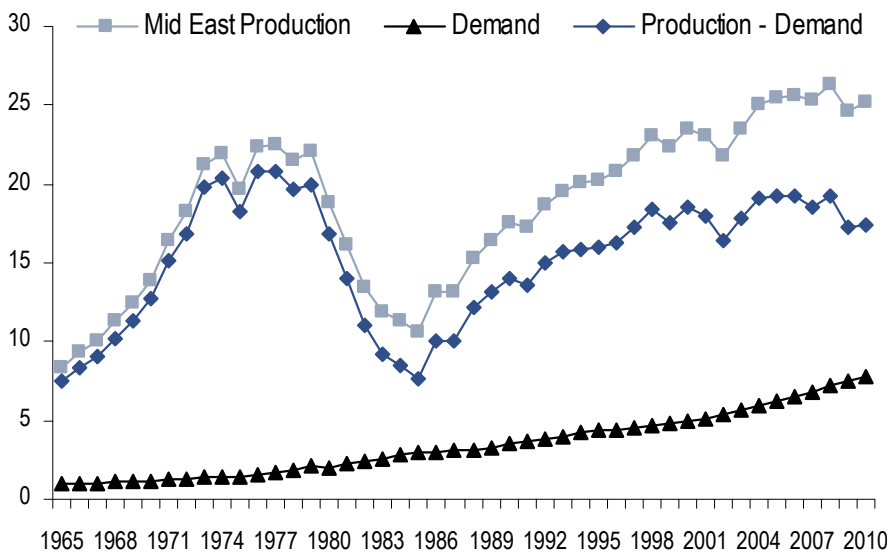
Source: Bloomberg, Citi Investment Research and Analysis

Producer country demand has been supportive for the bullish theme...especially in the Middle East where current export availability is below 1970 levels...

## Has Russia Seen Total Exports Peak?

One of the long-term bullish themes that has tightened the oil market in recent years has been the rapid growth of demand in many key oil producers, which has kept export availabilities constrained despite rising production. This is clearly visible in the Middle East, which includes key OPEC countries, where the rapid increase in demand has meant that the rise in production since the 1970s has been completely absorbed by domestic demand leaving export availabilities lower.

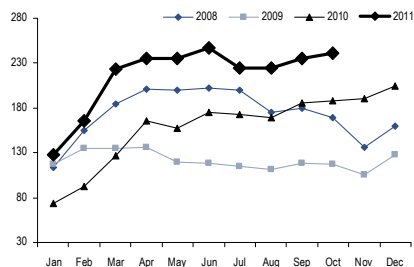
Figure 28. Middle East Export Availability Below 1970 Levels



Source: BP Statistical Review 2011, OPEC, Citi Investment Research and Analysis

...with Russia potentially joining its  
OPEC counterparts in that regard...

Figure 29. Russian Car Sales – 1000s

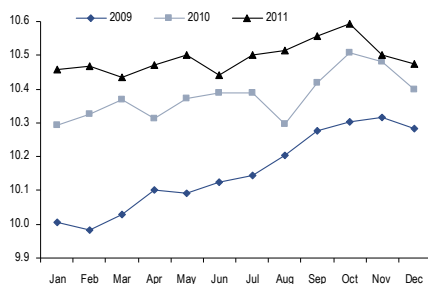


Source: AEB, Citi Investment Research and Analysis

It looks like Russia is joining OPEC in that regard. Despite domestic crude production reaching a new record high in 2011 (up 110-k b/d or 1.1% y-o-y), domestic product demand seems to have surged starting in May, cutting into total surplus available (crude + products) for exports. Car sales data in Russia have been on a tear, helped by a cash-for-clunkers scheme, which should boost gasoline demand in coming months, though it is diesel demand that has really been driving product consumption growth in Russia, rising at an impressive 12% and 9% in 2010 and 2011, respectively.

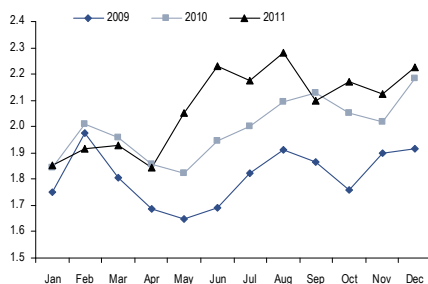
The recent Russian elections saw Putin's United Russia party stumble badly, raising the odds of a state spending splurge to boost Putin's popularity. This will be bullish domestic demand, for oil products along with much else. To be sure, there is already talk of a reduction in petrol prices.

Figure 30. Russian Crude Production



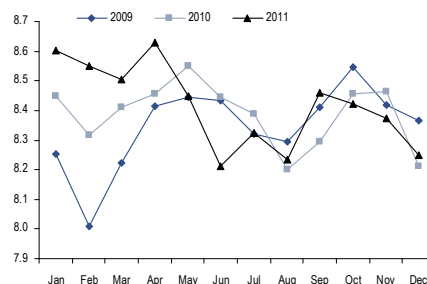
Source: EIG, FGE, CIRA

Figure 31. Total Russian Product Demand



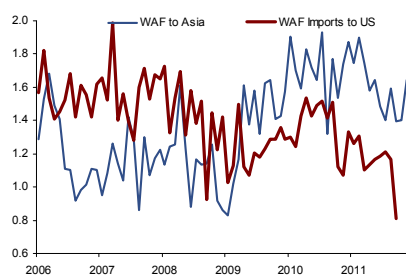
Source: EIG, FGE, CIRA

Figure 32. Total Surplus Available for Exports



Source: EIG, FGE, CIRA

Figure 33. WAF bbls going to US and Asia

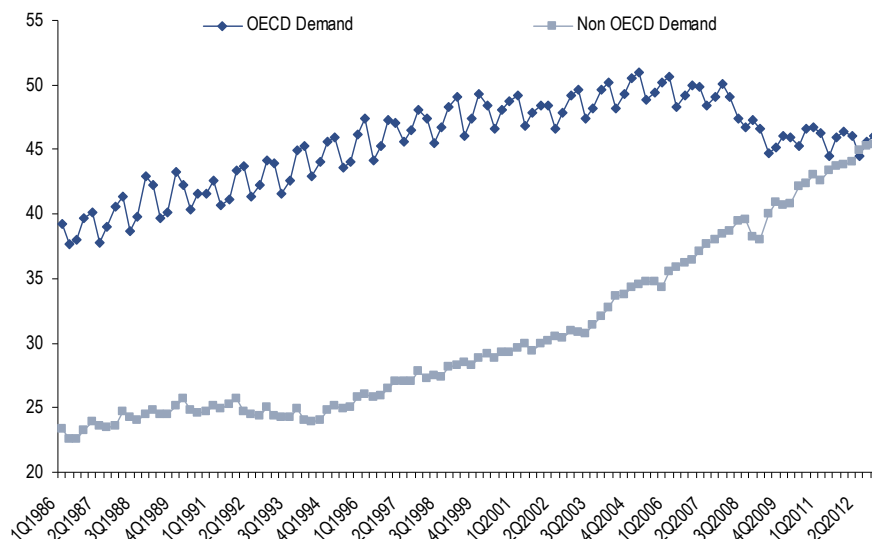


Source: Bloomberg, CIRA

Asia remains the most bullish regional driver of the oil market. It is significantly and structurally short crude oil, and this shortage will only continue to grow as consumption outpaces regional production. West Africa is the swing supplier to global crude markets, as barrels can go west to the US East Coast, or east to Asia. Starting in 2009, Asia started to take more WAF barrels than the US and 2011 saw the proportion going East blow out further. The closure of two US East Coast refineries (Marcus Hook and Trainer) and the likely closure of Sunoco's Philadelphia refinery in the summer of 2012 will likely ensure that Asia takes a yet higher proportion still in 2012.

The structural bullish case for oil demand is simple. Non-OECD demand is now roughly equal to OECD demand — 2012 will be a landmark year for the oil market as non-OECD demand looks likely to exceed OECD demand for some portions of the year for the first time — and non-OECD demand is growing more quickly than OECD demand is declining.

Figure 34. OECD and Non-OECD Oil Product Demand – m b/d



Source: IEA, Citi Investment Research and Analysis

## The Rise of the Non-OECD and Seasonality in the Oil Market

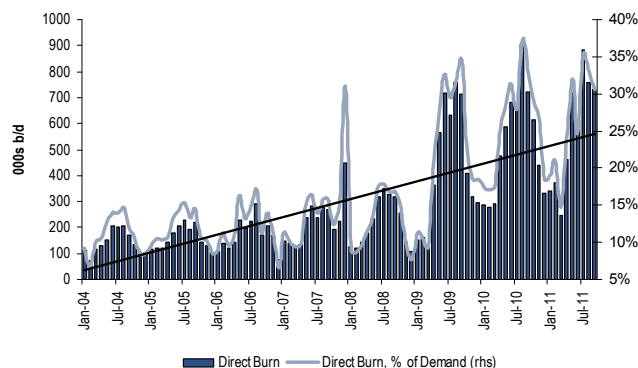
Seasonality of emerging markets demand is playing an increasingly important role for global oil markets...from Saudi Arabia to China to Brazil...

Many factors go into oil price formation. There is a well defined seasonality to some of these factors, though their importance to the market can wax and wane, and there have been some important shifts in the oil market that will ensure that some previously important factors will be less so going forward, while some that have not mattered in the past will be key.

The seasonality of demand in the non-OECD is quite different to the OECD. The 2<sup>nd</sup> quarter is known as the shoulder period in the OECD as it comes between the winter heating oil season and the summer gasoline season. In the non-OECD 2Q is when power generation demand for air conditioning in the Middle East starts to surge and Latam sees its winter start. It's also traditionally a robust period for Chinese industrial demand growth following the long shut-downs of industrial production that precede Chinese New Year. For example, this coming Year of the Dragon, 2012, starts in late January and extends for fifteen days to early February, but plants are already starting to shutter. The resumption of activity post Chinese New Year always sees an uptick in commodity demand.

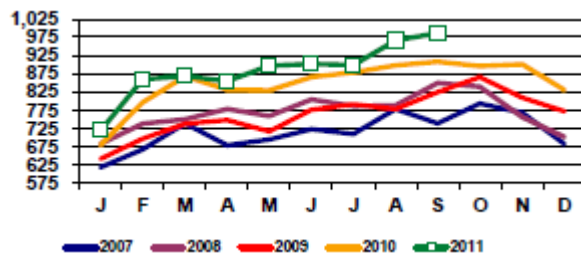
This means that the very different seasonality of non-OECD demand is assuming an ever increasing import to the global oil market.

Figure 35. Saudi Crude Burn



Source: JODI, Citi Investment Research and Analysis estimates

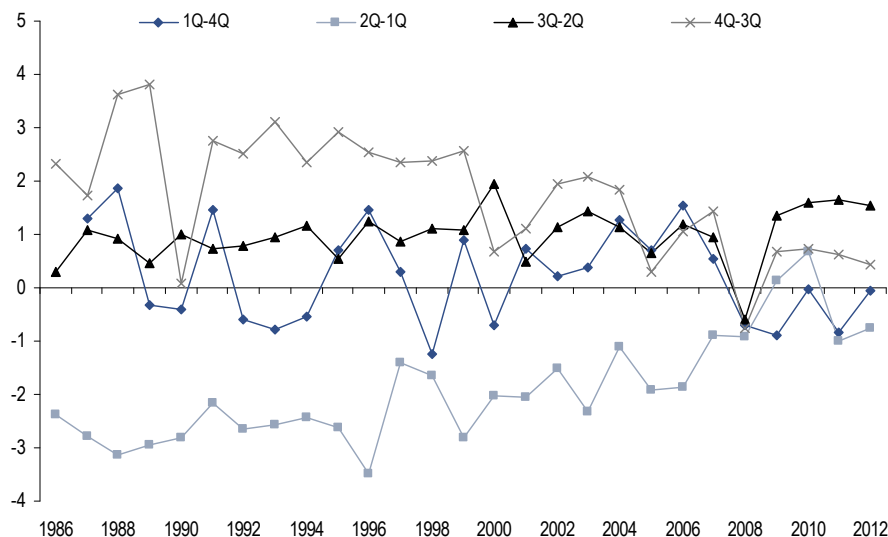
Figure 36. Brazil Gasoil Demand



Source: Citi Investment Research and Analysis

This rise of the non-OECD has meant that the usual 2Q dip in demand is dwindling, though if there is a cold winter in the Northern Hemisphere the resulting demand for heating fuel can outweigh the 2Q rise in the non-OECD. Notably the relative strength in 3Q versus 2Q is persisting.

Figure 37. Global Q on Q Demand Deltas – m b/d



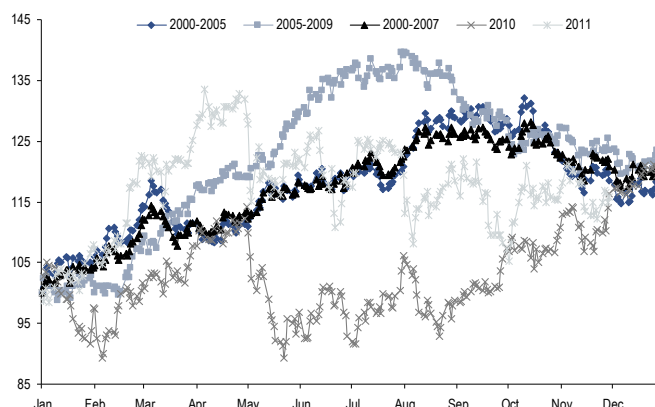
Source: Citi Investment Research and Analysis, IEA

Correlation between oil markets and equities are on the rise...

Oil prices, however, do not seem inclined to follow the global demand script. The below chart shows oil prices indexed to Jan 1=100. They have tended to rise into the summer gasoline season and then taper off into year-end. Interestingly this pattern of falling into year-end has not been seen in the last couple of years. This may partly be the result of oil markets becoming increasingly globalized, but the rising correlations observed with equity markets may also be helping (along with a number of one-off factors in recent years). The following figure shows a similar chart of the S&P 500 indexed to Jan 1=100; equity markets seem to like to finish the year on a strong note and the new normal of strong positive correlations between oil and equities may go some way towards explaining oil's new found 4Q strength.

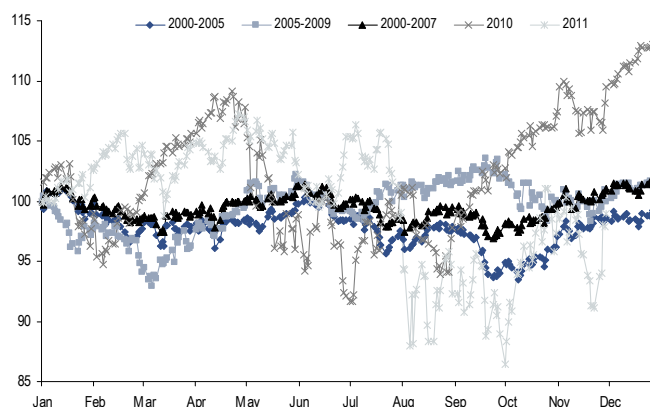


Figure 38. Brent prices indexed to Jan 1=100



Source: Citi Investment Research and Analysis, Bloomberg

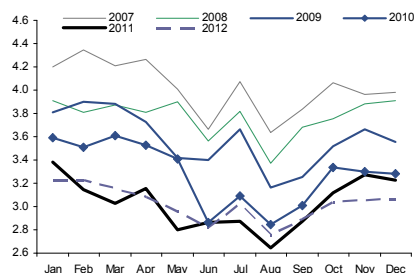
Figure 39. S&P 500 indexed to Jan 1=100



Source: Citi Investment Research and Analysis, Bloomberg

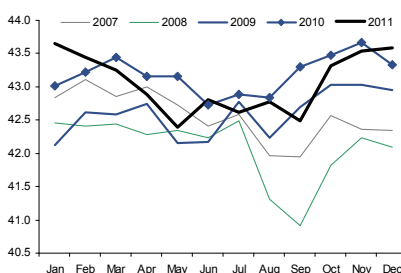
An additional explanation for the seasonality of oil prices comes from the supply side. North Sea oil fields go into maintenance over the summer, and it is common to see several other non-OPEC producers in maintenance in the summer as well. The net result can be seen in the common pattern of lower crude production in the summer, sometimes greatly exacerbated by US hurricane impacts on Gulf of Mexico production, just as global refinery demand for crude peaks.

Figure 40. North Sea Crude Production



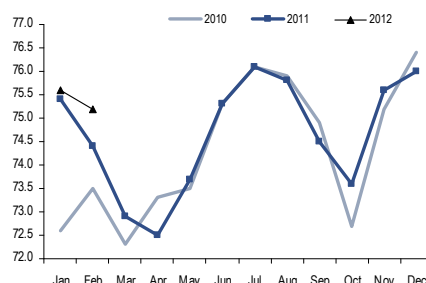
Source: Citi Investment Research and Analysis

Figure 41. Non-OPEC Crude Production



Source: Citi Investment Research and Analysis

Figure 42. Global refinery Throughput



Source: Citi Investment Research and Analysis

Similarly, the peak in Saudi crude burn during the summer means less crude available for exports, adding to seasonal support for oil prices. The seasonality of Saudi crude burn has some other important implications for the oil market. At present all of Saudi natural gas production is associated. It is only produced along with oil, so cutting back on oil production will mean less gas. In the summer months Saudi Arabia runs short of gas for power generation. This makes it more difficult for them to pull back on oil production as it will mean the loss of their associated gas. Depending on market conditions this can have bullish or bearish implications: with Saudi crude burn falling by some 800-k b/d from the peak in summer to Dec/Jan levels, this can free up crude for export and can soften the market. On the other hand, the fall off in Saudi gas demand gives them greater flexibility in terms of pulling back on crude production should they want to tighten the market.

2012 could mark a significant new development in Saudi Arabia with the start up of Karan, their first offshore non-associated natural gas field, which is expected to reach 1.8 Bn cfd in April 2013. This development could give Saudi Arabia more flexibility to rein in oil production if deemed necessary.

Will the Kingdom's social spending programs force its hand...

...perhaps in the long-term but unlikely in 2012 or 2013 although it won't be easy...

## What Oil Price Does Saudi Arabia Want?

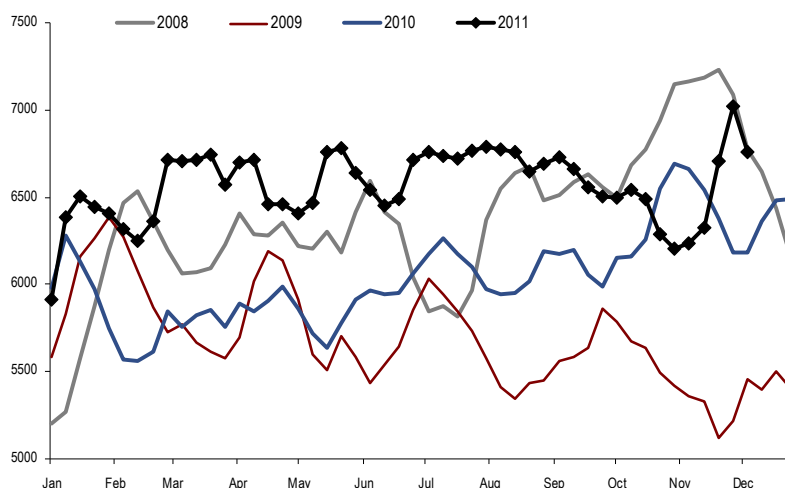
In response to the Arab Spring, Saudi Arabia spent almost \$100 billion on social programs, which has raised the breakeven for the Saudi budget to about \$90/bbl (referencing Brent) for 2012, according to the Institute of International Finance. As a fairly shocking aside, in a July 2011 paper, Jadwa Investments extrapolate from Saudi Arabia's rapidly increasing oil demand and expenditure requirements to calculate an eye-watering breakeven price of \$322/bbl in 2030.

In our base case Saudi Arabia looks fairly comfortable in 2012 and 2013, though we do not think they get a free ride. We assume that they will have to curtail output if they want to keep the market fundamentally supported, but the volumes we see them having to take off the market should not be overly problematic.

One data point that may give some insight into what Saudi Arabia views as a fair price for oil comes from shipping tracking data. We are skeptical of most of the OPEC production data, as the various surveys that are then compiled into IEA and OPEC estimates are just surveys of analysts' opinion; they are not referencing anything resembling official data. For this reason we pay attention to ship tracking data and we attempt to monitor actual oil movements out of Saudi Arabia.

The most striking observation regarding the chart on Saudi exports is the muted increase in exports seen in March and April of 2011. Libyan production had collapsed by this time and Saudi Arabia was being very vocal in claiming that they were putting 1-m b/d of extra oil on the water to compensate for the loss of Libyan production. Our vessel tracking efforts picked up an increase in export flows of about half that volume, and the crude oil market certainly traded like it was missing significant volumes, with both Brent and Dubai staying in very strong backwardation.

Figure 43. Saudi Exports – 4 week average, k b/d



Source: Bloomberg, Citi Investment Research and Analysis

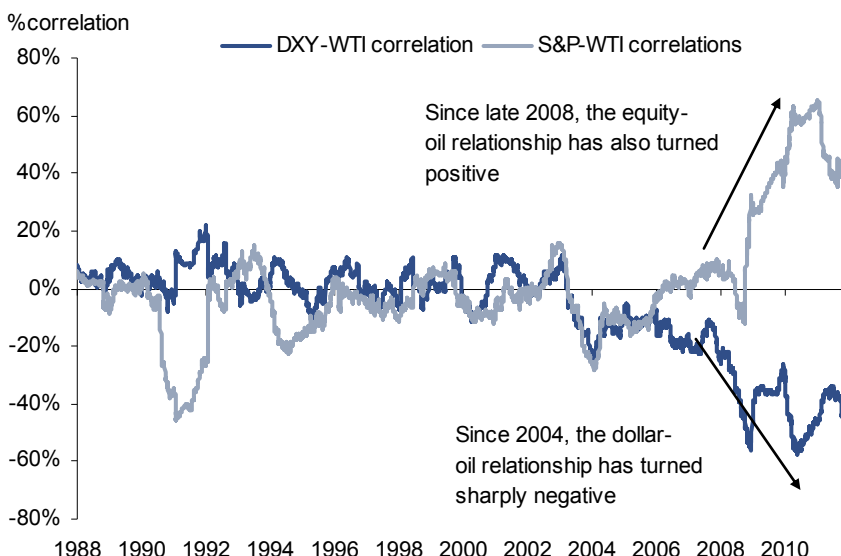
We think that Saudi Arabia will remain cautious about oversupplying the market, given their high breakevens and fiscal requirements, their preference for maintaining a backwardated market and the risks to the oil price given the fragile macro economic backdrop.

**Oil-Dollar and Oil-Equity correlations have become a more meaningful factor in the markets since the 2008 crisis...**

## Correlations Galore

A major factor recently driving commodity prices is the broader pulse of market risk appetite. This has connected many previously independent asset classes into tighter risk-on/risk-off synchronization. In particular, since 2004 and the increasing financialization of commodities as an investible asset class, significant correlations have emerged between oil, the US dollar, and equities. These have strengthened in the wake of the 2008 Great Recession, with oil-dollar negative correlations falling below -50% and oil-equity positive correlations exceeding +60%.

**Figure 44. Oil-Dollar and Oil-Equity Daily Correlations**



Source: Bloomberg, Citi Investment Research and Analysis

These emergent patterns have forced markets to reassess what they thought they knew about the relationship between oil and other macro asset classes. Oil, thought to be a cost source on aggregate for net importers such as the US and therefore negatively related to equities, has instead behaved as a “just another” risk asset due to synchronized financial flows and shifting expectations about global demand.

Going forward, the economic outlook remains cloudy but Citi’s equity strategists are calling for a strong rally as investors shift from negative headline sentiment to solid fundamental earnings, though US equities remain underweight relative to Japan and the EM sector. If correlations between equities and oil remain intact, a return in risk appetite raising the tide of all risk assets would benefit oil prices as well.

On the other hand, oil-dollar relationship has also grown strongly negative, with a 10% appreciation in the US dollar now associating with a 15% decline in nominal oil prices. In contrast to the relatively optimistic picture from our equity strategists, the FX strategy team sees continued US dollar strength due to EMU crisis and the scope for further monetary easing by the ECB; the EURUSD is forecasted to drop into the 1.25-1.30 range. This can put downward pressure on nominal oil prices on the order of \$10-15/bbl.

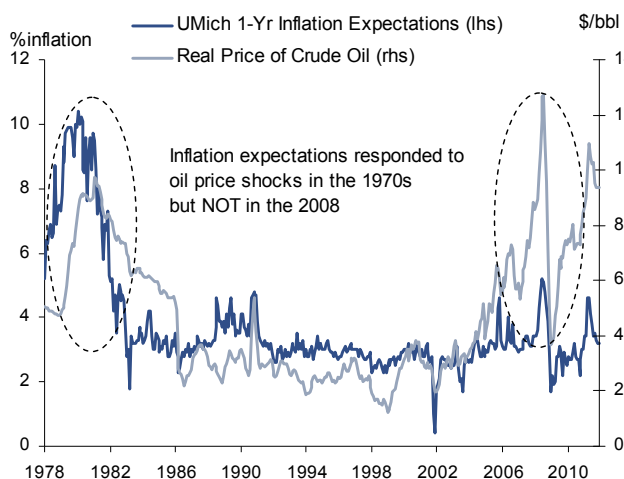
## Inflation We Trust

...as has the link to inflation...and whether oil can serve as a meaningful hedge...

Another question is the degree to which oil can serve as a hedge against inflation. Historically, oil was a major tracker (indeed driver) of inflation, notably during the 1970s when US annual inflation entered double-digit territory as oil prices surged.

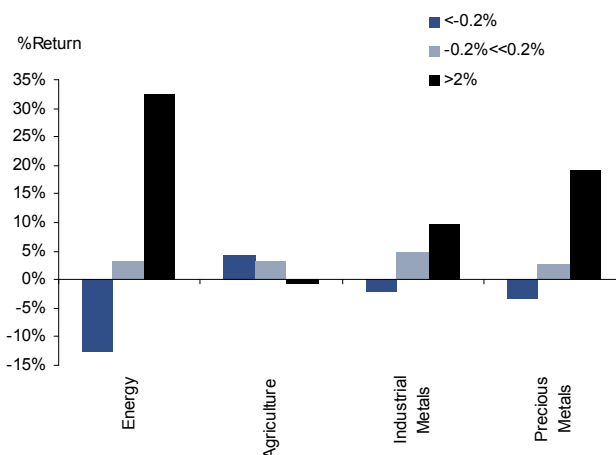
But the 1970s oil shocks were so damaging not only because of the immediate impact of expensive oil but also because inflation expectations also unanchored, causing a difficult period of stagflation that was eventually controlled only at the cost of harsh monetary tightening.

Figure 45. Real oil prices and inflation expectations, 1978 to present



Source: Bloomberg, Federal Reserve, Citi Investment Research and Analysis

Figure 46. Behavior of commodity sectors in different inflation expectations regimes



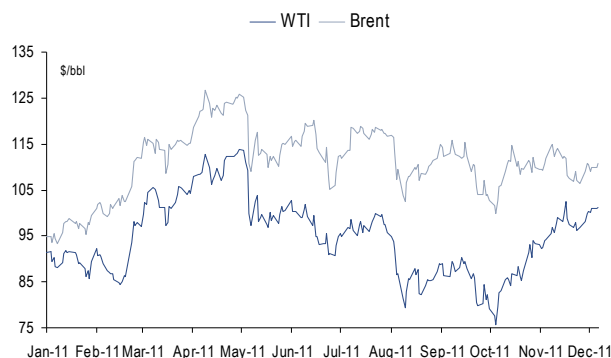
Source: Citi Investment Research and Analysis

Since then, oil has become less useful as a hedge against inflation because stable inflation expectations have limited the degree to which higher headline energy prices affected broader price levels. The figure above shows how while real oil prices during 2008 rose to similar heights as during the 1970s, inflation expectations were far more muted.

At present, the consensus view assigns more fear on the threat of deflation than inflation. But a destabilization of inflation expectations remains a critical tail risk as central banks continue to inject unprecedented amounts of liquidity into the global economy. M1 money supply as a % of GDP has surpassed 63%, the highest level since the 1980s. If expectations indeed un-anchor, nominal oil prices may respond disproportionately, fueled further by higher financial flows.

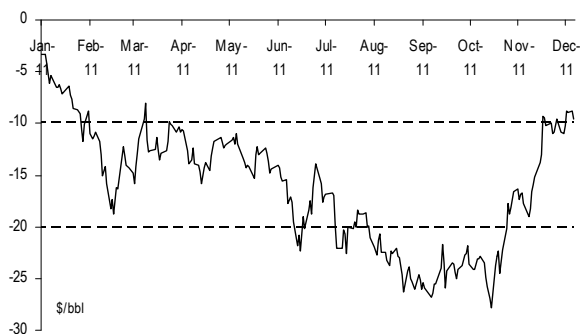
## WTI-Brent Spread Still Prone to Blow Out in 2012

Figure 47. WTI-Brent Prices, YTD



Source: Bloomberg, Citi Investment Research and Analysis

Figure 48. WTI-Brent Spread, YTD



Source: Bloomberg, Citi Investment Research and Analysis

Figure 49. NYMEX WTI Discount to ICE Brent

	WTI-Brent
2010	\$ (0.76)
1Q'11	\$ (11.04)
2Q'11	\$ (14.68)
3Q'11	\$ (22.60)
4Q'11	\$ (13.63)
Forecast	
1Q'12F	\$ (10.00)
2Q'12F	\$ (10.00)
3Q'12F	\$ (10.00)
4Q'12F	\$ (10.00)
2013F	\$ (7.00)

Source: CIRA estimates

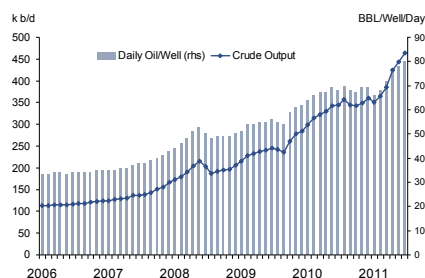
Over the past year, WTI fell from its traditional ~\$2/bbl premium over Brent to a discount, after which the prompt spread between the two grew to as much as \$27/bbl in August and October of this year, while deferred prices swung until they finally converged toward year-end. Meanwhile, in 4Q'11, the front end WTI-Brent spread converged rapidly to ~\$10/bbl. It's no accident that both the blowout in spread and the convergence tracked closely first with the total disruption of Libyan supplies in 1H'11 and more recently, the recovery of Libyan production to an astonishing 840-k b/d, following the ouster of Muammar Qaddafi, although other factors were also at play.

Looking forward into 2012 it looks likely that it will remain a choppy period for the differential—one not necessarily biased to a systematic narrowing but rather a period where the 'arb' could find a floor of about \$8-\$10/bbl, and remain prone to a blow out wider. The fundamental drivers for this view are the same as they were during this past year's bumpy ride: growing North American production point to a supply imbalance favoring an inventory build in the US inland PADD II area including at Cushing, Oklahoma, the delivery point for NYMEX crude. Rampant new production of light sweet WTI within the US mid-continent will unlikely find an immediate home in the current refinery system despite potentially weaker inland demand and an insufficient pipeline, rail, truck and barge evacuation infrastructure.

**\$8-\$10/bbl is the likely floor for the WTI-Brent spread in 2012 but growing North American production will likely favor an inventory build in the US inland that lacks insufficient takeaway capacity... that could lead to a blow out wider in fits and starts...**

This has also been part of the story in 2011 of the WTI-Brent differential, a tale of robust crude oil production out of Western Canada and the Bakken shale plays in North Dakota, the latter which has seen 120-k b/d y-o-y production growth as of September 2011, plus some other areas of production growth into PADD II, leaving the US midcontinent as an 'isolated landlocked island of glut' where crude oil stocks for the region as a whole hovered at record levels through most of this year. This congestion has benefited PADD II refiners with robust margins and 90%+ utilization rates, making mid-continent crude transport to richer markets a logistical challenge for upstream producers, with limited evacuation possibilities via aforementioned modes of transport. The rest of the story has been the pull on Brent prices by the Libyan disruption, which although taking out only 2% of global production by volume, accounted for 15% of the world's light, sweet crude supply.

Figure 50. North Dakota Production



Source: NDS, Citi Investment Research and Analysis

...financial flows should also favor Brent  
as it rebalances into the DJ-UBS index...

This almost overnight shutdown of Libya's 1.5-m b/d of production, more than three-quarters of which was light and sweet and benchmarked to Brent streams, might have been the trigger for the spread blow out, but supply pressures exacerbated the difference between the relatively oversupplied inland US oil market versus a physically tight environment for waterborne light and sweet crude streams.

By mid 3Q'11, North Sea prices also became further elevated due to a series of disruptions globally, especially of crude streams either in the North Sea or benchmarked off of Brent, including Urals and Caspian Azeri and West African Nigerian and Angola crude streams. Those disruptions were partially responsible for the Brent-WTI differential reaching its peaks in October, just as Libyan production was starting to rebound. With European refiners in a negative cash situation through much of 2011, they tended to reduce throughputs and hold crude inventories to minimum levels. When North Sea production was slow to come out of maintenance in late summer, especially in the case of the 200-k b/d Buzzard field, they bid up the price of nearby contracts and then of other crudes priced off of Brent. But these conditions look likely to have been one-off and expectations are that UK North Sea production will remain flat for 2012, even factoring in summer maintenance.

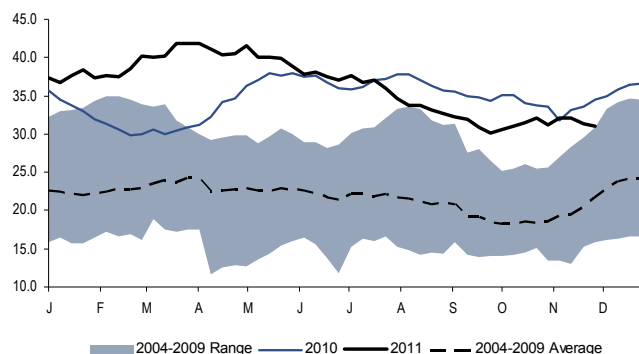
Meanwhile financial flows have also played a role that is likely to maintain a significant new set of pressures on differentials. When the WTI-Brent spread blew out, Brent was in steep backwardation and WTI structure was in steep and persistent contango. This meant that passive investors, traditionally seeing WTI as a critical part of their indexed investments, also suffered from continual monthly losses as contracts rolled from prompt to second month; Brent meanwhile provided, with its structurally steep backwardation, tantalizing positive roll yields and rewards for investors. No wonder then, that trading through the year in Brent increased by about 75% while trading in WTI fell by about 35%. And no wonder that passive investment flows increasingly embodied Brent contracts, thus buttressing Brent prices at the expense of WTI. Come 2012, some key commodity indices including the DJ UBS index will move a significant portion of their portfolios toward Brent and away from WTI and will be one of many factors supporting prompt Brent vs. prompt WTI. We estimate about \$90Bn in OTC swaps are linked to the DJ-UBS commodity index. Its current 15% allocation to crude oil is all WTI – but come January, about 5% will be 'replaced' by Brent. On the whole, we could see a net swing of 90,000 contracts with the sale of WTI and the purchase of Brent about evenly distributed in that aggregate figure.

This autumn's 'collapse' in the WTI-Brent spread to around -\$10/bbl, after peaking at -\$28/bbl on 14<sup>th</sup> October, is a function of some of the factors mentioned above, including the resurgence of Brent-benchmarked Libyan production, a return of more North Sea crude from maintenance and a reduction in inventories at WTI's pricing point in Cushing, Oklahoma. That inventory reduction involved a number of factors, none perhaps more important than the pushing out of flows from PADD III and the US Gulf Coast into inland PADD II, which enabled refiners to draw down Cushing inventory rather than relying on inflow from the Gulf of Mexico or other sources.

How are spreads between inland WTI and coastal LLS likely to evolve in 2012? And how in turn are spreads between WTI and Northwest European Brent likely to evolve next year?

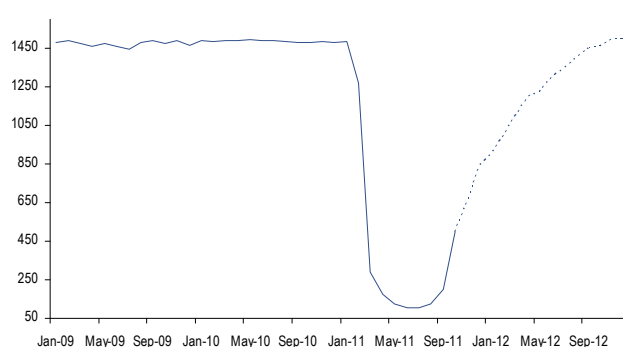


Figure 51. Crude Oil Stocks in Cushing, Oklahoma (m bbls)



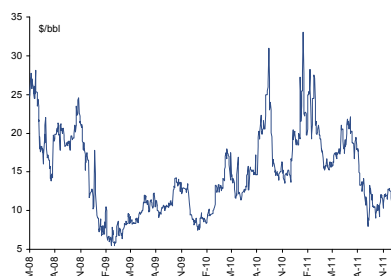
Source: EIA, Citi Investment Research and Analysis

Figure 52. Libyan Wellhead Production (000s b/d)



Source: EIG, Citi Investment Research and Analysis

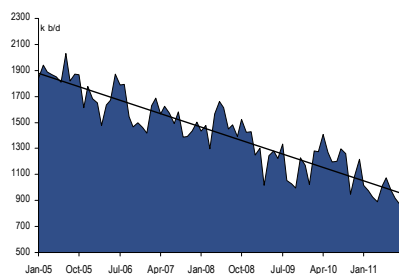
Figure 53. WTI Premium to WCS



Source: BBG, Citi Investment Research and Analysis

One factor for sure will be the reversal of the COP/Seaway pipeline, under the new management of Enbridge and Enterprise Partners. What is known is that ConocoPhillips is selling its 50% stake in the 350-k b/d pipeline, which was fully operated by COP but jointly owned by Enterprise Product Partners (EDP), to Enbridge (EEP), and the new management has announced it will reverse the flow. The deal put a death knell on the proposed 800-k b/d Wrangler pipeline from Cushing to the Houston area. The reversed Seaway is to send 150-k b/d of light and sweet crude from Cushing to Freeport Texas by the end of Q2 perhaps, and starting in 2013 will increase the flow to a maximum 400-k b/d. It's important to note that Freeport, TX, which would become the new 'end' point of the Seaway pipeline, has but one refinery with limited capacity to handle light/sweet crude that would need to move to Houston or other locales with greater capacity. Thus the situation leaves much needed room for additional pipeline projects and other evacuation routes, should the prompt and deferred 'diff' hold up at the current levels.

Figure 54. PADD III to PADD II Pipeline



Source: EIA, Citi Investment Research and Analysis

Meanwhile, two new supply pressures are emerging. First, indigenous production from Canada and into PADD II of heavy and lighter crude streams are expected to rise y-o-y by as much as 350-k b/d. Meanwhile, within PADD II there are three refinery upgrading projects emerging at: Wood River, Illinois; Detroit, Michigan; and Whiting, Indiana. These three refineries, by end-2012/early-2013, are expected to see their demand for light sweet crude fall by 420-k b/d just as their demand for heavier and more sour Canadian crudes rises by more than 500-k b/d; note WCS which has tightened significantly to WTI this year. Between lower demand for light sweet crude in the area and higher production, the result could be as much as 750-k b/d of more WTI supply in PADD II a year from now than is currently the case. All other things being equal, until new pipeline capacity becomes available to move oil out of PADD II, spreads between WTI and LLS, and hence between WTI and Brent, will be under pressure and expected to widen in fits and starts. At the low end, spreads could hover around the cost of transporting crude oil out of North Dakota to the US Gulf Coast by rail, which is likely to be in a range of \$9-11/bbl.

**Evacuation routes remain the driving force behind the spread... there is still about 1.9-m b/d in incoming pipeline capacity currently in Cushing and this far exceeds the 1.1-m b/d in estimated outbound pipeline capacity...**

**Evacuation routes** in the US mid-continent are at the heart of the matter for West Texas Intermediate discount to Brent. For 2012 only an additional 150-k b/d of pipeline capacity is a 'known' in being added along with some 50-k b/d of available rail capacity. But in 2013, infrastructure could change. But even then, there is still about 1.9-m b/d in incoming pipeline capacity currently in Cushing and this far exceeds the 1.1-m b/d in estimated outbound pipeline capacity.



...although the spread is now more of a pure transportation arbitrage differential...

In short, as far as 2012 is concerned, the floor of the 'arb' between WTI and Brent is likely to hover between \$8 and \$11 per barrel, the cost of getting crude oil of North Dakota by rail. The spread between WTI and Brent, which was exaggerated by the Libyan disruption, is now more of a pure transportation arbitrage differential. But that doesn't mean it won't potentially blow out significantly from time to time in 2012. The pressures for a blowout are based on the combination of the following:

- Significantly reduced refinery demand for WTI-like crudes, accelerating through 2012, reaching 420- to 450-k b/d.
- Higher production from Canada (200-k b/d of which 50-100-k b/d is likely to be light sweet crude streams.
- Escalating PADD II production of light sweet crude, or of production from other areas, but feeding into PADD II of as much as 250-k b/d.

These physical imbalances are not likely to see a meaningful evolution in their reduction until 2013, when substantial new exodus capacity looks likely for crude out of PADD II, especially if the long-delayed Keystone Express line receives permitting by January 2013 (per Republican Congressional wishes) and can be expedited by year-end 2013. Until then, the differential is likely to remain wider and choppy, and highly unlikely to converge to its historical narrow range.

Figure 55. Estimated PADD II and PADD IV balance

k b/d	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13
P2 production	906	920	975	1030	1065	1080	1135	1190
of which Bakken	495	509	564	619	654	669	724	779
P4 Production	394	399	409	420	432	444	456	468
<b>Total P2+P4 production</b>	<b>1300</b>	<b>1320</b>	<b>1385</b>	<b>1450</b>	<b>1497</b>	<b>1524</b>	<b>1591</b>	<b>1658</b>
<b>Canadian imports into P2+P4</b>	<b>1868</b>	<b>1880</b>	<b>1892</b>	<b>1904</b>	<b>1916</b>	<b>1928</b>	<b>1940</b>	<b>1952</b>
Permian to P2	1045	1064	1070	1090	1145	1148	1154	1175
Capline	298	283	268	253	238	223	208	193
<b>Total P3 to P2</b>	<b>1343</b>	<b>1347</b>	<b>1338</b>	<b>1343</b>	<b>1384</b>	<b>1371</b>	<b>1362</b>	<b>1369</b>
<b>Total mvts into P2+P4</b>	<b>4511</b>	<b>4547</b>	<b>4615</b>	<b>4698</b>	<b>4796</b>	<b>4823</b>	<b>4893</b>	<b>4978</b>
<b>Total mvts out of P2+P4</b>	<b>435</b>	<b>573</b>	<b>600</b>	<b>610</b>	<b>760</b>	<b>846</b>	<b>840</b>	<b>840</b>
<b>Pipeline mvts out of P2+P4</b>	<b>190</b>	<b>280</b>	<b>325</b>	<b>325</b>	<b>415</b>	<b>505</b>	<b>505</b>	<b>505</b>
Total capacity out of P2+P4 (incl. rail/barge)	435	582	627	627	923	1116	1116	1116
<b>Total mvts into P2+P4</b>	<b>4511</b>	<b>4547</b>	<b>4615</b>	<b>4698</b>	<b>4796</b>	<b>4823</b>	<b>4893</b>	<b>4978</b>
<b>Refinery runs in P2+P4</b>	<b>3987</b>	<b>4102</b>	<b>4101</b>	<b>3943</b>	<b>4002</b>	<b>4129</b>	<b>4118</b>	<b>4037</b>
Surplus crude	523	446	514	755	794	694	775	941
<b>Total mvts out of P2+P4</b>	<b>435</b>	<b>573</b>	<b>600</b>	<b>610</b>	<b>760</b>	<b>846</b>	<b>840</b>	<b>840</b>
<b>Stock change</b>	<b>89</b>	<b>-127</b>	<b>-86</b>	<b>145</b>	<b>35</b>	<b>-153</b>	<b>-64</b>	<b>102</b>
m bbls								
Cushing stocks (max scenario)	37	36	22	31	37	30	18	24
<b>P2+P4 stocks</b>	<b>113</b>	<b>112</b>	<b>98</b>	<b>107</b>	<b>113</b>	<b>106</b>	<b>94</b>	<b>100</b>

Source: Citi Investment Research and Analysis estimates

## Demand Outlook: Middle Distillates Lead Global Petroleum Demand

### Overview

Middle distillates have underpinned global oil consumption growth...in both EM and OECD...

Over the past decade, middle distillates, including especially diesel, have underpinned global oil demand growth. Even in OECD countries, where oil demand has largely reached a plateau, middle distillate use has remained strong, despite growing efficiency. The notable exception was 2009 in the aftermath of the economic and financial crisis. By contrast, gasoline demand at that time either showed no growth or weakened, paralleling any slowdown in the economy. It is this very weakness in the light-end products that is contributing to lower refinery runs in a high oil price environment. The resulting low product supply, including middle distillates, added to tightness in products that have more resilient demand. Such tightness could persist next year despite additions of refining capacities.

...as demand for light end products such as gasoline have faltered...

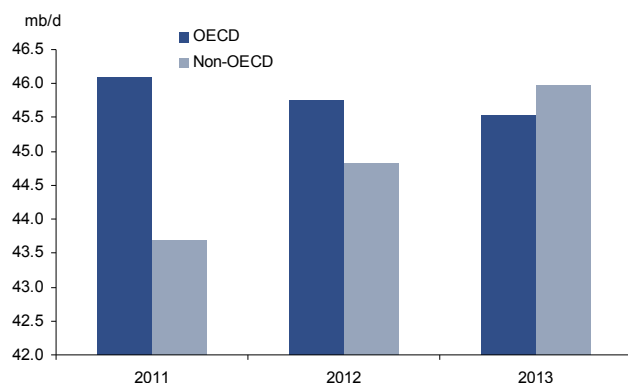
We present below (1) our overview of crude and major products; (2) an assessment of macroeconomic risk and scenarios, and (3) examinations of region-specific demand factors.

### Overview of Crude and Major Product Demand

Our new base case scenario sees global consumption to grow 0.8-mb/d in 2012 and 1-m b/d to 2013...

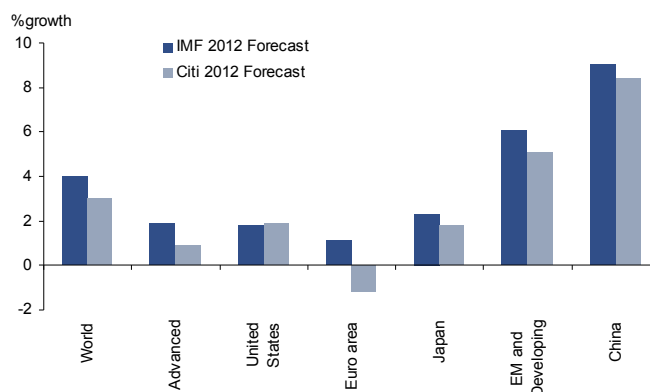
In our base case scenario, global product demand we project to increase from 89.4-m b/d in 2011 to 90.3-m b/d in 2012 and 91.3-m b/d in 2013, an incremental year-on-year demand increase of +0.8-m b/d and +1-m b/d respectively. This base case is based on Citi's economic forecasts seeing global real GDP growth falling from +3.7% growth in 2011 to +3.0% growth in 2012 before recovering to +3.6% growth in 2013. This is substantively more pessimistic than the latest IMF World Economic Outlook from September 2011.

Figure 56. Base Case OECD and non-OECD Product Demand Forecasts



Source: Citi Investment Research and Analysis

Figure 57. Citi and IMF Economic Forecasts for 2012



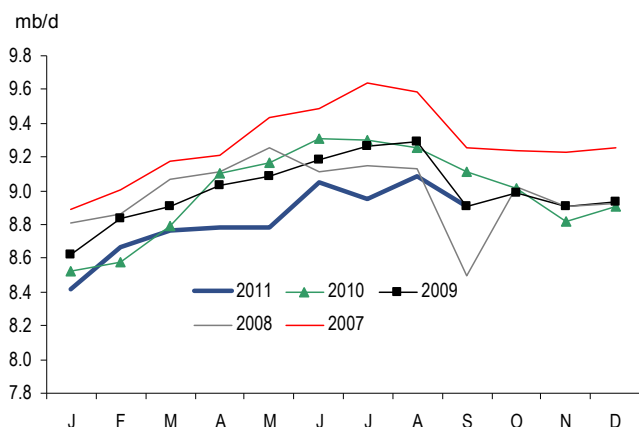
Source: IMF, Citi Investment Research and Analysis

...driven by emerging markets economic growth with developed markets expected to lag...

As with economic growth, the non-OECD remains the engine for the world. Citi forecasts advanced economies to grow a lackluster +0.9% growth in 2012 and +1.2% in 2013. Growth in emerging and developing economies is also forecasted to slow from 2010 down to +5.6% in 2012 and +6% in 2013. In parallel, consumers outside of the OECD are projected to account for +1.1-m b/d of petroleum product demand growth in both 2012 and 2013, more than compensating for negative demand growth in the OECD, projected to be -300-k b/d and -100-m b/d respectively.

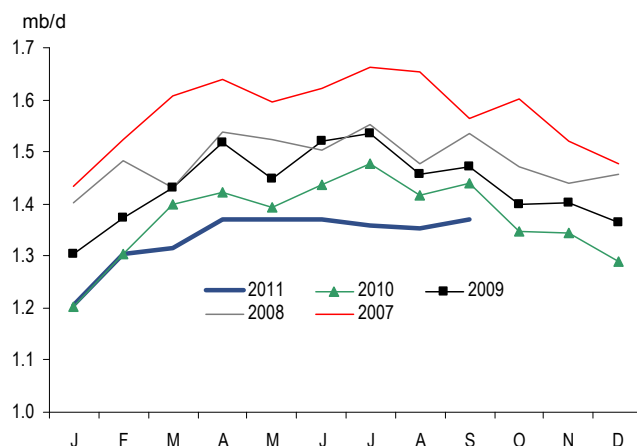
Across products, gasoline is the major source of weakness, forecasted to grow by only +100-k b/d in 2012 before recovering to +200-k b/d in 2013. Gasoline demand has been damaged by lower personal income and consumption in the North Atlantic basin, despite strength from Latin America and East Asia. In both the US and Western Europe, gasoline demand has never fully recovered from the Great Recession and remains well below pre-crisis 2007 levels. Increasing substitutes from ethanol, the increasing dieselization of the European car fleet, and stronger vehicle efficiency standards should further cut into usage.

Figure 58. US Gasoline Demand, 2007 to 2011 YTD



Source: EIG

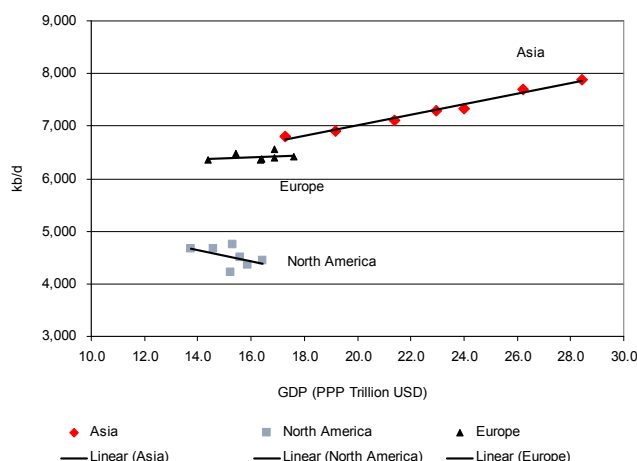
Figure 59. Western Europe Gasoline Demand, 2007 to 2011 YTD



Source: EIG

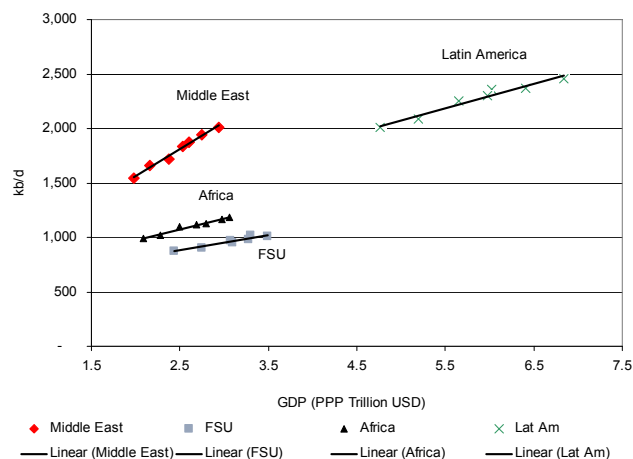
By contrast, distillate has been the primary demand driver in every year in the past decade, even during the turbulent 2008-2009 financial crisis, and should remain so going forward. Middle distillate's popularity stems from its spanning a spectrum of possible uses: as an aircraft transport and power generation fuel to its use as a feedstock and heating fuel. As economic growth in non-OECD countries continues, distillates demand is expected to maintain its upward trajectory.

Figure 60. Average annual gasoil demand vs. regional PPP-weighted GDP in Asia, Europe and North America



Source: FGE, IMF, Citi Investment Research and Analysis

Figure 61. Average annual gasoil demand vs. regional PPP-weighted GDP in Latin America, FSU, Africa and Middle East

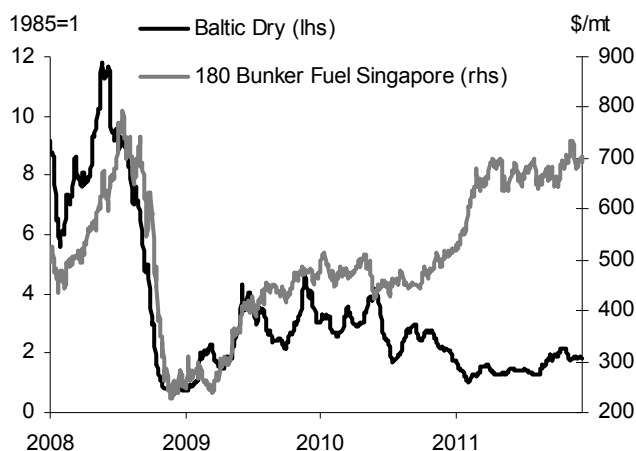


Source: FGE, IMF, Citi Investment Research and Analysis

The above charts show the geographic robustness of incremental distillate demand growth. Europe and Asia GDP levels and gasoil demand started at similar levels in 2005 but have since diverged, as Asian demand took off with a gain of over 1-m b/d since then. Elsewhere, impressive gasoil demand growth in the Middle East and Latin America were buttressed by further gains in the former Soviet Union and Africa. The relationships between gasoil demand and economic growth are expected to remain in place at least in the next couple of years. In our base case, demand for middle distillates, particularly gasoil, grows +600-k bbl in both 2012 and 2013, therefore accounting for 73% and 60% of total demand growth respectively.

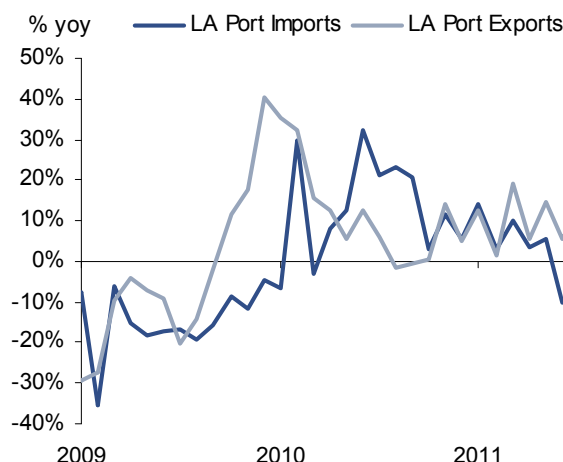
Demand for residual products has primarily come from marine bunker fuel for use in ships and asphalt in road construction. Currently, the global shipping fleet is suffering from an overhang of capacity, the legacy of overly optimistic building in the years prior to the 2008 Great Recession and the collapse of global trade. This overcapacity has led to a divergence in shipping rates from fuel prices, further pressuring shipping companies.

Figure 62. Baltic Dry and Bunker Fuel Rates



Source: Bloomberg, Citi Investment Research and Analysis

Figure 63. LA Container Shipping Imports and Exports



Source: American Association of Port Authorities

However, trade volumes, particularly in the trans-Pacific routes, are showing signs of nascent recovery, with container exports out of the port of Los Angeles rising to 194k TEUs, up 28% y-o-y. Our base case scenario projects residual demand to grow slightly (+100-k b/d and +200-k b/d in 2012 and 2013), with virtually all growth coming from the non-OECD, particularly China.

## Macro Risks and Alternative Scenarios

**An uncertain economic outlook is the largest risk to the demand story as global growth projections have been growing more dismal...currently +2.5% for 2012 according to Citi economists**

The primary risks to demand are due to uncertain economic outlook. Already, our Citi economic forecast is more pessimistic than the IMF but nevertheless assumes that actual economic contraction remains limited to the euro area and no double-dip hits the US, Japan, or other major economies.

But global economic growth prospects have been growing steadily dimmer in the past few months. In market exchange-rate terms, world GDP growth has been revised downward to +2.5% for 2012, a substantial slowdown from +3.0% growth expected in 2011. The slowdown is led by advanced economies, particularly the Eurozone, which already has likely entered recession in 4Q11 and should continue to contract going into 2012. Real GDP growth in the Eurozone is forecasted to

...our base case is more pessimistic than the IMF but nevertheless assumes the EMU stays intact...although Eurozone contagion risk remains heightened and an expected recession shall weigh on the global economy...

But the US story has been a relative bright spot and increasingly appears unlikely to double-dip...

contract -1.2% in 2012 and -0.2% in 2013, sharply down from the +1.5% growth in 2011, and there is a real danger that financial and economic shockwaves can emanate to the rest of the world, particularly if the euro zone breaks up in a messy fashion.

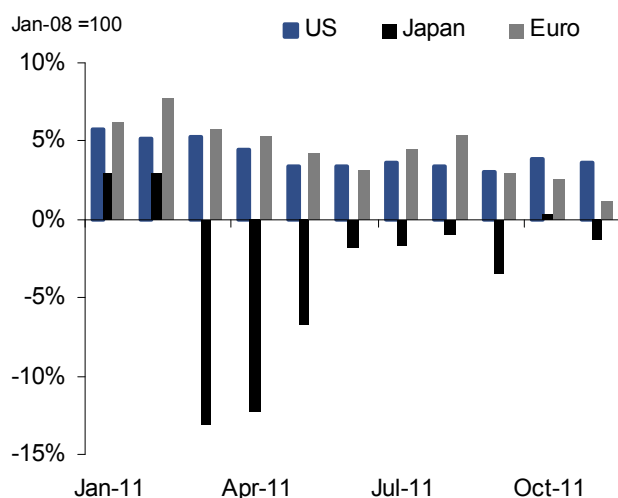
Our base case assumes that the euro-zone remains intact, but the three-way game of brinkmanship between the ECB, the core economies of Germany and France, and the ever-lengthening list of troubled periphery nations has heightened risks of a fatal collision. Already, the fear of contagion has affected even otherwise fundamentally sound and fiscally solvent nations such as Spain, Italy, and Belgium.

With roughly €300bn of financing capacity remaining in the European Financial Stability Facility (EFSF) (after deducting existing commitments to Ireland, Portugal, and Greece) compared to the €2tn in gross financing requirements required by Austria, Belgium, France, Italy, and Holland to the middle of 2014, it is now clear that additional sources of funding must be found, either within or outside the EU. The ECB is the likeliest lender-of-last-resort and the IMF may step in as well, if only as a transfer mechanism to bypass restrictions of the Maastricht Treaty.

On the other hand, a failure of political will, either by creditor constituents reluctant to bailout its debtor peers or by debtor constituents unwilling to accept politically intrusive oversight and painful austerity measures runs the risk of breaking the euro zone and severely exacerbating the crisis. A messy breakup would cause capital flight and forced deleveraging, particularly Central and Eastern Europe.

The US has been a comparative bright spot, buoyed by recent positive economic news, notably improved labor and payroll data as well as signs of a bottom in housing demand. However, GDP growth in 3Q11 has come in at only +2.0%, lower than expected, though much of the weakness was driven by inventory drawdowns. Growth in 2011 is expected to come in at +1.8% in 2012 and 2013, assuming the crisis-era unemployment benefits and payroll tax breaks are extended next year. If not extended, this could eliminate another -1.0% of growth next year.

Figure 64. Advanced Economy Industrial Production %y-o-y



Source: Bloomberg, Citi Investment Research and Analysis

Figure 65. Exports as a % share of China GDP and Growth



Source: Haver, Citi Investment Research and Analysis

...as Japan returns to growth in its reconstruction efforts post-Fukushima...

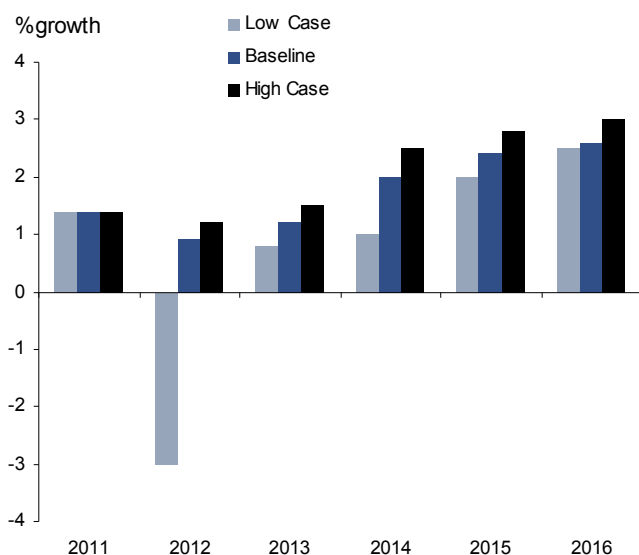
Meanwhile, Japan's growth, after contracting -0.4% in 2011 due to disruptions from the Tohoku earthquake and the Fukushima nuclear disaster, is forecasted to bounce back +1.8% in 2012 due to reconstruction efforts but then slow to +1.3% in 2013. Japan's outlook has worsened recently due to poor manufacturing and machine order numbers (down again -6.9% in October).

...so can China and the non-OECD pick up the slack?

The downside risks to the OECD are again raising questions about the resilience of "decoupling" and whether the world can rely upon emerging economies, particularly China, to pick up the slack. The good news is China's growth is now driven more by internal ones, particularly fixed asset investment, rather than exports and should remain relatively immune to an external global contraction. The share of gross capital formation in China's GDP is reaching 50%, much higher than the 40% levels reached by Japan and South Korea during the peak of its investment-driven growth cycle. By contrast, exports, which had reached a peak of 10% of GDP in 2007, have now fallen below 4% in 2010.

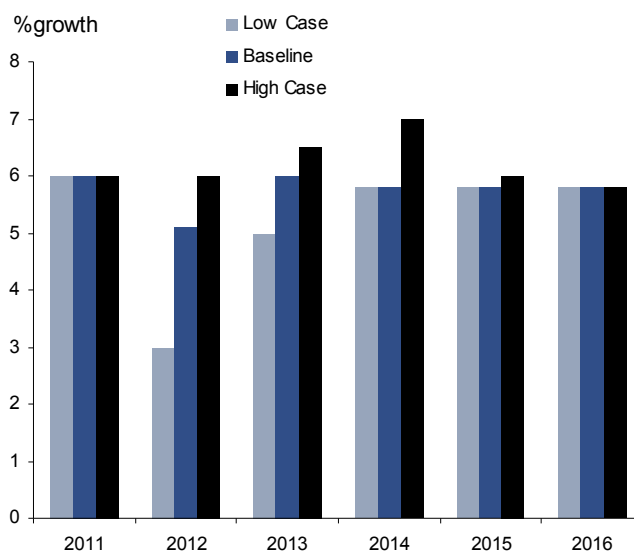
On the other hand, there are substantial home-grown risks, notably from the rapid growth of credit in its poorly supervised local banking sector and a potential hard-landing in its property sector. But in the short-term, China can rely upon robust government coffers to provide economic stimulus to counteract any slowdown in external demand, including a repeat of the infrastructure spending package that allowed China's growth to power ahead through the Great Recession of 2008. Already, the People's Bank of China has cut reserve requirements by 50bps in December and may continue to ease monetary policy in response to signs of a slowdown. Risks of a hard landing in China, while very real, are not yet immediate. China is forecasted to grow +8.7% in 2012 and +8.4% in 2013, somewhat down from the +9.1% growth in 2011.

Figure 66. Baseline, Low, and High Economic Scenarios for OECD



Source: Citi Investment Research and Analysis

Figure 67. Baseline, Low, and High Economic Scenarios for Non-OECD



Source: Citi Investment Research and Analysis

Our alternative scenarios is a low case that implies a true systemic global recession...

Based on these risks, we consider two alternative scenarios, a low case (to which we assign 15% probability) of a true systemic global recession, with OECD GDP growth falling by -3% in 2012 before recovering to +0.8% in 2013 while non-OECD growth falls to 3% in 2012 and 4% in 2013. In such a scenario, global product demand is forecasted to fall -600-k b/d in 2012 and another -100-k b/d in 2013.

**Growth of Middle East gasoil demand has been stunning: options limited by economics and availability of other fuels**

Again, the declines are led by the OECD, with a -1.2-m b/d and -0.8-m b/d fall in 2012 and 13 respectively, similar to the previous retrenchment we saw in 2008-2009.

We also consider an optimistic scenario (to which we assign 25% probability). Due to the relative lack of upside risks in the global economy, we raise OECD growth slightly to +1.5% growth in 2012 and +2.5% in 2013 while non-OECD growth powers ahead at +6.5% and +7% growth in those two years. In such a scenario, with assumptions closer to the IMF World Economic Outlook, we unsurprisingly see higher product demand growth led by the non-OECD. OECD demand growth is still projected to fall slightly by (-200-k b/d in 2012 and -100-k b/d in 2013) but is more than made up for by +1.1-m b/d and +1.2-m b/d of non-OECD demand growth respectively.

## Examinations of Region-Specific Demand Factors

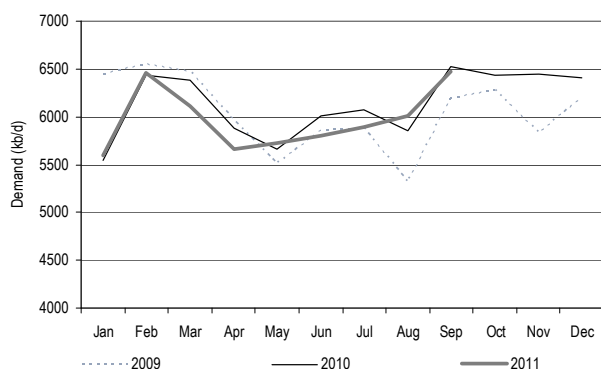
### Middle distillate demand resilience in Europe

European distillate demand has been resilient, even with macroeconomic headwinds. Near term factors – gasoil demand resilience, refinery margin compression, low run rates and a weak macroeconomic environment – do not appear to be abating next year. However, demand for light-end products is under pressure. The dieselization of the car fleet and bio-fuel mandates are hurting future demand for gasoline. Naphtha, used as an oil-based petrochemical feedstock, is under stress due to poor macroeconomic conditions and competition from low ethane prices.

**Despite economic headwinds, gasoil demand has been resilient in Europe**

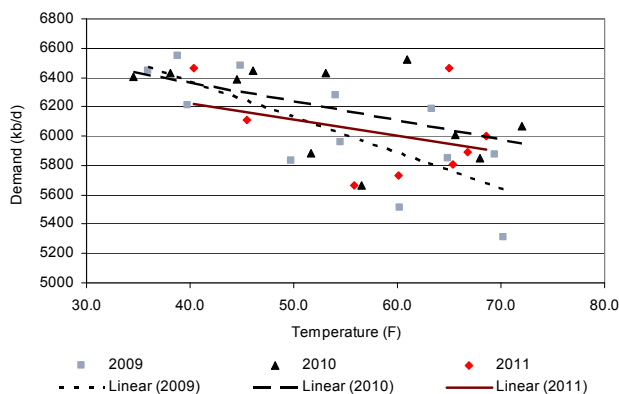
The latest IEA data show that 2011 gasoil demand has stayed close to levels seen in 2010 and above those in 2009, even as the sovereign debt crisis, contagion to banks, and the resulting decline in sentiments and credit crunch push Europe toward the brink of another recession. Winter demand for non-diesel gasoil should remain robust, with demand at similarly low temperatures exhibiting smaller variance than at higher temperatures.

**Figure 68. Year-on-year diesel and other gasoil demand in OECD Europe**



Source: IEA, Citi Investment Research and Analysis

**Figure 69. Diesel and other gasoil demand vs. gasoil-weighted average monthly temperatures in OECD Europe**

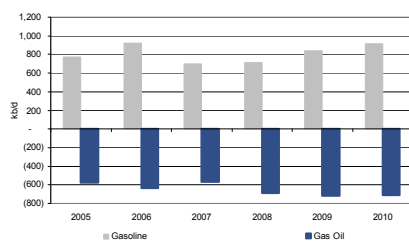


Source: IEA, Citi Investment Research and Analysis

The dieselization of the car fleet is taking away market share of gasoline and keeping diesel demand resilient. Sensitivity analysis points to a mere -10 to -20-k b/d decline in demand for every 1% drop in GDP.



**Figure 70. Europe product balance: Refinery supply and other supply minus demand**



Source: FGE, Citi Investment Research and Analysis

Meanwhile, gasoline demand continues to fall in the very region that is long gasoline production. Besides alternative fuel mandates, greater fuel efficiencies in cars, in part motivated by the requirement to meet the 130g CO<sub>2</sub>/km average fleet carbon emissions target, is driving gasoline demand lower in Europe.

As the region is perpetually long gasoline production amid declining demand, exports would have to more than offset domestic consumption declines. Although refinery shutdowns on the US East Coast make that part of the Atlantic Basin short gasoline, adding to strength in Latin American gasoline demand, European and global gasoline demand elsewhere are either declining or less impressive than gasoil. Weak light-end cracks would hurt refining margins, similar to what took place this year, leading to cuts in utilization. In turn, the gasoil market could get tighter in a region that is already short the product.

In the former Soviet Union, although our global economics team expects tight domestic liquidity and slowing growth globally to pressure Russia GDP, multiple forces, mainly policy-driven, are more constructive on demand. Strong car sales on cash-for-clunkers scheme should increase gasoline demand, though diesel demand is driving product demand growth in Russia, rising at an impressive 12% and 9% in 2010 and 2011 respectively. Disappointing election results by the United Russia Party and lackluster poll numbers for Putin's reelection bid would increase the chance of fiscal stimulus to help Putin's popularity and election prospects, including a reduction in petrol prices. High oil prices would certainly promote economic growth as well, leading to higher demand via a positive feedback effect.

Economic growth does seem to have accelerated recently, with 3Q11. Q3 2011 Russian GDP expanded 4.8% from a year ago, the fastest since Q2 2010. Countering the potential impact of a European recession, fixed capital investment rose 8.5% in September. Along with retail sales higher by 9.2%, the largest gain since October 2008, petroleum product demand has been and will likely stay robust, unless and until the ripple effect of a possible European recession hits Russia. .

### Modest gains in US domestic and export demand

Much as gasoil demand in Europe is holding up despite macro headwinds, the U.S. is exhibiting demand gains amid modest economic growth. Coupled with strong exports and the possible impact of year-end accounting treatment favoring low inventories, the distillates market has become tight. A number of these factors are expected to remain in 2012, likely leading to extended tightness, especially with refinery closures in PADD I later on in 2012.

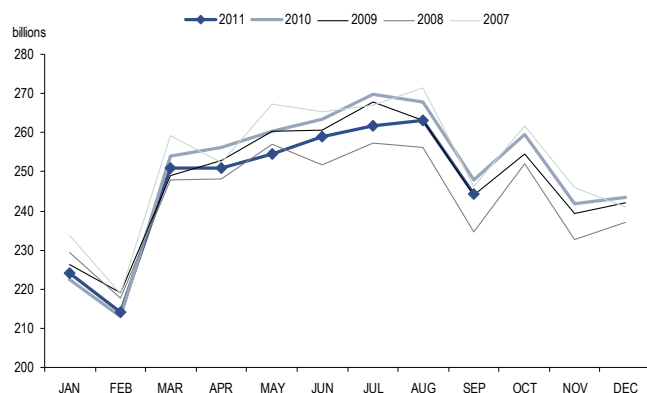
Gasoline demand this year has thus far remained tepid, but a slightly brighter economic outlook is signaling support for gasoline consumption. Gasoline demand, which fell -160-k b/d y-o-y in 2011, is forecasted to return to positive growth territory, growing +20-k b/d in 2012 and +60-k b/d in 2013. After sustained declines in gasoline demand, signs of improving labor market and higher sales of Sport-Utility-Vehicles (SUVs) recently may be pointing to a turnaround. Already, total vehicle miles travelled have recovered from 2007 lows and are down only -1.5% y-o-y in September.

Furthermore, November auto sales reached an annualized pace of 13.6 million, the largest in more than two years, with cars and light-truck sales jumping 13.9% year-on-year. The rising share of SUVs and truck sales amid higher overall vehicle sales could further support gasoline demand. Although fuel efficiencies have improved, these larger vehicles still consume more than cars and light-trucks. Shares of SUVs and truck sales rose from 47.3% of all sales in 2009, to 50.2% in 2010 and 50.8% through November.

**US distillates demand has been robust throughout the year, with very strong exports**

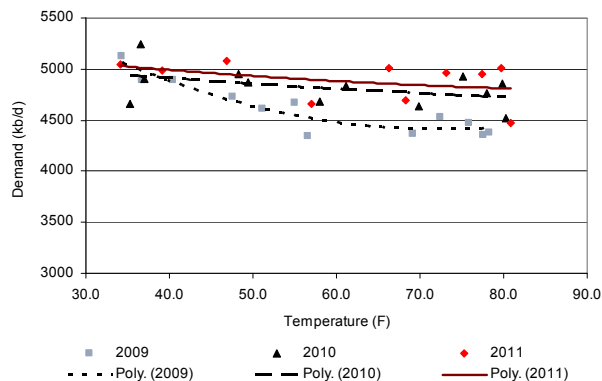
Turning to middle distillates, the US Energy Information Administration and the International Energy Agency show apparent demand gains of distillates for two straight years. Similar to Europe, the small variance of demand at low temperatures since 2009 amid the last recession demonstrate robustness of demand for heating that is mostly invariant to economic conditions. As such, as long as weather this winter is not extraordinarily mild, distillates demand should hold up.

**Figure 71. US Total Vehicle-Miles Travelled**



Source: US BTS, Citi Investment Research and Analysis

**Figure 72. Diesel and other gasoil demand vs. gasoil-weighted average monthly temperatures in OECD North America**

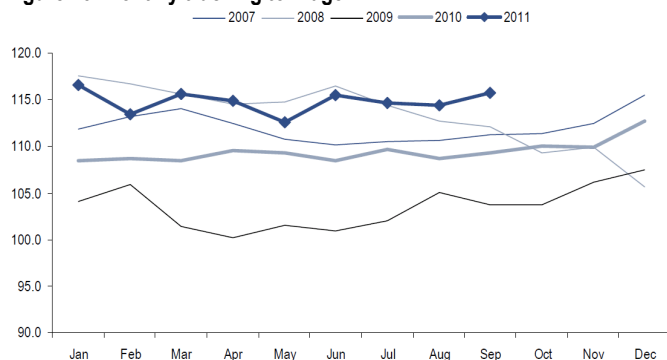


Source: IEA, Citi Investment Research and Analysis

**Transportation demand for diesel looks surprisingly robust...**

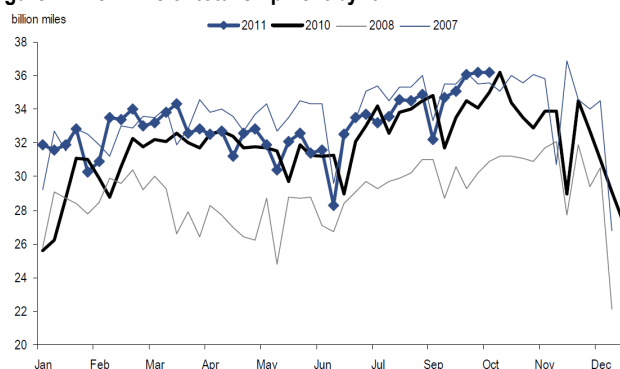
Transportation demand for diesel is also looking surprisingly robust. The post-summer climb in trucking tonnage put it squarely above any time since 2007. FedEx has forecasted a 12% increase in holiday shipments and planned to hire 20,000 workers for the holiday season. Rail ton-miles, despite a slight dip since October, remain at a multi-year high. These underlying transport data, in conjunction with positive macroeconomic indicators, point to a likely continuation of strong distillates demand for transport, unless a double-dip recession happens.

**Figure 73. Monthly trucking tonnage**



Source: American Trucking Association, Citi Investment Research and Analysis

**Figure 74. Ton-mile of total shipment by rail**

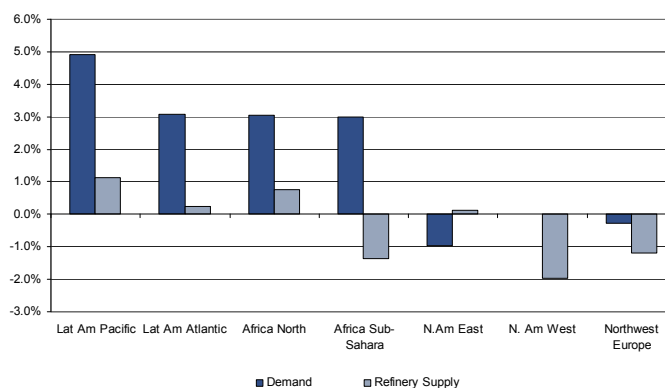


Source: Association of American Railroads, Citi Investment Research and Analysis

**Strong US exports highlight the strong demand growth but slow to negative growth in refinery supply in the Atlantic Basin**

Even if US apparent demand figures cannot be attributed entirely to domestic sources, then this implied other regions outside the US are importing distillates. But refining supply has not kept pace with demand growth in the Atlantic Basin, as shown in the following figure. In fact, strong exports to South America point to the sustained strength in the region. The EIA also expects 2011 to be the first year that the U.S. becomes a net exporter, and would export about +0.2-m b/d of petroleum products in 2012.

**Figure 75. Cumulative annual growth rates of distillates demand and refinery supply in the Atlantic Basin by region since 2005**

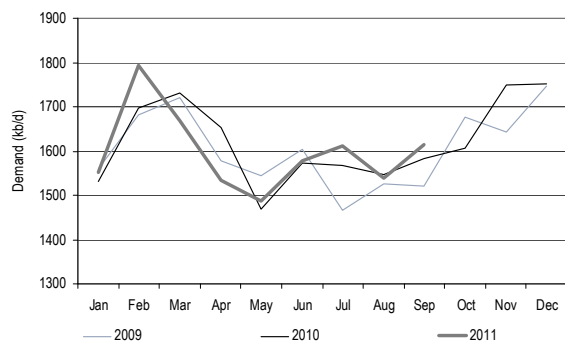


Source: FGE, Citi Investment Research and Analysis

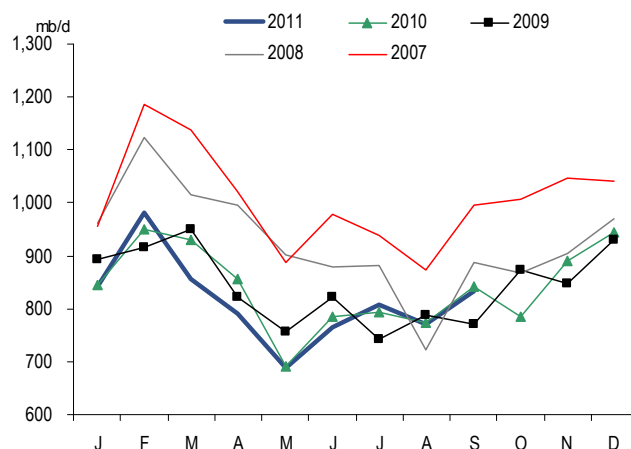
### Accelerating demand in Asia

In Asia Pacific, the trend in middle distillates demand is being bolstered by post-Fukushima demand pop in Japan and persistent growth in Chinese consumption. The Tohoku earthquake in March led to demand declines in the following April and May, as damage reduced power load and other economic activities. However, shutdowns of nuclear and some coal generation facilities in Japan has forced Japan to substitute oil-fired and gas-fired power plants, with LNG imports supplied in part by heightened Qatari cargoes. As Kansai Electric is set to shut down the 826-MW Takahama No. 2 reactor in late November, only 10 reactors, or just over 9GW of generation capacity, would be available this winter, nearly 40GW below the total nuclear generation capacity. Our base case has Japanese middle distillate demand up slightly by +40-k b/d in 2011 though it slows to +20-k b/d in 2012 as economic growth post-reconstruction stabilizes.

**Figure 76. Year-on-year diesel and other gasoil demand in OECD Pacific** **Figure 77. Japan Gasoil Demand**



Source: IEA, Citi Investment Research and Analysis

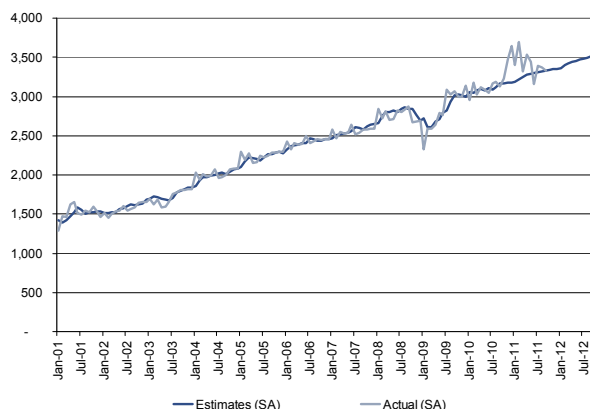


Source: EIG, Citi Investment Research and Analysis

The major longer-term growth driver is China, both on a trend growth basis and the threat of power shortage-induced distillates use. Trend growth on a seasonally adjusted basis would have put demand about 175-k b/d higher year-on-year

between the December-February period, assuming that there was no surge in distillates demand to meet oil-fired power generation demand.

Figure 78. Seasonally-adjusted gasoil demand in China (-k b/d)

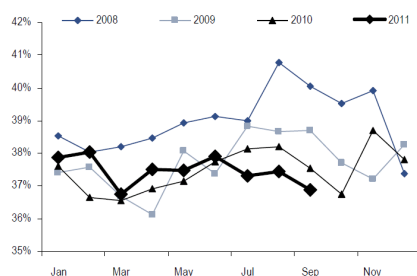


Source: EIG, Citi Investment Research and Analysis

#### Retail product price cut by China's NDRC also spurred pent-up demand

As discussed earlier, signs of a slowdown in China have given the government impetus to loosen tight monetary and fiscal measures, both of which would be supportive of product demand in China. On the other hand, government controls on prices of petroleum products, electricity and coal could drive demand in either direction. After holding retail prices flat for nearly half a year, the NDRC cut retail product prices in October just days after Brent fell from \$114/bbl to \$97/bbl from April to September. While the cut looked timely at the time, Brent subsequently returned back to \$110/bbl by mid-October but retail product price caps did not follow. This yet again led to a decline in margins but a rise in retail demand on higher crude but lower retail product price caps.

Figure 79. China diesel yield



Source: Bloomberg, Citi Investment Research and Analysis

While refineries owned by state-owned oil majors have been subsidized by upstream profits, independent "teapot" refineries, which supply an estimated 10 to 15% of the products in China, were squeezed without the support of flush state-backed parents. Although some refineries have come back online, either due to a return from maintenance or policy directive to produce, the already low inventory and a ramp up in seasonal demand make sizable stock builds an uphill climb. High gasoline demand growth also led to a steeper inventory draw down. Refineries had to prioritize gasoline production over distillates. With low refinery supply, distillates stocks drew as well.

Some form of power shortages is still expected this winter. Already, market observers forecast another winter with power shortages, so a demand surge for power generation remains a distinct possibility. Last winter, the distillates demand surge for power generation amounted to about 300-k b/d of extra consumption beyond seasonally-adjusted figures. If distillates were called on yet again to fill power generation shortages, which the State Electricity Regulatory Commission of China estimated to be about 26GW during peak periods, these oil-fired generators may drive a similar increase in distillate demand on top of regular seasonal demand. Though China raised retail electricity prices but capped coal price increases, the incremental increase in generation profit margins is unlikely to completely eliminate the need for extra diesel generation.

Middle East demand has grown rapidly in recent years and is likely to continue...

...leading to a positive feedback loop...

...as regional states turn to oil and natural gas to fuel and power their growing economies

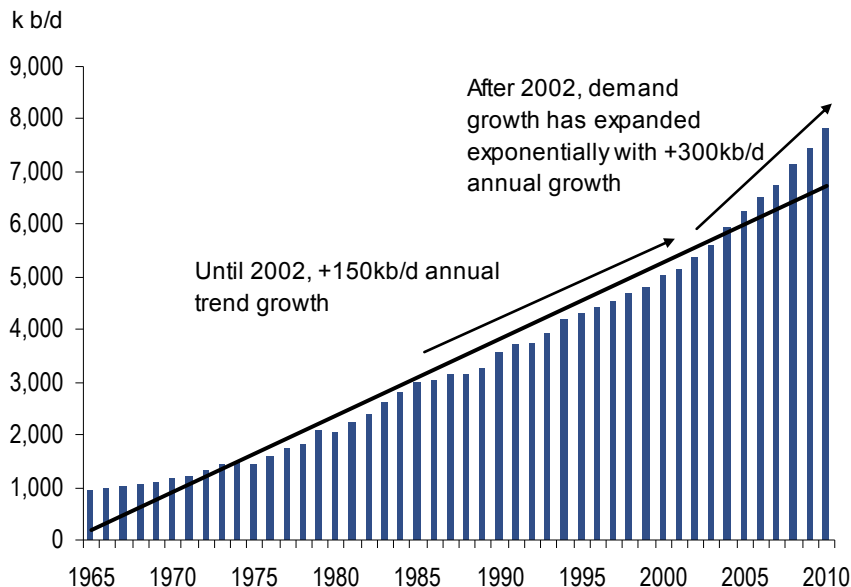
## The stunning growth of Middle East Demand

A closer look at demand growth paths puts into sharp focus the well-known but nevertheless remarkable year-on-year gains in the Middle East. With similar starting GDPs in 2005 and similar economic growth since then, Middle East demand rose by over +500-k b/d, 4 times that of even the energy-inefficient FSU in the same period. Latin American demand also rose by over 0.5-m b/d, but with twice as much GDP growth as the Mideast.

The rapid growth of Middle East demand is a vivid reflection of a positive feedback loop. With so much of their economies dependent upon oil revenues, higher oil prices actually boosts oil demand, in contrast to virtually ever other consumer. Furthermore, because of subsidized prices, the usually stabilizing price-led demand destruction is negated.

Furthermore, as Middle East nations seek to wean their economies away from the upstream petroleum sector and generate job-creating economic activity to defuse social unrest, this results in strong energy demand for power generation, water desalination, or petrochemical and heavy industries. Given the overwhelming abundance of domestic hydrocarbon sources and the questions raised by a civilian nuclear program in a geopolitical volatile region, it is only natural that MENA nations have turned to oil and to a lesser extent, natural gas, to fuel and power their rapidly growing economies.

Figure 80. Middle East Total Product Demand Growth



Source: BP, Citi Investment Research and Analysis

Until 2002, this has meant incremental demand growth of about +150-k b/d. But after 2002, a new paradigm shift sees +250-300-k b/d annual demand growth for the region. Given our base forecast that oil prices would remain elevated into 2013, demand from the Middle East should remain as robust as ever.

Middle distillate market buttressed by demand growth in both Europe and China...

...as gasoline and naphtha weakness is felt by lower demand in the OECD...

...that should likely remain weak next year...

...although better gasoline margins could raise European refining run rates as refinery shutdowns in US east coast could take out nearly 1-m b/d in gasoline refining capacity....

## Refinery and Product Balances

Middle distillates remain the key beneficiary of demand growth. We see growing gasoil demand outpacing refinery supply in the key demand regions, not just in perennially distillate-short Europe. Emerging market demand, led by China, has pushed incremental demand for distillates to more than 50% of the barrel while the global refining system can barely yield 40%, and going forward these regional product imbalances are likely to persist.

Yet, crack spreads of light-end products are hurt by lower demand for gasoline and naphtha in the OECD, as outlined in the demand section. Even though global gasoline demand would still rise, the magnitude is much smaller compared with overall increases in refinery capacities and middle distillate demand. Naphtha demand is also squeezed first by slowing global growth and European recession, and then by the competition from low cost ethane and NGLs.

Weaker light-end product cracks could very well outweigh strong distillates cracks, similar to 2011. Compressed refinery margins leading to low refinery run rates look to continue. The impact of low run rates is illustrated on the next page, where the worldwide distillates balance shifted from about even to a shortage in 2011 after low run rates, and a shortage in distillates in 2012 instead of a surplus. Using refinery capacity and run projections from FGE as the base case<sup>3</sup>, our low run rate case<sup>4</sup> would have the overall distillates length in Asia reduced in both 2011 and 2012, while the shortage in Europe would worsen in both years.

As demand for gasoline and naphtha in developed economies will likely remain weak in 2012, incentivizing low run rates, the resulting low output of distillates could lead to yet more shortages next year. As such, inventories are likely to remain lower than normal on reduced refinery supply amid resilient demand.

However, the possibility exists that higher gasoline margins could raise European refining run rates. Refinery shutdowns in PADD I in the U.S. could take out nearly 1-m b/d of gasoline refining capacity by mid summer. Filling part of this gap would require greater imports from Eastern Canada and Europe.

The adverse macro environment, in the form of credit crunch, also affected refinery operation beyond product demand. The sovereign debt crisis and the contagion to banks caused a sharp reduction in available lending and letters of credits, as banks preserve capital. However, the reduction in available credit has also led refineries to reduce the amount of crude oil purchases. Instead of ramping utilization, inventories were instead drawn down and are being maintained at low levels.

In China, the petroleum product shortages have now subsided as refinery runs surged on government directives, in addition to higher imports. But it could repeat in 2012. Shortages earlier in 2011 came about when retail price caps amid high oil prices coincided with low run rates and inventory draw downs in both gasoline and distillates. This past summer's push to maximize gasoline yields only made matters worse for gasoil. Refining losses steepened this year on squeezed margins, contributing to low refinery utilizations earlier in the year just when demand remained robust.

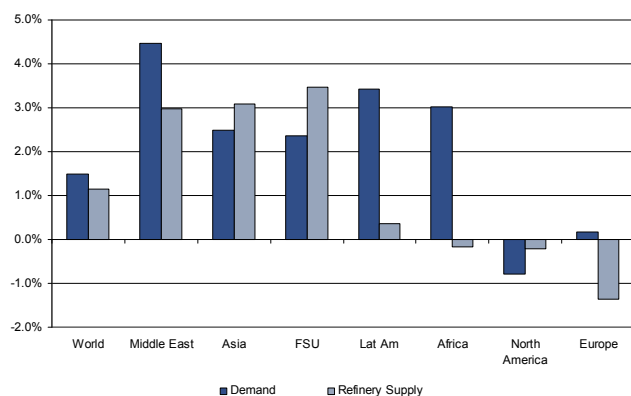
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<sup>3</sup> In the base case, Asian capacity run rates would rise from 80% in 2010 to 81% in 2011 and 82% in 2012, and that European run rates would largely stay flat at 79% in 2010 and 2011, but fall to 77% in 2012.

<sup>4</sup> The low run rate case has Asian utilization in 2011 and 2012 at flat to the 2010 level and a 1% drop in European runs from the base case.

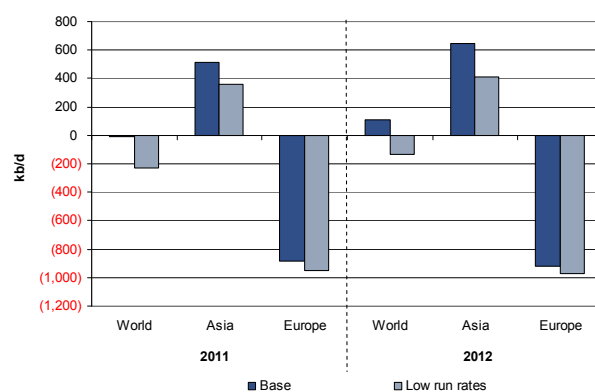
Amid a rising crude price environment, refining margins were compressed as the government did not raise retail prices in an effort to curb inflation. Planned maintenance at refineries in China added to the tightness. A high price crude market but limited increase in retail price caps could very well persist in 2012, again hurting refining margins and run rates, with shortages lurking yet again.

**Figure 81. Cumulative annual growth rates of distillates demand and refinery output by region**



Source: FGE, Citi Investment Research and Analysis

**Figure 82. Surplus (deficit) of distillates globally, in Asia and in Europe in 2011 and 2012 (Illustrative)**



Source: FGE, Citi Investment Research and Analysis



## 2012 Supply Outlook

The year-ahead supply outlook is incredibly uncertain, with respect to both non-OPEC and OPEC. OPEC production in particular is subject to extremely lumpy unknowns – how much of Libya's offline production will be coming back, and when? How might Iraq overcome significant logistical bottlenecks in moving new production capacity to market? To what degree will Saudi Arabia and other GCC countries pull back on production to make room for new supplies? And neither last nor least, what supply disruptions, due to politics or weather, lurk on the horizon? Some of these OPEC issues are addressed below.

### Non-OPEC supply

2010 saw a surge in new discoveries and embodied the supply growth trend...

When it comes to non-OPEC oil, there are growing signs of the demise of the peak oil hypothesis, with tight/shale oil and deepwater prospects looking particularly prolific going forward. Indeed, when it comes to hard data, 2010 saw a surge in new discoveries of over 21 billion barrels of oil and other liquids – over 50% above 2009 levels – as exploration, driven by higher oil prices in recent times, is starting to pay off, with evidence that rising upstream capex, which started to spike in 2003, is continuing its relentless growth.

...but 2011 is a slightly different story...when disruptions came to fore...

On the other hand, there are also strong signs that that the light, tight oil story might be exaggerated, at least as far as 2011 has been concerned. The main surprise of this past year has been the failure of non-OPEC to meet its early-year promise. A year ago, the IEA was projecting growth in non-OPEC oil supply of some 800-k b/d (including biofuels), plus 500-k b/d of growth in OPEC NGLs (traditionally thought of as non-OPEC). It looks as though non-OPEC real oil supply will end the year up only ~130-k b/d this year. Nonetheless, 2012 could still see over 1-m b/d of non-OPEC supply growth to 56.9-m b/d both from new projects (including delays from 2011) expected to start-up over the year, as well as from the slowing or reversal of declines from more mature fields, with particularly large additions from North America, Latin America, Asia Pacific, FSU as well as smaller volumes from Africa and non-OPEC Middle East (see Figure below).

...begging the question of whether supply in 2012 will disappoint the way it has in 2011...

Thus overhanging the market is the question of whether supply in 2012 will disappoint the way it has in 2011. The IEA in its November *Oil Market Report* estimates 2011 non-OPEC supply growth of 140-k b/d, significantly below its December 2010 estimate of 0.8-m b/d. The IEA's earlier estimate consisted of +295-k b/d from Latin America, +190-k b/d from biofuels, +175-k b/d from the FSU and +125-k b/d from China, as well as smaller contributions from Australia and New Zealand (+45-k b/d) and Africa (+40-k b/d), and refinery processing gains (+40-k b/d); declines in North America of -180-k b/d, OECD Europe (-75-k b/d) and other parts of Asia (-30-k b/d) were projected to partially offset this. But a string of supply disruptions from Azerbaijan to the North Sea and West Africa to Yemen took perhaps up to 1-m b/d out of the market at times in 3Q'11, leading to global inventory draws that tightened oil markets significantly. In contrast to this picture, North American production growth was far stronger than expected, with the IEA more recently estimating +245-k b/d in the US Lower 48 and +97-k b/d in Canada in 2011.

Figure 83. Selected countries' supply growth in 2012

	2010	2011	2012	Change 2011	2012
<b>North America</b>					
Canada	3370	3467	3627	97	160
US L48	7124	7369	7619	245	250
Mexico	2960	2934	2934	-26	0
<b>Europe</b>					
North Sea	3783	3514	3389	-269	-125
UK Offshore	1349	1189	1189	-160	0
Norway	2137	2058	1933	-90	-125
<b>Asia Pacific</b>					
Australia	513	455	585	-58	130
India	865	902	922	37	20
China	4103	4158	4283	55	125
Indonesia	975	913	858	-62	-55
Malaysia	716	629	584	-87	-45
<b>FSU</b>					
Azerbaijan	1042	984	1059	-58	75
Russia	10450	10570	10670	120	100
Turkmenistan	196	218	248	22	30
<b>Africa</b>					
Congo	293	293	313	0	20
Equatorial Guinea	274	252	267	-22	15
Ghana	7	84	124	77	40
<b>Latin America</b>					
Brazil	2137	2196	2341	59	145
Colombia	788	920	1020	132	100
<b>Non-OPEC Middle East</b>					
Oman	867	895	930	28	35
Yemen	295	207	157	-88	-50
Syria	385	340	265	-45	-75
<b>Total shown</b>	<b>44629</b>	<b>44547</b>	<b>45317</b>	<b>-93</b>	<b>895</b>
<b>Total non-OPEC</b>	<b>52606</b>	<b>52743</b>	<b>53851</b>	<b>137</b>	<b>1107</b>

Source: IEA, Citi Investment Research and Analysis estimates

While the challenges that disrupted production and exports in 2011 (the “1-m b/d problem”) certainly highlight technical and political risks going forward, they also shifted some of the supply growth that was previously projected for 2011 into 2012, including recovery of lowered volumes. The IEA and Wood Mackenzie both forecast around 1.1-m b/d of non-OPEC supply (not including North America) in the two years from 2010-2012, but while Woodmac sees 718-k b/d of growth in 2011 and 359-k b/d of growth in 2012 from earlier field-by-field estimates, the IEA sees only 157-k b/d of growth in 2011, deferring a chunk of added volumes to 880-k b/d of supply growth in 2012.

### Project start-ups in 2012

New projects in non-OPEC could see the start-up of fields from Australia to Vietnam that could amount to around 2-m b/d when they reach peak production. New projects in OPEC could see the start-up of fields in Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria and the UAE that could total around 1.8-m b/d at their peak production. In particular, Iran faces acute risks in being able to export new volumes even if start-up of those fields continues, in light of increasing geopolitical tension. Political and tail risks are discussed further in sections below.

But 2011 challenges could spillover to supply growth in 2012...

Figure 84. Potential new project start-ups in 2012

Country	Project Name	Operator	Peak (k b/d)
<b>OPEC</b>			
Algeria	Block 208 - El Merk	Anadarko	50
Algeria	Block 208 - El Merk	Anadarko	50
Algeria	Block 405b - Menzel Ledjmet	Eni	20
Algeria	Takouazet	Rosneft	50
Angola	Block 18 West (Platina; Chumbo; BP Cesio)		100
Angola	Kizomba D Satellites - Block 15	Exxon	140
Angola	Block 31 NE PSVM (Plutao; Saturno; Venus; Marte)	BP	150
Ecuador	Pungarayacu Ph 1	Petroecuador	30
Iran	Jufeyr 1	INOC	25
Iran	Yadavaran Ph 1	Sinopec	85
Iran	Foroozan		65
Iraq	Rumaila Ph 2		200
Iraq	Nassiriya Ph 2	INOC	150
Iraq	Gharaf		230
Iraq	Al Ahdab		50
Kuwait	Sabriya; Umm Niqa Ph 2	KPC	50
Libya	I/R (NC 186/115)	Repsol	30
Nigeria	Usan	Total	180
UAE	SAS Exp (Sahil, Asah, Shah)	ADCO	60
UAE	Upper & Lower Zakum Expansion	Exxon	125
<b>Total OPEC</b>			<b>1840</b>
<b>Non-OPEC</b>			
Australia	Crux Liquids	Nexus Energy	30
Australia	West Seahorse		20
Brazil	Baleia Azul	Petrobras	100
Canada	Hibernia South Exp	HMDC	80
Canada	Jackfish Ph 2	Devon Energy	30
Canada	Christina Lake (Unnamed Expansion 2)	EnCana	30
Canada	Kearl Mine Ph 1	ExxonMobil	171
Canada	Long Lake 2		72
China	Jidong Nanpu Ph 1 (Bohai Bay)	PetroChina	200
Eq. Guinea	Doula	Noble Energy	50
Eq. Guinea	Aseng		100
Indonesia	Ranggas; Gehem; Gendalo	Chevron	50
India	Aishwariya		40
Kazakhstan	Kashagan		450
Malaysia	Gumusut-Kakap	Shell	100
Mexico	Ayin-Alux	Pemex	70
Oman	Mukhaizna EOR	Occidental	50
Oman	Amal E/W Expansion		25
Oman	Nimr-Karim		15
Russia	Verkhnechonsk Ph 2	TNK-BP Rosneft	150
Thailand	Bongkot South Gas		50
UK	Huntington		30
USA	Caesar; Tonga	Anadarko	50
USA	Santa Cruz/Isabella		50
Vietnam	Su Tu Trang	Cuu Long Joint	20
<b>Total non-OPEC</b>			<b>2033</b>

Source: Citi Investment Research and Analysis estimates

## North America

### US Onshore

**The US is a key driver for global supply growth outlook...**

The US has been and continues to be a key driver in the global supply outlook, with rig counts surging and production growing more rapidly than many expected. Indeed, the US has had the fastest and largest growth in output of any non-OPEC country over the past five years, with China not far behind. The application of horizontal drilling and hydraulic fracturing has allowed greater access to liquids in tight oil geology, boosting productivity as seen in increasing well efficiency levels in North Dakota.

Light, tight oil in the US has exceeded expectations for production growth, with the IEA revising up its 2012 outlook for light, tight oil production by 120-k b/d to 810-k b/d. North Dakotan production, predominantly from the Bakken and Three Forks areas, has led the charge, with an increase of 120-k b/d y-o-y to 464-k b/d in September, and projected 150-k b/d of growth over 2012. Other light, tight plays including Eagle Ford in Texas, Monterey in California, Niobrara in the Rockies also contribute to rapid overall growth. In plays with both gas and liquids content, such as Eagle Ford, the high oil-to-gas price ratio has encouraged the maximization of liquids production. And as rig counts in Eagle Ford grow from around 55 in January 2011 to an expected 115 in January 2012, production is expected to grow 72-k b/d y-o-y to reach 172-k b/d, and to reach over 240-k b/d by December 2012 based on an assumed 170 oil rig count by that time.

But light, tight oil is not all; conventional growth, particularly in the Permian basin, is seeing gains, but even in the more mature West Texas region, new shale plays are playing a role. Estimated production could increase from 1.15-m b/d in January 2011 to 1.30-m b/d in January 2012 and 1.45-m b/d by January 2013, or no less than (and possibly much more than) 80-k b/d of growth in 2012.

**...but can political forces derail growth driven by hydraulic fracturing?**

US production growth faces several risks to the optimistic outlook. Domestic political opposition to hydraulic fracturing has been heating up, with detractors particularly concerned about contamination of water resources. As a key technology for exploiting light, tight oil resources, an extreme scenario could see slowing, if not halting, of production in US shale plays, thus cutting off the major source of US supply growth.

And seasonal disruptions to production could appear again in 2012. Particularly cold winter weather followed by flooding in spring slowed production in the Bakken in 1H'11, and could affect production growth in 1H'12.

A further risk to production could be a lack of transportation options to refineries outside of the US midcontinent, which affects North Dakotan production more than, say, Eagle Ford, which is located nearer US Gulf Coast refining centers. High supply growth in the US, combined with increasing production from Western Canada, has fed the crude glut in the US midcontinent – a familiar story since the WTI-Brent spread blew out in early 2011 – although the forces at work have been in place since 2006. These increased flows into the US PADD II, or midcontinent, region have moved into Cushing, Oklahoma, bumping into a dearth of transportation capacity to evacuate crude from there on to refiners on the US Gulf Coast.

## Canadian production

The Western Canadian oil sands outlook is positive for production growth, with annual production growth at around 145-k b/d in 2011 and 285-k b/d in 2012, as part of a steady increase expected over the medium-term as expansion projects come online. On a month-to-month basis, unplanned outages are critical and unpredictable on a short-term basis, but the longer-term trajectory is conducive to continued supply growth.

Risks from lack of pipeline and other capacity should not constrain output in the near-to-medium-term; these primarily go south to the US Gulf Coast via Cushing/Patoka, while later options, likely post-2013, could add volumes west to the Pacific via the Enbridge Gateway pipeline to Kitimat, BC, and eastwards to the Atlantic on extensions to Line 5 and Line 9. There are also risks from regulatory opposition on environmental grounds. Other risks come from falling energy prices, which could make marginal projects uneconomic, with projects pushed back to later, higher-price periods.

**Figure 85. Canadian Oil Sands Production**

<i>k b/d</i>	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Athabasca Oil Sands Project	190	235	255	265	285	305	335	355	370	370
CNRL Kirby	-	-	-	6	16	26	36	40	40	40
Christina Lake	20	33	58	75	98	123	158	193	218	218
Cold Lake	150	150	150	150	155	165	175	180	180	157
Fort Hills	-	-	-	-	-	40	80	120	160	160
Foster Creek	105	118	120	122	132	142	165	184	210	210
Great Divide Project	16	18	20	20	20	20	20	20	20	20
Hangingstone	8	8	9	12	22	32	40	40	40	40
Horizon	60	103	124	141	143	152	167	207	238	279
Jackfish	38	45	58	68	73	80	93	103	105	105
Joslyn	-	-	-	-	-	-	30	50	80	100
Kai Kos Dehseh	8	14	19	19	24	34	50	65	80	80
Kearl	-	27	50	90	130	160	200	220	235	265
Long Lake	42	33	40	44	48	53	59	64	71	78
MEG Christina Lake	25	25	30	50	60	60	60	60	60	60
MacKay River	30	30	30	30	30	35	50	65	70	70
Orion	6	10	13	16	18	20	20	20	20	20
Peace River	9	10	12	12	12	12	12	12	12	12
Primary CNRL Cold Flow	25	24	23	22	21	20	19	18	17	16
Primary CNRL Pelican Lake	45	46	64	76	80	80	72	65	58	52
Primary Cenovus Pelican Lake	22	25	30	35	40	40	38	36	34	33
Primary Penn West Seal	6	8	12	14	16	16	15	13	12	11
Primary Shell Canada Seal	14	16	16	15	14	12	11	10	9	8
Primrose/Wolf Lake	101	120	120	120	120	120	120	120	120	120
Suncor Mining Project	255	266	278	278	278	278	278	278	278	278
Suncor SAGD Project	79	131	191	219	229	229	229	229	229	229
Sunrise	-	-	-	5	10	35	45	66	75	106
Surmont	25	27	27	27	33	42	52	74	102	110
Syncrude Project	289	305	322	340	405	425	435	500	550	600
Tucker	8	12	18	22	22	22	22	22	22	22
<b>Total Liquids</b>	<b>1576</b>	<b>1839</b>	<b>2089</b>	<b>2293</b>	<b>2534</b>	<b>2778</b>	<b>3086</b>	<b>3429</b>	<b>3715</b>	<b>3869</b>

Source: Wood Mackenzie, Citi Investment Research and Analysis estimates

Brazilian supply growth has been disappointing this year...but could improve in 2012...

## Latin America

### Brazil

Brazil's output growth in 2011 has been the most noteworthy failure of expected non-OPEC supply and a main question is whether 2012 will see postponed production coming on stream or whether it will be a repeat of disappointment. Recent huge pre-salt offshore finds in the Santos Basin have put Brazil in the limelight, and the country also has other potential in conventional plays in shallow and deep water, enhanced oil recovery in mature fields yet to be used, and unexplored inland basins.

Growing production in the newer developed Santos Basin should add to growth this year, and should become increasingly important going forward as the offshore Campos Basin – the mainstay of Brazilian production since the 1970s – still sees growth but looks to plateau and peak by 2017 before declining.

In 2012, the Baleia Azul field is expected to come on stream; with likely peak production of 100-k b/d, production could be at 20-k b/d levels in 2012, up to 60-k b/d in 2013. This contributes to a +117-k b/d increase in total production in 2012 as estimated by Woodmac, while the IEA sees total output growth of +143-k b/d in 2012.

Further production increases in Aruana (+29-k b/d), Jubarte (+70-k b/d), Lula (+55-k b/d), Marlim Sul (+41-k b/d), Peregrino (+25-k b/d) and Waimea & Fuji fields (+23-k b/d) in 2012 (as estimated by Woodmac) add to growth and offsetting declines elsewhere, from completed maintenance and new wells.

Risks to production include strikes at Petrobras oil fields calling for higher safety standards after recent accidents at offshore platforms, as well as improved workers' pay and benefits, with a November 16 planned strike called off after workers accepted a new Petrobras proposal. And measures taken in the wake of the Chevron oil spill in the Frade offshore field in November could see the company's wells shut and drilling halted as environmental audits take place.

### Colombia

Colombia might see 102-k b/d growth in 2012...less than experienced this year...

After recovering from supply disruptions due to strikes and protests near the large Rubiales field hitting some 2-m bbls of production in 3Q'11, Colombia has recovered and is expected to see 102-k b/d of growth in 2012, albeit slower than estimated growth of 130-k b/d in 2011, as liquids production is plateauing and remains questionable for 2013, with forecasts split as to whether growth continues or production declines. Colombia's supply picture is the result of a combination of large declines in its mature fields, measures to halt or reverse these declines and production from new fields, including those to tap its substantial heavy oil resources, such as the Quifa field close to Rubiales, started in 2009.

### Argentina light, tight oil

The shale oil wagon has come to Argentina, with a major discovery at the Vaca Muerta shale formation in the Lomo La Lata Norte field in Neuquen Basin, 650 miles southwest of Buenos Aires. The 927-m boe shale oil find includes 80% shale oil, or around 741-m bbls of light, 40-45 API oil. This is following sizable oil finds earlier this year and last year, with earlier discoveries of 10-50-m boe in July 2011 and 150-m bbls in May 2011, after finding 4.5 tcf of unconventional gas in December 2010. Repsol says it plans to drill another 17 wells and use hydraulic fracturing on 14 existing wells, and other IOCs, particularly Total, have shown renewed interest.

Latin American supply growth holds great promise but faces many headwinds including slowing US demand coupled with stronger US production...

Policy changes continue to shift the landscape for exploration and production. Renewed interest in exploring Argentina's resources has been helped by an easing of previous government price controls (imposed after the 2001-02 economic collapse) which held back investment – the price producers received for oil was as low as \$42/bbl under a variable export tax – but recent months have seen this price rise to \$60-65/bbl. However, foreign exchange controls were issued in October, requiring that oil exporters repatriate all foreign currency export revenues in an effort to stem capital flight, raising the possibility that extracting profits from Argentina might become more problematic.

And while Brazil, Argentina, Falklands, Guyanas-Suriname basin, even Venezuela hold great promise for further finds, these countries' main export market is the US, which is facing both slowing demand but also growth of its own indigenous oil production. These could provide further headwinds for Latin American supply growth going forward.

## Africa

### Angola

Angola has several 2012 projects that could eventually add 390-k b/d at peak production...

The West African OPEC producer has been competing with Nigeria to be the largest oil producer in sub-Saharan Africa. Over the last decade, exploration was concentrated in the Lower Congo Basin, particularly in the deepwater and ultra-deepwater sector, stoked by finds in Brazilian pre-salt reservoirs, which could also exist in Angola.

2011 saw Total's Pazflor project on Block 17 come on stream, helping to boost exports to reach around 1.77-m b/d this year with Total, Statoil and Exxon began shipping Pazflor cargoes. Production has been at just over 91-k b/d, contributing to supply growth in 2011, and could reach 220-k b/d within half a year, contributing to 2012 growth.

2012 projects include several fields that are expected to reach 390-k b/d at peak production. These include Exxon's Kizomba Satellites Phase 1, which could reach 140-k b/d at its peak, to gradually ramp up through 2012-2013, through subsea tiebacks. Woodmac sees 45-k b/d of production in 2012. And BP's ultra-deepwater Block 31 NE PSVM, which could see 150-k b/d output at its peak, producing an estimated 120-k b/d in 2012.

### Nigeria

Nigerian production growth may increasingly depend on deepwater fields as onshore growth has matured...

Almost all of Nigeria's production comes from the Niger Delta, which consists of varying sections of swamp, shallow water and deepwater. Comprising of light, sweet crude dispersed among many small deposits, and facing outages and civil unrest, Nigeria has a number of maturing fields, and its growth is likely to come predominantly from deepwater fields, which could account for half of Nigeria's production by 2020.

Fiscal terms vary among concessions, PSCs, PSAs and service contracts. In particular, a 2008 government draft bill (the Petroleum Industry Bill, or PIB) controversially proposed to increase the government share on deepwater PSC projects; although it has been delayed, it could still come into effect by or after late-2012. This uncertainty has discouraged new upstream activity.

...supply disruptions loomed large in 2011 as geopolitical risk remains high...

And this year saw a string of problems as part of the wider spate of supply disruptions, with operator Royal Dutch Shell declaring *force majeure* on Nigerian Bonny Light, and later, Forcados cargoes, due to partial shut-ins to repair leaking



pipelines, which cut October Forcados shipments to ~153-k b/d, from around 235-k b/d prior to that; Bonny Light exports improved to 153-k b/d from a low in September, but remained below full capacity of over 250-k b/d.

In 2012, Total's Usan field is set to come on stream by Q3. Holding lighter 34' API crude, Usan could be producing 91-k b/d in 2012 and 112-k b/d in 2013. This combined with a 49-k b/d production increase within Shell's 31 oil mining leases (OMLs) in onshore and shallow water of the Niger Delta could add the majority of the ~150-k b/d of supply growth in 2012.

### Non-OPEC Africa

In **Equatorial Guinea**, the Aseng development is set to come online in 2012, with the FPSO arriving a month early at the 55-k b/d field. This could help offset declines elsewhere. **Ghana** could see the Jubilee could increase around 35-40-k b/d to around 120-k b/d in 2012, as Phase I development continues after some new volumes were delayed from 2011 due to technical issues. A new Tullow Tano Shallow field is not likely to come online until after 2012. **Congo** could see modest gains from increases from the 2008 Moho Bilondo deepwater fields to offset declines in mature fields.

### Russia and the FSU

Russia should remain the largest oil producer in the world...nearly 10.7-m b/d expected in 2012...

Russia is set to remain the largest oil producer globally at ~10.45-m b/d in 2010, growing an estimated 120-k b/d to 10.57-m b/d in 2011, with growth of 100-k b/d expected in 2012. The new "60-66" tax regime introduced in October cuts crude export duties, likely incentivizing higher exports and output, although it has mixed effects on upstream versus downstream. But a nuanced story amongst the four major producing regions underlies the continuation of steady growth of around 1% per year seen since 2008.

The largest region, West Siberia, has declined and then stabilized at 6.6-m b/d, followed by the mature Volga-Urals region, which is stable at around 2.2-m b/d. These regions have well developed infrastructure. Timon-Pechora, in more remote regions with far less developed infrastructure, has seen declines but could recover; the remote frontier regions of East Siberia and the Far East are a primary growth driver and could approach 2-m b/d levels as major fields such as Sakhalin-1 ramp-up. These remote regions require significant investment in facilities and transportation infrastructure, and are needed in the longer term to maintain Russia's production targets.

### Other FSU

Azerbaijan could see further growth in 2012 with production returns after BP infrastructure upgrades over the summer. US and EU sanctions on Iran could negatively impact BP gas projects in the country in which a subsidiary of Iran's national oil company has a stake. Turkmenistan could see further liquids production growth from ramp-ups in the South Caspian Basin.

## Kazakhstan's Kashagan field

Kashagan, in the Caspian Sea, is one of Kazakhstan's three supergiant fields, and its Phase One development has been progressing ahead of schedule, with Eni expecting it to be 98% by end-2011, although skeptics see delays possible, with Woodmac more conservatively estimating 110-k b/d levels in 2013 and 220-k b/d in 2014. First oil is targeted for end-2012, and could begin at 70-k b/d, to 300- to 370-k b/d levels in 2013-14, and further phases of development are scheduled to follow. However, if start-up is not possible before November, ice and harsh conditions would hinder monitoring of subsea pipelines and production may be delayed until April 2013. Kashagan had been widely seen as a project with wild cost over-runs, although Eni upstream COO Claudio Descalzi has mentioned that capex on the project was "not far off our targets".

## North Sea

North Sea could see smaller production declines in 2012...

After seeing extended disruptions that reduced production by 269-k b/d this year, the North Sea could see smaller production declines of ~125-k b/d in 2012 driven by declines in Norway, with UK production staying flat as the much maligned Buzzard field stabilizes and new fields come on stream. Nexen has said that they forecast Buzzard production of 168-198-k boe/d in 2012, up 35-k boe/d from 142-153-k boe/d this year, although this could be a conservative estimate. Norway also sees new projects starting up, but the gains from these are more than offset by declines at mature fields.

## Middle East

Non-OPEC Middle East is rife with potential production but faces elevated disruption risk...

Of the non-OPEC Middle Eastern countries, Oman is expected to see growth from new projects (that could reach 40-k b/d at peak output levels) as well as increased volumes from existing fields to reach 930-k b/d levels. Along with Qatar, Oman represents significant upstream value for IOCs in the Middle East, and is more politically stable than Syria and Yemen. Yemen has seen a string of disruptions this year due to attacks on pipelines in the Marib region; although it has the potential for production growth, political unrest is likely to disrupt supply further in 2012, down to ~150-k b/d levels. Syria has been facing sanctions from the EU since September, which has begun to constrain its oil output, as well as political pressure from the Arab League in response to its continued repression of the anti-government protests that began earlier this year. With the recent escalation represented by attacks on military bases by Syrian army defectors in November, the situation remains unstable, and disruptions to oil production and exports are likely.

## Qatar Pearl GTL Project

Shell's flagship Pearl gas-to-liquids (GTL) plant is a joint venture with Qatar Petroleum, and is set to be the largest GTL facility in the world in mid-2012 as it adds its full capacity of 140-k b/d distillates and 120-k b/d NGLs to global volumes, processing 1.6-bcf/d of gas from Qatar's North Field. Of this, estimated peak production sees 47-k b/d of gasoil and 21.5-k b/d of kerosene.

Costing an official figure of \$19 billion, but with estimates that it could be as high as \$22-24 billion, the GTL project has been seven years in the making since Shell and Qatar Petroleum signed the production sharing contract. The first of two 70-k b/d GTL trains began in June 2011, with the second train expected to start up soon, with each train taking between 6 to 12 months to hit full capacity. The first shipment of 300-k bbls of gasoil departed from Ras Laffan for Europe. More recently, a shipment of GTL lubricant base oil arrived in Houston, TX in late November, for blending into motor fuels.

Shell has claimed that the GTL products are cost competitive with conventional oil products. However, the prospect of further GTL projects is constrained by the competing economics of LNG versus other gas export projects for gas producers; employing gas resources for LNG projects enjoys more favorable profit margins while LNG remains oil-linked in a high oil price environment.

**OPEC remains the key with a plethora of questions that remain unanswered...**

## OPEC supply

As can be seen in the discussion above there are huge questions looming in the year ahead concerning OPEC.

- How sustainable is Libya's production growth and how much can the country grow from current levels? This is a 750-k b/d issue.
- How much oil will Saudi Arabia produce? Will the largest oil exporter in the world raise output further? Chances are unlikely. More importantly will the KSA continue to produce at levels above 9-m b/d? Will it revert to its OPEC production level? This is a potential 1-m b/d+ issue.
- How much more production will Iraq be able to add? A potential 400-k b/d issue.
- Will Iran continue to see production erosion? How much? Another 150-k b/d? And of course there is the pending question of whether there will be a supply disruption based on an escalation of current Middle East tensions, the biggest question of all since 16-17-m b/d of flows through the Strait of Hormuz are at stake.
- Will Venezuela see production rise or fall? And if there is a leadership succession during this coming election year, what are the potential fallout for oil output?
- Will Nigeria see enhanced security and high production and exports? Or will the country undergo more internal violence and more supply disruptions. And, if so at what levels?

There are two major issues for the supply/demand fundamentals in the oil market that hinge on OPEC in 2012. The first of these is: how much oil is likely to be produced, and by which producers? We have penciled in our base case for 2012, which sees output consistently above 30-m b/d for the producer group.

**...with Saudi Arabia and the GCC remaining the key players as far as potential growth and spare capacity...**

The second is: what is the level of spare capacity in OPEC, and especially in the key GCC countries, notably Saudi Arabia and Kuwait? As far as Kuwait is concerned, there is clear evidence that a combination of port debottlenecking and new production has boosted Kuwait's capacity to 3-m b/d. The closer the country comes to sustaining production at close to this level, the more compelling the argument that Kuwait, like most other OPEC countries, has no effective spare capacity.

That leaves Saudi Arabia, a country whose NOC President recently announced a suspension of capacity growth investments and holding capacity at 12.5-m b/d. Recently Saudi Arabia's oil minister was quoted as saying that the country was holding capacity at that level indefinitely. He also said at current levels the country had 1.5-2 m b/d of spare capacity. But the country's own submissions to OPEC and posted on the JODI data base indicates production in a range of 9.3- 9.4-m b/d. If the country could raise output by only 1.5- to 2-m b/d. that would leave capacity at 10.8- to 11.4-m b/d, more than 1-m b/d lower than claimed. We have been pegging Saudi capacity at 11.8-m b/d, considering some 700-k b/d of the 12.5-m b/d claimed as too heavy and too high in sulfur and metals content to have significant market value.

The reason this issue is important is that the lower Saudi's spare capacity, the lower the cushions there are for meeting another supply disruption. GCC countries appear to have raised production by 1.7-m b/d since January 2011, in response to the Libyan disruption. The first line of defense for the market against a supply

disruption consists of inventories – inventories of commercial and strategic stocks above the ground, and inventories of producible oil below the ground. If global spare capacity is only 2-m b/d, that level of cushion is quite thin and constitutes one of the most bullish factors in today's market.

**Figure 86. Estimated OPEC supply**

<i>k b/d</i>	<b>Dec-10</b>	<b>Dec-11</b>	<b>Quota</b>	<b>Capacity</b>
Algeria	1,220	1,170	1,202	1,300
Angola	1,645	1,850	1,517	1,900
Ecuador	495	510	434	510
Iran	3,545	3,450	3,336	3,750
Iraq	2,600	2,800	-	2,800
Kuwait	2,045	2,850	2,223	2,660
Libya	1,480	850	1,469	-
Nigeria	2,225	1,860	1,673	2,650
Qatar	735	790	731	900
Saudi Arabia	8,240	9,550	8,051	12,160
UAE	2,470	2,550	2,223	2,800
Venezuela	2,450	2,400	1,985	2,650
<b>TOTAL</b>	<b>29,150</b>	<b>30,630</b>	<b>24,844</b>	<b>34,080</b>

Source: Citi Investment Research and Analysis estimates

#### **Iraq – the impact of Exxon-KRG deal**

Last month, a KRG official announced that they had signed a deal with ExxonMobil to develop six blocks in the northern, semi-autonomous Kurdistan region of Iraq; this was the first major IOC to do so, in spite of warnings from Iraq's central government in Baghdad not to do so. Exxon had a service contract with Baghdad to develop West Qurna-1, including water injection projects to halt and reverse declines in the mature field. It warned that until oil and gas legislation between Baghdad and the KRG was in place, that IOCs could not do deals in Kurdistan.

The KRG had been offering more lucrative production sharing contracts (PSCs) to IOCs, as compared to Baghdad's service contracts, and had managed to attract a number of smaller IOCs to invest in Kurdistan, including Vallares, backed by former BP chief executive Tony Hayward, as well as Turkish player Genel Energy and others. The lack of such an agreement between Kurdistan and Baghdad was reflected in, and compounded by, Baghdad's late or missed payments to Kurdistan for its oil exports, and these difficulties have been one of the reasons for Iraq's struggling export levels to date.

After the Exxon-KRG deal was revealed, there were mixed signals from Baghdad, with some calling for a termination of Exxon's contract for West Qurna-1, others calling for a faster resolution to the oil and gas bill that could normalize arrangements between Baghdad and Kurdistan.

The dilemma for Baghdad is that they want to stop other companies from following in Exxon's footsteps of flouting Baghdad's wishes, but don't want to jeopardize its West Qurna-1 water injection project; and, how should they deal with other IOCs that are already in KRG? The IOC's appear to be doing these deals with the KRG in order to pressure Baghdad into reducing obstacles for export facility growth and hence to production growth.

Iraq's internal politics have played a role. Iraq wishes to stand up to Exxon and show that it cannot be pushed around, but there have been different noises coming

from Prime Minister Maliki, who has been more dovish on the issue, as opposed to Deputy Prime Minister for Energy Hussain Al-Shahristani, who has called for sanctions on Exxon.

Ultimately, the Exxon-KRG puts pressure on Baghdad to resolve their differences with the KRG to boost investment in Iraq. The oil and gas bill is in late drafting stages and is likely to pass soon, and is likely to transition all contracts to PSC-style agreements, and grandfather in all current KRG agreements. It could perhaps exclude Exxon from this, as punishment, although Baghdad has announced that it would not cancel Exxon's West Qurna-1 deal.

On Exxon's side, they have not been happy with Baghdad, which has been late to pay Exxon during the current cost recovery stage of the West Qurna service contract

The question is: to what extent does Baghdad need Exxon to develop West Qurna-1, including the water injection project? There are arguments that Baghdad does not need Exxon – because the West Qurna-1 project remains at an early stage, and Exxon's responsibilities, as they currently stand, could be easily re-parceled amongst the other companies – for instance, Shell – who also have shares in the project.

If it is credible for Baghdad to proceed on West Qurna-1 without Exxon, the incentive may be for Baghdad to pass the oil and gas bill as soon as possible – allowing IOCs to deal with KRG as well as enjoy PSCs with Baghdad, thus encouraging greater investment, and increasing Iraqi crude exports, while terminating Exxon's deal before this, thus saving face for Baghdad.

Recently Baghdad and KRG agreed a target of 175-k b/d exports in 2012, versus 160-k b/d since February to Ceyhan port in Turkey, with some disruptions in 3Q'11

Project start-ups in Iraq in 2012 include:

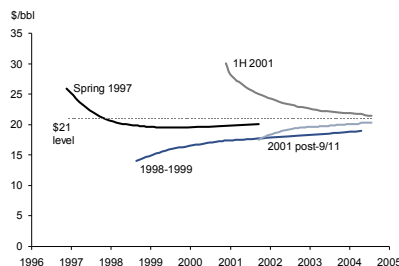
- Rumaila phase 2, which could reach 200-k b/d of production at its peak, and an estimated 50-k b/d growth in 2012
- Nasiriyah could see 10-k b/d growth in 2012, and could reach 150-k b/d levels at its peak
- Gharraf could see 35-k b/d in 2012, and could reach 230-k b/d peak production
- Ahdab could grow 45-k b/d to 60-k b/d in 2012
- Risks to the outlook include Iranian disruptions and Baghdad-KRG tensions

## Long-Term Oil Prices

Upstream and development might finally be stabilizing...

There are growing signs that after more than a half-decade of extraordinary cost inflation of just under 100% per annum in finding and developing new oil resources, these costs have begun to stabilize and could potentially even fall, as new technology is developed, and as greater supply of drilling and other upstream services becomes available. Several different indicators are pointing in this direction.

**Figure 87. Long-term 60-month deferred prices stayed around the \$21/bbl level from the mid-1980s through 2002**



Source: Bloomberg, CIRA

**Long-term (60-month) deferred prices.** For most of the period since the mid-1980s and through 2002, deferred crude oil prices appeared to be mean reverting at around \$21 per barrel (basis WTI). There were times when prompt prices were under duress (e.g. 1998-99; post-9/11 2001) and the price structure was in contango, and other times when they were at a premium, with term structure in backwardation (Spring 1997, first half-2001), and yet there was remarkable stability in deferred prices.

Starting in 2003, when companies, recognizing tighter-than-previously-believed supply conditions, simultaneously and vastly expanded their upstream capital expenditures (capex), the result was severe cost inflation due to inadequate availability of upstream resources. But after the price crash of 2008-09, the 60-month forward curve began to rapidly stabilize. For the past two years, it has hovered in the low \$90-range (nominal \$) indicating that globally adequate supply should be available around this level.

**Average finding and development costs.** There has been a well-understood relationship between oil prices and average finding and development (F&D) costs, first articulated by MIT energy economist Morris Adelman a half century ago, that prices stabilize at a level of about 3x average F&D costs. Thus during the period between the mid-1980s and around 2002, while deferred oil prices were mean reverting at around \$21 per barrel, average F&D costs were around \$7/bbl on a three-year moving average basis. More recently, F&D costs for integrated oil and gas companies as well as independents have been around \$14-15 per barrel on a five-year average basis, as estimated by Citi equity analysts in a June 28, 2011 note, "2010 Finding and Development Cost Study" although estimates for 2010 varied, with independents below the five-year average at \$11.46/boe but integrations above the five-year average, estimated at \$15.63/boe. But an IHS survey showed that F&D costs with respect to oil is higher, at around \$17-18/bbl, given the lower cost of gas F&D. Meanwhile, the forward curve has been averaging around \$90, around 5x average oil F&D costs of \$17-18 per barrel (see the back end of WTI and Brent forward curves in Figure above).

There appear to be a couple of reasons for this, including higher average per barrel resource taxes prevailing today that escape reported F&D costs, as well as significantly less data available today than was the case when Adelman undertook his studies, due to the growth of national oil companies as well as of private companies not domiciled in areas where regulators require robust cost disclosure. Further, higher price volatility confronting projects could require higher returns to compensate. Note that applying the 3x rule today would suggest that prices should be stabilizing in a range of \$51-\$54/bbl.

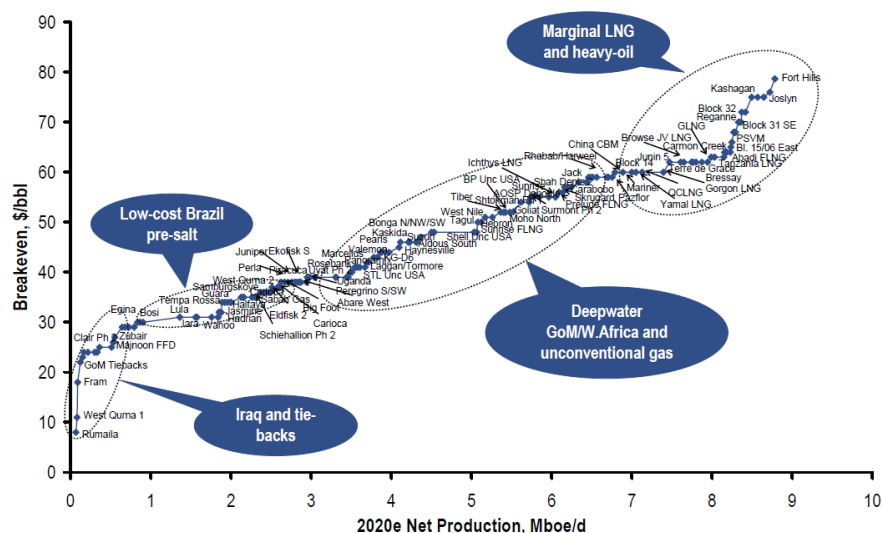
**Marginal costs are pointing to a stable \$50-60 range, with a \$90 top.** A field-by-field analysis of costs suggests that there are two separate and distinct "marginal cost" areas. These include deepwater offshore areas, whether in the Gulf of Mexico, offshore South America or West Africa, or in any of the many other areas now indicating highly prolific geology, including deepwater off East Africa, the Indian Ocean, the Eastern Mediterranean, the Caspian, the north-west Australian shelf, Indonesia or the Arctic. They also include new non-conventional tight oil plays in both the United States and Canada. There are very expensive non-conventional plays with all-in costs in the \$70-85 range, including the Kashagan field in Kazakhstan and some of the most expensive oil sands projects currently under development in Canada. These latter projects are consistent with a long-term oil price of \$90 a barrel.



Citi's equity analysts have developed a database of new upstream projects. As stated in their September 1 report, "Oil Vision: A Map of Decade-ahead Industry Growth", the analysis

"...indicates marginal economics for the industry today in the \$70-90/bbl range, largely composed of long-life projects in the Canadian and Venezuelan oil sands, Russian and Australian LNG projects, and some of the West African ultra-deepwater developments. Our outlook is for pricing equilibrium around a tension point that sits within this marginal range, but with price volatility. The implication of volatility is that these marginal assets will drop in/out of their economic threshold, very unlike the last decade, which allowed for a steepening of the cost-curve, thereby price-enabling 4th-quartile assets. From an investment strategy standpoint, this is an important point. Last decade many of the investment 'winners' were those companies that benefited most from this cost-curve steepening (e.g. Canadian heavy oil). Our scenario would favor a very different investment strategy in this decade: profitable growth and, therefore, 'winners' are likely to come from those companies that can deploy capital in the 1st-3rd quartiles of the curve."

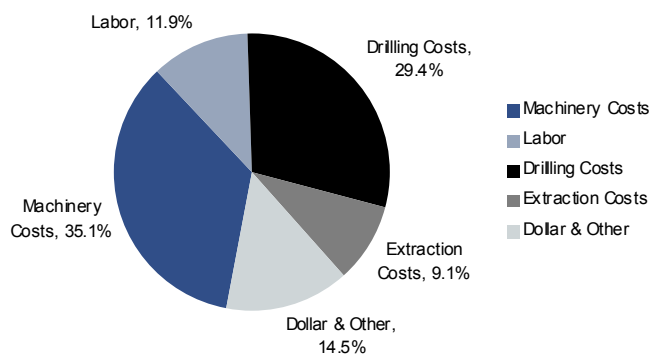
Figure 88. Development projects to 2020 – a median breakeven\* of \$48/bbl, but high-end needs \$70-90/bbl



Source: Citi Investment Research and Analysis. \*Breakeven is NPV zero at 10% discount rate

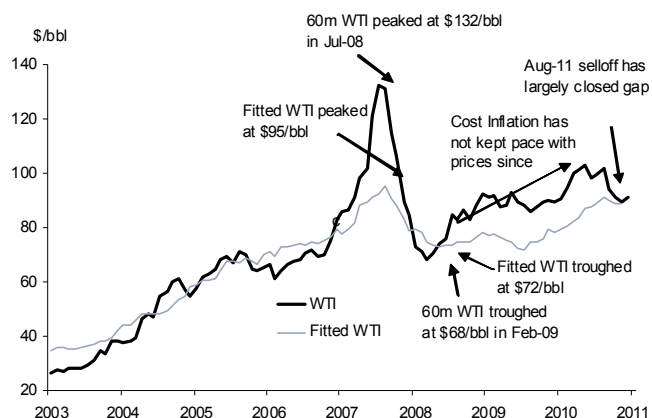
**Citi's proprietary cost index points to deferred prices stabilizing in a range of \$75-80/bbl.** Citi's cost indicator has provided direction on fundamental "fair value" of WTI deferred prices. They also help indicate when there might be some speculative froth in the structure of deferred prices in comparison to where these indicators point (another potential explanation of divergence might be the US-centric nature of the data, although the services sector generally reflects global conditions).

Figure 89. US BLS Cost Indices



Source: US BLS, Bloomberg, Citi Investment Research and Analysis

Figure 90. 60m-forward and “fitted” WTI



Source: US BLS, Bloomberg, Citi Investment Research and Analysis

In conclusion, we feel it is reasonable to put a cap on long-term prices (5-10 years) at the recent level of deferred WTI and Brent prices, i.e. around \$92/bbl, recognizing that technological change or a more competitive services sector could bring these prices to a lower level, while the onset of longer-term inflation and/or a further significantly deteriorating value for the US dollar could raised these prices.

## Expecting the Unexpected: Politics and Tail Risks

When it comes to tail risk events impacting oil prices and curve structures, 2012 looks like it could make 2011 look like a calm normal year. While most of the known and knowable factors at work have a bullish cast, some of them are decisively bearish and make price forecasts unusually precarious.

### The seasonal and political calendars

- **Winter/spring weather:** The largest and lumpiest factors confronting demand are weather and seasonal swings, especially winter to spring in the northern hemisphere. So far, 2011 is exceptionally mild and y-o-y comparisons to the coldest winter in Europe in 2010 are likely to show exaggerated 2% declines. Unless there's a cold snap before end of winter, declines to spring will likely look more anemic than normal.
- **Summer gasoline:** A tight US/Atlantic basin market is expected in 2012, due to refinery closures of more than 1-m b/d in the Atlantic Basin limited make of summer RBOB with its tight RVP specifications. Any stimulus package in the US reinforcing the recent increase in employment and decline in unemployment could put additional froth on summer demand, exacerbating what are already expected to be tight markets.
- **January 23 +15 days:** Chinese New Year ends in early February, signaling the beginning of a period of an expected period of commodity restocking during a period when severe weather often has adverse consequences for commodity demand because of delivery problems.

- **March 4 Russian Presidential elections:** Prime Minister Putin's loss of supermajority in Russia's Duma after the December 4<sup>th</sup> ballot should mean more stimulus ahead of the Presidential election. It remains to be seen whether the Prime Minister will replace President Medvedev as a "running mate" in order to shore up a victory. Increased Russian production demand should continue to stretch Russia's total exports and continue the y-o-y negative growth for international markets, especially in Europe. The regime's legitimacy is being challenged and will significantly depend on higher oil and natural gas prices.
- **March 29 Iranian Parliamentary elections:** Growing personal and structural antagonism between the unelected Supreme Leader and the elected President could lead to a constitutional change that would eliminate direct elections for the President and replace it with a system in which the Supreme Leader could assure greater theocratic control. This is likely to be regarded as highly unpopular perhaps spurring on more domestic discontent.
- **April Republic of Korea Parliamentary Elections:** Relations between North and South are one of the critical issues at stake with bearish or bullish consequences depending on who wins.
- **April 22 French Presidential elections (round 1):** A highly unpopular President looks likely to be running on a platform that emphasizes greater control over speculation in commodities in addition to issues revolving around Euro systemic risk.
- **June-Egyptian Presidential Elections:** Eyes will be on whether Islamist party victories in November's parliamentary elections are reflected in the direct vote for the President, and what the consequences are for Egyptian-Israeli, Egyptian-Saudi, Egyptian-Palestinian relations with important but tangential implications for oil and gas prices.
- **July 1 Mexico Presidential and Legislative Elections:** By tapping into shale reservoirs south of the Texas Eagle Ford play, and deepwater Gulf of Mexico prospects it looks like Mexico's production of oil and gas is starting to climb. With at least one candidate in favoring of amending the country's constitutional obstacles to foreign investments in oil and gas, prospects for continued and increasing production growth are in the balance.
- **July-India Presidential Elections:** Subsidies for gasoline are an issue, given higher crude costs and higher subsidy costs and the ongoing politicization of food and fuel inflation. The rupee depreciation is also pushing up costs of imported oil.
- **September Angola Parliamentary Elections:** With output expected to rise by up to 400-k b/d between last November and next April and with IMF pressure to raise revenues, it looks as though pre-election politics point to no restraints on oil production. Angola could see output rising to 1.9- to 2.0-m b/d under this year's electoral pressures as well as governmental desire to keep foreign investment into the oil and gas sector rising.
- **October Chinese leadership transition begins:** New leaders are expected to be named, taking office after Chinese New Year 2013. In preparation additional economic stimulus measures are expected over and above those that might be adopted earlier in the year, continuing the recent trend to reducing constraints on the expansion of money supply, encouraging housing, and fostering fixed investment, which should be bullish for bulk commodities, base metals, agricultural commodities and oil.

■ **November 6: US Presidential Election:** Oil prices could be critical to who wins, and further quantitative easing could be in the works before hand.

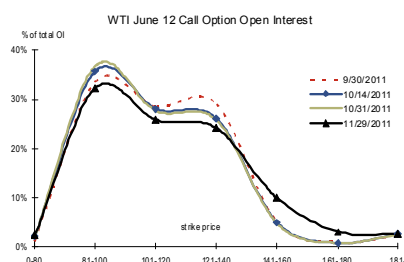
■ **December Republic of Korea Presidential Elections:** (see above with respect to Parliamentary Elections).

## Tail Risks

**Tail risk events dominated the 2011 crude oil market story...and will likely remain in 2012...**

Just as tail risk events dominated both the 2011 flat price environment and 2011 term structure, so too are they likely to dominate the same issues in 2012. Problems lie, however, in identifying whether the tail risk events are to be bearish or bullish, understanding that by definition it is close to impossible to take a divine perspective on tail risks and identify what unknowable events lie ahead.

**Figure 91. WTI June 12 Call Option OI sees moves to \$140-180/bbl strike prices**

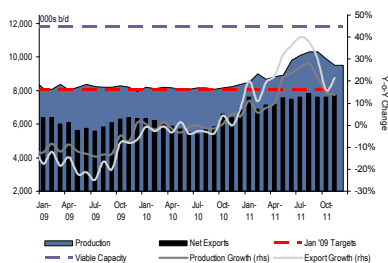


Source: Bloomberg, CIRA

Notwithstanding these difficulties, investor sentiment at year-end has been and remains largely bullish, as it similarly increased after the Libyan supply disruption. Since early 2010 out-of-the money call option open interest (OI) for December'12 delivery with strikes price between \$100 and \$140/bbl rose substantially and they are skewed toward upside price risk. There had been a significant jump upward after the Libyan disruption with investors preparing for an upside price breakout, but in late Q311, as global economic growth prospects were put at risk, there was a fading in open interest. Bullish optioning position has once again increased for next year, however, as perceived risk of an Iranian-related disruption is heightened.

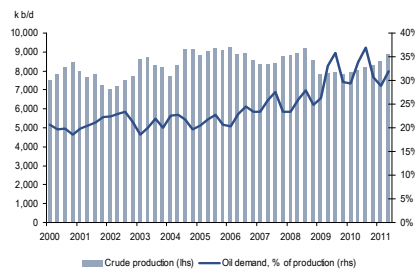
It is clearly the case that oil prices have been bolstered as the year ends by the increased tensions associated with Iran, and open interest in deep out-of-the-money calls (\$140-180) for June 2012 have survived as the market prices-in the potential for more surprises to come.

**Figure 92. Saudi spare capacity has been dwindling**



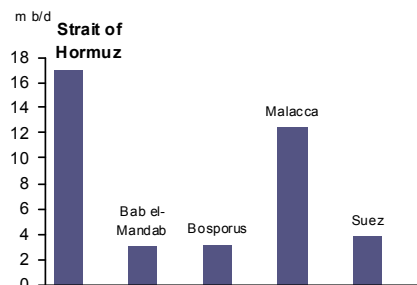
Source: JODI, Citi Investment Research and Analysis

**Figure 93. Saudi domestic crude demand as % of production has been on the rise**



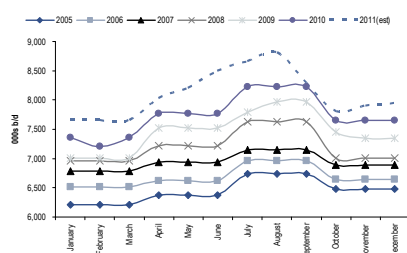
Source: JODI, Citi Investment Research and Analysis

**Figure 94. The Strait of Hormuz is a major oil chokepoint located at Iran's doorstep**



Source: EIA, Citi Investment Research and Analysis

**Figure 95. Middle East oil consumption rising year-on-year**

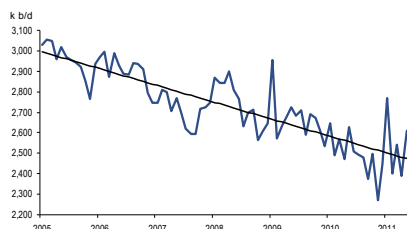


Source: EIA, Citi Investment Research and Analysis

## Key Bullish Risks

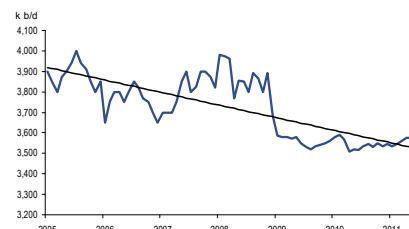
1. **Iran.** Iran ranks as the number one political risk in the oil market as the year ends. Several factors are at work, including a potential European Union-wide boycott of Iranian oil in response to Iran's failure to abide by conditions imposed by the IAEA concerning the country's nuclear program and concerning conditions leading to the attacks on and the closure of the UK embassy in Tehran. Two explosions have been reported recently at military sites as the year-end approaches, with little information concerning whether the perpetrators are domestic or foreign. Based on the above factors, the combination of internal and external factors suggests that some disruption related to Iran looks likely. The risks relate to the implications of a closure of the Strait of Hormuz, through which up to 17-m b/d of oil flows.
2. **Saudi Arabia.** Despite signs of internal dissent, the market is concerned about two factors related to the most important oil producer in the world: firstly, its shrinking spare capacity and delays in capacity expansion and secondly, a potential terrorist attack on a critical oil facility, such as the large 7-m b/d stabilization facility at Abqaiq, or the port facilities at Ras Tanura, given the inability to replace these other than by a sustained release of strategic petroleum reserves in IEA-member countries.
3. **Collapsing OPEC output.** Several key members of OPEC have seen their oil production capacity fall with no end in sight, due to lack of capital investment. Two members in particular, Iran and Venezuela have lost a combined 1.5-m b/d of capacity over the last ten years and the IEA is now projecting that Iran's sustainable crude production capacity could fall by 800-k b/d between 2010 and 2016.
4. **Rampant demand growth in OPEC countries.** Oil producing countries, especially members of OPEC, have rapid population growth and maintain significant subsidies for consumers of oil products. This demand growth is rapidly eroding exportable surpluses. The Middle East oil producers alone saw oil consumption rise by 1-m b/d between 2005 and 2010 and at the same rate could rise by another 1.5-m b/d between 2010 and 2015 and by 2.0-m b/d between 2015 and 2020. That's 4.5-m b/d of structural tightness in the oil market.
5. **Contagion of disruptions to other light, sweet oil producers.** The disruption of 1.5-m b/d of Libyan oil supply had a disproportionate impact on global oil prices. While Saudi Arabia alone had no problem replacing that amount of oil volumetrically, no oil producer could add light, low-sulfur oil that is readily refined into low-sulfur transportation fuels. Libya's output was close to 15% of the world's pool of light quality oil and two other OPEC producers – Algeria and Nigeria – produce a combined 3.7-m b/d of similar quality oil. The Libyan disruption indicated what a big deal a small local disruption can mean for global prices.

**Figure 96. Venezuelan crude production is in decline, and may grow only 140-k b/d between 2010 and 2016...**



Source: EIG, Citi Investment Research and Analysis

**Figure 97. ...as is Iranian crude production, declining 100-300-k b/d per year**

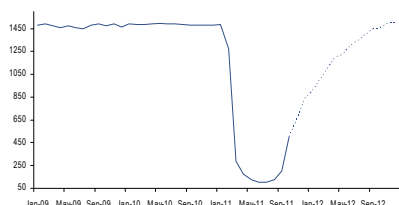


Source: EIG, Citi Investment Research and Analysis

## Key Bearish Factors

While bullish risks weighed heavily on the market and point to long-term market tightness, there are also tangible bearish factors that could have a more immediate impact.

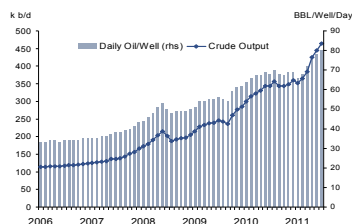
**Figure 98. Libyan wellhead production (k b/d)**



Source: EIG, CIRA estimates

1. **Libyan oil revival.** While Libya's oil disruption weighed significantly on oil prices for much of 2011, the resumption of production since the ouster of Muammar Qaddafi has been very strong. Indeed, by year-end about half of Libya's 1.5-m b/d production capacity is being restored. With the current return of service companies and operating companies to the country, it is now plausible that all of the country's lost production will be returned to the market by the end of 2012.
2. **Iraq on the march.** No market analyst doubts Iraq's potential production growth. But there have been major impediments to raising production levels and removing constraints to the country's exports. Relieving the export bottlenecks in the southern part of the country could result in 400-k b/d of more oil in global markets by year-end. A political solution to a dispute between the KRG authorities in the north and Baghdad could result in another 200-k b/d or so of exports through the northern pipeline system through Turkey. On the other hand, failure to resolve these political and physical constraints could actually result in lower production if political conditions deteriorate.
3. **A combination of a double-dip recession and continued Saudi production at current levels.** Either of these factors alone would be bearish. A double dip could result in minimal oil demand growth, while growing non-OPEC supply combined with higher output from Libya and Angola would force a global crude oil inventory build. If at the same time Saudi authorities decided to maintain current output of around 9.5-m b/d, prices could fall to under \$90 a barrel by spring.

**Figure 99. North Dakota production growth of over 120-k b/d y-o-y is driving US onshore output gains**



Source: State of North Dakota, CIRA

4. **A Chinese economic upset.** Sustained growth of Chinese oil demand has underpinned oil markets for the past decade, but Citi's Chinese economists recognize that a combination of factors including a bursting of the property bubble could have a severe impact on Chinese economic growth, as well as the risks of a rise in social discontent and continued environmental degradation: the question is when, rather than whether, it occurs. This as an unlikely scenario for 2012, with a softer landing as the base case, but this tail risk cannot be dismissed.
5. **Accelerated US oil independence.** The global market is finally taking stock of the fact that the US has been the fastest growing oil producer of the past half decade, adding 1-m b/d to its liquids production and carving 1-m b/d off its consumption. By 2015, the US looks likely to add another 2-m b/d to its production base and shave another 500-k b/d from consumption. That's more than the oil exports of any OPEC country other than Saudi Arabia.



## Appendix – Supply and Demand Balances

Figure 100. Base Case Supply-Demand Balance

<i>m b/d</i>	2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	2011	Q1 2012	Q2 2012	Q3 2012	Q4 2012	2012	2013	12v11	13v12
<b>Demand</b>														
OECD Demand	46.2	46.3	44.6	45.6	46.9	45.8	46.2	44.4	45.3	46.4	45.5	45.5	-0.3	-0.1
Non-OECD Demand	42.1	42.8	43.6	43.7	44.1	43.6	43.9	44.8	44.9	45.3	44.7	45.8	1.1	1.1
<b>Total Demand</b>	<b>88.3</b>	<b>89.1</b>	<b>88.2</b>	<b>89.3</b>	<b>91.0</b>	<b>89.4</b>	<b>90.1</b>	<b>89.1</b>	<b>90.1</b>	<b>91.7</b>	<b>90.3</b>	<b>91.3</b>	<b>0.8</b>	<b>1.0</b>
<b>Supply</b>														
Non-OPEC														
Crude	48.7	48.9	48.3	48.6	49.3	48.8	49.4	49.4	49.8	50.1	49.7	50.3	0.9	0.7
Other	3.9	3.8	4.0	4.0	4.1	4.0	4.1	4.2	4.2	4.3	4.2	4.4	0.2	0.3
<b>Total Non-OPEC</b>	<b>52.6</b>	<b>52.7</b>	<b>52.3</b>	<b>52.6</b>	<b>53.4</b>	<b>52.7</b>	<b>53.5</b>	<b>53.6</b>	<b>54.0</b>	<b>54.3</b>	<b>53.9</b>	<b>54.8</b>	<b>1.1</b>	<b>0.9</b>
OPEC														
Crude	29.5	30.0	29.4	30.0	30.3	29.9	30.7	30.0	30.0	30.1	30.2	30.4	0.3	0.2
Other	5.3	5.8	5.8	5.9	6.0	5.9	6.2	6.2	6.3	6.3	6.2	6.4	0.4	0.1
<b>Total OPEC</b>	<b>34.8</b>	<b>35.8</b>	<b>35.2</b>	<b>35.9</b>	<b>36.3</b>	<b>35.8</b>	<b>36.9</b>	<b>36.2</b>	<b>36.3</b>	<b>36.4</b>	<b>36.4</b>	<b>36.8</b>	<b>0.6</b>	<b>0.3</b>
<b>Total Supply</b>	<b>87.4</b>	<b>88.5</b>	<b>87.5</b>	<b>88.5</b>	<b>89.7</b>	<b>88.5</b>	<b>90.4</b>	<b>89.8</b>	<b>90.3</b>	<b>90.8</b>	<b>90.3</b>	<b>91.5</b>	<b>1.8</b>	<b>1.2</b>
Stock Change	-0.8	-0.6	-0.7	-0.8	-1.3	-0.9	0.3	0.6	0.1	-0.9	0.0	0.2		
<b>Crude Oil Prices</b>														
Brent (\$/bbl)	80.3	105.0	117.4	113.3	109.7	111.4	105.0	110.0	110.0	115.0	110.0	120.0	-1.3	10.0
WTI (\$/bbl)	79.4	93.5	102.2	89.7	93.8	94.8	95.0	100.0	100.0	105.0	100.0	113.0	5.2	13.0

Source: Citi Investment Research and Analysis estimates

Figure 101. Total Products Demand Scenarios

Base Case (60% Probability)

m b/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
OECD	46.3	44.6	45.6	46.9	46.2	44.4	45.3	46.4	45.9	44.2	45.2	46.5	46.2	45.8	45.5	45.5	-0.3	-0.3	-0.1
Non-OECD	42.8	43.6	43.7	44.1	43.9	44.8	44.9	45.3	45.0	45.9	46.0	46.4	42.1	43.6	44.7	45.8	1.5	1.1	1.1
Total Demand	89.1	88.2	89.3	91.0	90.1	89.1	90.1	91.7	91.0	90.1	91.2	92.9	88.3	89.4	90.3	91.3	1.1	0.8	1.0

Low Case (15% Probability)

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
OECD	46.3	44.6	45.6	46.9	45.6	43.6	44.2	45.1	44.4	42.7	43.6	44.9	46.2	45.8	44.6	43.9	-0.3	-1.2	-0.8
Non-OECD	42.8	43.6	43.7	44.1	43.7	44.3	44.2	44.4	44.1	44.9	45.0	45.3	42.1	43.6	44.2	44.8	1.5	0.6	0.7
Total Demand	89.1	88.2	89.3	91.0	89.3	87.9	88.4	89.5	88.6	87.6	88.6	90.2	88.3	89.4	88.8	88.7	1.1	-0.6	-0.1

High Case (25% Probability)

m b/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
OECD	46.3	44.6	45.6	46.9	46.1	44.4	45.4	46.7	46.0	44.3	45.3	46.6	46.2	45.8	45.7	45.6	-0.3	-0.2	-0.1
Non-OECD	42.8	43.6	43.7	44.1	43.9	44.8	44.9	45.3	45.1	46.0	46.1	46.5	42.1	43.6	44.7	45.9	1.5	1.1	1.2
Total Demand	89.1	88.2	89.3	91.0	90.0	89.2	90.3	92.0	91.1	90.3	91.4	93.2	88.3	89.4	90.4	91.5	1.1	1.0	1.1

Selected Countries (Base Case)

m b/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
US	19.2	18.8	19.0	19.2	19.1	18.9	19.2	19.2	19.2	19.0	19.4	19.4	19.2	19.0	19.1	19.3	-0.1	0.0	0.2
Europe	8.7	8.6	8.7	8.9	8.5	8.3	8.3	8.4	8.1	7.9	8.0	8.0	9.0	8.7	8.4	8.0	-0.2	-0.4	-0.4
Japan	4.9	3.9	4.4	4.5	4.8	4.0	4.4	4.5	4.8	4.0	4.4	4.5	4.5	4.4	4.4	4.4	0.0	0.0	0.0
Rest of OECD	13.6	13.2	13.4	14.3	13.7	13.2	13.4	14.4	13.8	13.3	13.5	14.5	13.6	13.6	13.7	13.8	0.0	0.0	0.1
China	9.4	9.3	9.1	9.9	9.5	9.6	9.8	10.3	9.9	10.2	10.4	10.8	8.8	9.4	9.8	10.3	0.6	0.4	0.5
Middle East	7.6	8.0	8.5	7.9	7.9	8.3	8.7	8.1	8.1	8.6	9.0	8.4	7.8	8.0	8.3	8.5	0.2	0.3	0.2
Rest of Non-OECD	25.7	26.3	26.1	26.4	26.5	26.8	26.3	26.9	27.0	27.1	26.7	27.2	25.5	26.1	26.6	27.0	0.6	0.5	0.4

Source: Citi Investment Research and Analysis

Figure 102. Gasoline Demand Scenarios

Base Case (60% Probability)

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
OECD	13.7	14.1	14.3	14.2	13.5	14.0	14.2	13.9	13.4	13.8	14.0	13.9	14.3	14.1	13.9	13.8	-0.3	-0.2	-0.1
Non-OECD	8.4	8.5	8.5	8.6	8.7	8.8	8.8	8.9	9.0	9.1	9.1	9.2	8.2	8.5	8.8	9.1	0.3	0.3	0.3
Total Demand	22.1	22.6	22.9	22.8	22.3	22.8	23.0	22.9	22.4	22.9	23.1	23.1	22.5	22.6	22.7	22.9	0.1	0.1	0.2

Low Case (15% Probability)

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
OECD	13.7	14.1	14.3	14.2	13.3	13.6	13.7	13.4	12.7	13.1	13.3	13.2	14.3	14.1	13.5	13.1	-0.3	-0.6	-0.4
Non-OECD	8.4	8.5	8.5	8.6	8.7	8.7	8.7	8.7	8.9	8.9	8.9	9.0	8.2	8.5	8.7	8.9	0.3	0.2	0.2
Total Demand	22.1	22.6	22.9	22.8	22.0	22.3	22.4	22.2	21.6	22.0	22.3	22.2	22.5	22.6	22.2	22.0	0.1	-0.4	-0.2

High Case (25% Probability)

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
OECD	13.7	14.1	14.3	14.2	13.4	13.9	14.1	13.9	13.2	13.6	13.9	13.7	14.3	14.1	13.8	13.6	-0.3	-0.3	-0.2
Non-OECD	8.4	8.5	8.5	8.6	8.7	8.8	8.8	8.9	9.0	9.1	9.1	9.2	8.2	8.5	8.8	9.1	0.3	0.3	0.3
Total Demand	22.1	22.6	22.9	22.8	22.1	22.7	22.9	22.8	22.2	22.8	23.0	22.9	22.5	22.6	22.6	22.7	0.1	0.0	0.1

Selected Countries

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
US	8.6	8.9	9.0	8.7	8.6	8.8	9.0	8.7	8.7	8.9	9.1	8.8	9.0	8.8	8.8	8.9	-0.2	0.0	0.1
Europe	1.3	1.4	1.4	1.3	1.1	1.2	1.2	1.1	1.0	1.1	1.1	1.0	1.4	1.3	1.2	1.0	-0.1	-0.1	-0.1
Japan	0.9	0.9	1.1	1.0	0.9	0.9	1.0	1.0	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0
Rest of OECD	2.8	2.9	2.9	3.2	2.8	3.0	2.8	3.1	2.8	2.9	2.8	3.1	3.0	3.0	2.9	2.9	0.0	0.0	0.0
China	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.0	1.7	1.8	1.8	1.9	0.1	0.1	0.1
Middle East																			
Rest of Non-OECD	6.7	6.8	6.8	6.8	6.9	7.0	7.0	7.0	7.1	7.2	7.2	7.2	6.5	6.8	7.0	7.2	0.2	0.2	0.2

Source: Citi Investment Research and Analysis

Figure 103. Middle Distillate Demand Scenarios

Base Case (60% Probability)

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
OECD	12.8	12.0	11.9	12.8	12.7	12.0	11.8	12.6	12.7	12.0	11.8	12.7	12.6	12.4	12.3	12.3	-0.2	-0.1	0.0
Non-OECD	13.3	13.5	13.9	14.0	13.9	14.1	14.4	14.6	14.5	14.7	15.0	15.2	13.0	13.7	14.3	14.9	0.7	0.6	0.6
Total Demand	26.1	25.6	25.7	26.8	26.6	26.1	26.2	27.2	27.2	26.7	26.8	27.8	25.6	26.0	26.5	27.1	0.4	0.5	0.6

Low Case (15% Probability)

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
OECD	12.8	12.0	11.9	12.8	12.6	11.8	11.5	12.3	12.3	11.5	11.4	12.2	12.6	12.4	12.0	11.8	-0.2	-0.3	-0.2
Non-OECD	13.3	13.5	13.9	14.0	13.9	14.0	14.3	14.4	14.2	14.4	14.7	14.8	13.0	13.7	14.1	14.6	0.7	0.5	0.4
Total Demand	26.1	25.6	25.7	26.8	26.5	25.8	25.8	26.6	26.5	26.0	26.1	27.1	25.6	26.0	26.2	26.4	0.4	0.1	0.2

High Case (25% Probability)

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
OECD	12.8	12.0	11.9	12.8	12.7	12.0	11.8	12.7	12.7	12.0	11.8	12.7	12.6	12.4	12.3	12.3	-0.2	0.0	0.0
Non-OECD	13.3	13.5	13.9	14.0	13.9	14.2	14.5	14.6	14.6	14.8	15.1	15.3	13.0	13.7	14.3	14.9	0.7	0.6	0.6
Total Demand	26.1	25.6	25.7	26.8	26.7	26.2	26.3	27.3	27.2	26.8	26.9	28.0	25.6	26.0	26.6	27.2	0.4	0.6	0.6

Selected Countries

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
US	3.9	3.8	3.6	3.9	3.9	3.8	3.6	3.8	3.9	3.7	3.6	3.8	3.8	3.8	3.8	3.8	0.0	0.0	0.0
Europe	3.9	3.6	3.6	3.9	3.8	3.5	3.5	3.7	3.7	3.4	3.4	3.6	3.9	3.8	3.6	3.5	-0.2	-0.1	-0.1
Japan	0.9	0.7	0.8	0.8	0.9	0.8	0.8	0.8	0.9	0.8	0.8	0.9	0.8	0.8	0.8	0.9	0.0	0.0	0.0
Rest of OECD	4.1	4.0	3.8	4.2	4.1	3.9	3.8	4.2	4.2	4.0	4.0	4.4	4.0	4.0	4.0	4.1	0.0	0.0	0.1
China	3.4	3.4	3.4	3.8	3.6	3.5	3.7	3.8	3.7	3.7	3.9	4.1	3.2	3.5	3.7	3.8	0.3	0.1	0.2
Middle East																			
Rest of Non-OECD	9.9	10.1	10.4	10.2	10.3	10.6	10.8	10.8	10.9	11.0	11.1	11.1	9.8	10.1	10.6	11.0	0.3	0.5	0.4

Source: Citi Investment Research and Analysis

Figure 104. Residual Fuel Oil Demand Scenarios

Base Case (60% Probability)

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
OECD	3.1	2.8	3.0	3.1	3.0	2.7	3.0	3.0	3.0	2.7	3.0	3.0	2.9	3.0	2.9	2.9	0.0	0.0	0.0
Non-OECD	5.5	5.6	5.9	5.9	5.6	5.8	6.1	6.0	5.7	5.9	6.2	6.2	5.5	5.7	5.9	6.0	0.2	0.1	0.1
Total Demand	8.5	8.4	8.9	9.0	8.6	8.5	9.0	9.1	8.8	8.6	9.2	9.2	8.5	8.7	8.8	8.9	0.2	0.1	0.1

Low Case (15% Probability)

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
OECD	3.1	2.8	3.0	3.1	3.0	2.7	2.9	3.0	2.9	2.6	2.9	2.9	2.9	3.0	2.9	2.8	0.0	-0.1	-0.1
Non-OECD	5.5	5.6	5.9	5.9	5.6	5.7	6.0	5.9	5.6	5.8	6.1	6.1	5.5	5.7	5.8	5.9	0.2	0.1	0.1
Total Demand	8.5	8.4	8.9	9.0	8.6	8.4	8.9	8.9	8.6	8.4	9.0	9.0	8.5	8.7	8.7	8.7	0.2	0.0	0.0

High Case (25% Probability)

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
OECD	3.1	2.8	3.0	3.1	3.0	2.7	3.0	3.1	3.0	2.7	3.0	3.1	2.9	3.0	3.0	3.0	0.0	0.0	0.0
Non-OECD	5.5	5.6	5.9	5.9	5.6	5.8	6.1	6.1	5.8	6.0	6.2	6.2	5.5	5.7	5.9	6.0	0.2	0.2	0.2
Total Demand	8.5	8.4	8.9	9.0	8.7	8.5	9.1	9.1	8.8	8.7	9.2	9.3	8.5	8.7	8.8	9.0	0.2	0.1	0.2

Selected Countries

mb/d	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	2010	2011	2012	2013	11 vs 10	12 vs 11	13 vs 12
US	0.6	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0.0	0.0
Europe	0.6	0.6	0.6	0.7	0.6	0.5	0.6	0.6	0.5	0.4	0.5	0.5	0.6	0.6	0.6	0.5	0.0	-0.1	-0.1
Japan	0.4	0.4	0.5	0.4	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.5	0.0	0.0	0.0
Rest of OECD	1.4	1.3	1.4	1.4	1.5	1.3	1.4	1.5	1.5	1.3	1.4	1.5	1.4	1.4	1.4	1.4	0.0	0.0	0.0
China	0.7	0.6	0.6	0.8	0.9	0.6	0.7	0.7	0.8	0.7	0.8	0.8	0.6	0.7	0.7	0.8	0.1	0.0	0.1
Middle East																			
Rest of Non-OECD	4.7	5.0	5.3	5.1	4.7	5.2	5.4	5.4	4.9	5.2	5.4	5.4	4.9	5.0	5.2	5.2	0.1	0.1	0.1

Source: Citi Investment Research and Analysis

Figure 105. EIA Oil Supply-Demand Balance

m b/d	2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	2011	Q1 2012	Q2 2012	Q3 2012	Q4 2012	2012	10v09	11v10	12v11
<b>Demand</b>	<b>87.07</b>	<b>87.25</b>	<b>87.21</b>	<b>88.70</b>	<b>89.34</b>	<b>88.13</b>	<b>88.89</b>	<b>88.66</b>	<b>90.00</b>	<b>90.50</b>	<b>89.52</b>	<b>2.50</b>	<b>1.06</b>	<b>1.39</b>
OECD Demand	46.10	46.20	44.50	45.62	46.42	45.68	46.30	44.69	45.47	46.13	45.65	0.48	-0.42	-0.03
Non-OECD Demand	40.97	41.05	42.71	43.08	42.92	42.45	42.59	43.97	44.53	44.37	43.87	2.02	1.48	1.42
<b>Supply</b>	<b>87.06</b>	<b>87.60</b>	<b>86.25</b>	<b>87.89</b>	<b>89.30</b>	<b>87.77</b>	<b>89.07</b>	<b>89.54</b>	<b>89.54</b>	<b>89.62</b>	<b>89.42</b>	<b>2.72</b>	<b>0.71</b>	<b>1.65</b>
Non-OPEC Supply	51.76	52.06	51.37	52.08	53.14	52.16	53.39	53.43	53.21	53.26	53.32	1.29	0.40	1.16
Non-OPEC Supply ex FSU	38.56	38.72	38.02	38.67	39.68	38.77	39.71	39.83	39.76	39.91	39.80	0.99	0.21	1.03
FSU	13.20	13.34	13.35	13.41	13.46	13.39	13.68	13.60	13.45	13.35	13.52	0.30	0.19	0.13
OPEC NGL/Condensate	5.54	5.75	5.69	5.92	6.23	5.90	6.24	6.27	6.35	6.31	6.29	0.76	0.36	0.39
<b>Call on OPEC Crude and Stocks</b>	<b>29.77</b>	<b>29.44</b>	<b>30.15</b>	<b>30.70</b>	<b>29.97</b>	<b>30.07</b>	<b>29.26</b>	<b>28.96</b>	<b>30.44</b>	<b>30.93</b>	<b>29.91</b>	<b>0.45</b>	<b>0.30</b>	<b>-0.16</b>
OPEC Crude	29.77	29.78	29.20	29.89	29.94	29.70	29.36	29.84	29.99	30.05	29.81	0.68	-0.07	0.11
Stock Change	0.00	0.34	-0.95	-0.81	-0.03	-0.37	0.10	0.88	-0.45	-0.88	-0.10	0.22	-0.37	0.27

Source: EIA

Figure 106. IEA Oil Supply-Demand Balance

m b/d	2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	2011	Q1 2012	Q2 2012	Q3 2012	Q4 2012	2012	10v09	11v10	12v11
<b>Demand</b>	<b>88.26</b>	<b>88.92</b>	<b>87.92</b>	<b>89.58</b>	<b>90.21</b>	<b>89.16</b>	<b>90.16</b>	<b>89.39</b>	<b>90.93</b>	<b>91.37</b>	<b>90.47</b>	<b>2.72</b>	<b>0.90</b>	<b>1.31</b>
OECD Demand	46.15	46.29	44.52	45.89	46.38	45.77	46.11	44.43	45.62	46.02	45.55	0.51	-0.38	-0.22
Non-OECD Demand	42.11	42.64	43.40	43.69	43.82	43.39	44.05	44.96	45.31	45.35	44.92	2.21	1.28	1.53
<b>Supply</b>	<b>87.44</b>	<b>88.46</b>	<b>87.51</b>	<b>88.50</b>								<b>1.81</b>		
Non-OPEC Supply	52.61	52.70	52.26	52.60	53.42	52.74	53.67	53.61	53.80	54.12	53.80	1.06	0.14	1.06
Non-OPEC Supply ex FSU	39.06	39.06	38.68	39.02	39.68	39.11	39.92	39.79	40.11	40.27	40.02	0.78	0.05	0.91
FSU	13.55	13.64	13.58	13.57	13.74	13.63	13.75	13.83	13.70	13.85	13.78	0.28	0.09	0.15
OPEC NGL/Condensate	5.35	5.79	5.80	5.91	5.99	5.87	6.15	6.19	6.40	6.44	6.30	0.42	0.52	0.43
<b>Call on OPEC Crude and Stocks</b>	<b>30.31</b>	<b>30.43</b>	<b>29.86</b>	<b>31.07</b>	<b>30.80</b>	<b>30.54</b>	<b>30.34</b>	<b>29.59</b>	<b>30.72</b>	<b>30.81</b>	<b>30.37</b>	<b>1.25</b>	<b>0.24</b>	<b>-0.18</b>
OPEC Crude	29.49	29.97	29.45	29.99										
Stock Change	-0.82	-0.46	-0.41	-1.08										

Source: IEA

Figure 107. OPEC Oil Supply-Demand Balance

m b/d	2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	2011	Q1 2012	Q2 2012	Q3 2012	Q4 2012	2012	10v09	11v10	12v11
<b>Demand</b>	<b>86.94</b>	<b>87.52</b>	<b>86.28</b>	<b>88.30</b>	<b>89.13</b>	<b>87.81</b>	<b>88.73</b>	<b>87.44</b>	<b>89.50</b>	<b>90.33</b>	<b>89.01</b>	<b>2.24</b>	<b>0.87</b>	<b>1.20</b>
OECD Demand	46.15	46.34	44.60	46.06	46.52	45.88	46.38	44.62	45.98	46.50	45.87	0.55	-0.27	-0.01
Non-OECD Demand	40.79	41.18	41.68	42.24	42.61	41.93	42.35	42.82	43.52	43.83	43.14	1.69	1.14	1.21
<b>Supply</b>	<b>86.45</b>	<b>87.51</b>	<b>86.38</b>	<b>87.49</b>								<b>2.25</b>		
Non-OPEC Supply	52.28	52.76	51.97	52.17	53.07	52.50	53.32	53.16	53.22	53.57	53.32	1.18	0.22	0.82
Non-OPEC Supply ex FSU	39.06	39.44	38.71	38.92	39.72	39.21	39.87	39.75	39.77	40.05	39.83	0.96	0.15	0.62
FSU	13.22	13.32	13.26	13.25	13.35	13.29	13.45	13.41	13.45	13.52	13.49	0.22	0.07	0.20
OPEC NGL/Condensate	4.90	5.12	5.26	5.37	5.42	5.29	5.50	5.61	5.71	5.79	5.65	0.60	0.39	0.36
<b>Call on OPEC Crude and Stocks</b>	<b>29.76</b>	<b>29.64</b>	<b>29.05</b>	<b>30.76</b>	<b>30.64</b>	<b>30.02</b>	<b>29.91</b>	<b>28.67</b>	<b>30.57</b>	<b>30.97</b>	<b>30.04</b>	<b>0.46</b>	<b>0.26</b>	<b>0.02</b>
OPEC Crude	29.27	29.63	29.15	29.95								0.47		
Stock Change	-0.49	-0.01	0.10	-0.80								0.01		

Source: OPEC

## **Notes**



## Appendix A-1

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